Department of Computer Science & Engineering
Birla Institute of Technology, Mesra, Ranchi - 835215 (India)

B.TECH IN COMPUTER SCIENCE & ENGINEERING

(Semester –I)
COURSE INFORMATION SHEET

Course code: MA 103
Course title: Mathematics I
Pre-requisite(s): Basic Calculus, Basic Algebra
Co- requisite(s): ---
Credits: L: 3 T: 1 P: 0 C:4
Class schedule per week: 3 Lectures, 1 Tutorial.
Class: B.Tech.
Semester / Level: I / 1
Branch: All
Name of Teacher:

Course Objectives: This course enables the students to understand:

1.	infinite sequences and series
2.	theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc.
3.	multivariable functions, their limits, continuity, partial differentiation, properties and applications of partial derivatives.
4.	integrals of multivariable functions viz. double and triple integrals with their applications
5.	properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions

Course Outcomes: After the completion of this course, students will be able to

CO1	decide the behaviour of sequences and series using appropriate tests.

CO2	handle problems related to the theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc.
CO3	get an understanding of partial derivatives and their applications in finding maxima - minima problems
CO4	apply the principles of integrals (multivariable functions viz. double and triple integrals) to solve a variety of practical problems in engineering and sciences
CO5	get an understanding of gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions and demonstrate a depth of understanding in advanced mathematical topics, enhance and develop the ability of using the language of mathematics in engineering

Syllabus

MODULE – I: Sequences and Series

Sequences, Convergence of Sequence. Series, Convergence of Series, Tests for Convergence: Comparison tests, Ratio test, Cauchy's root test, Raabe's test, Gauss test, Cauchy's Integral test, Alternating series, Leibnitz test, Absolute and Conditional Convergence.

[9L]

MODULE – II: Matrices

Rank of a Matrix, elementary transformations, Row - reduced Echelon form. Vectors, Linear Independence and Dependence of Vectors. Consistency of system of linear equations. Eigenvalues, Eigenvectors, Cayley - Hamilton theorem.

[9 L]

MODULE – III: Advance Differential Calculus

Function of several variables, Limit, Continuity, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Chain rules, Jacobians and its properties, Taylor series for function of two variables, Maxima – Minima, Lagrange's method of multipliers.

[9 L]

MODULE – IV: Advance Integral Calculus

Beta and Gamma functions: definition and properties.
Double integrals, double integrals in polar coordinates, Change of order of integration, Triple Integrals, cylindrical and spherical coordinate systems, transformation of coordinates, Applications of double and triple integrals in areas and volumes.

[9 L]

MODULE – V: Vector Calculus

Scalar and vector point functions, gradient, directional derivative, divergence, curl, vector equations and identities. Line Integral, Work done, Conservative field, Green's theorem in a plane, Surface and volume integrals, Gauss – divergence theorem, Stoke 's theorem.

[9 L]

Text Books:

- M. D. Weir, J. Hass and F. R. Giordano: Thomas' Calculus, 11th edition, Pearson Educations, 2008E.
- H. Anton, I. Brivens and S. Davis, Calculus, 10th Edition, John Wiley and sons, Singapore Pte. Ltd., 2013.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

Reference Books:

- M. J. Strauss, G. L. Bradley And K. J. Smith, Calculus, 3rd Ed, Dorling.Kindersley (India) Pvt. Ltd. (P Ed),

Delhi, 2007.

- David C. Lay, Linear Algebra and its Applications (3rd Edition), Pearson Ed. Asia, Indian Reprint, 2007.
- Robert Wrede & Murray R. Spiegel, Advanced Calculus, 3rd Ed., Schaum's outline series, McGraw-Hill

Companies, Inc.,2010.

- D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.

Gaps in the Syllabus (to meet Industry/Profession requirements)

1. Making students solve engineering problems using the studied concepts.
2. Experimentally visualising the analytical concepts.
3. Difficult to produce extensive proves of the state of the art definitions and theorems.

POs met through Gaps in the Syllabus

3, 4, 12

Topics beyond syllabus/Advanced topics/Design

- Proofs of the said theorems
- For students to come up with innovative ideas and carry out project works during the running semester is beyond syllabus
- Industrial visits to train them of the challenges in the industry and support students to do Projects at

industries

POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 12

Course outcome (co) attainment assessment tools & evaluation procedure
Direct assessment

Assessment tool	% contribution during co assessment
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –

1. Student feedback on course outcome

Mapping of course outcomes onto program outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO2	3	2	2	2	1	1	2	1	3	3	2	2	2	3	3
CO3	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO4	2	2	3	1	1	1	1	1	3	3	2	2	2	3	3
CO5	3	3	3	3	3	1	1	1	1	1	1	2	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If satisfying< 34%=1, 34-66% =2, > 66% = 3

CD Code	Course delivery methods
CD1	Lecture by use of boards/lcd projectors/ohp projectors
CD2	Tutorials/assignments
CD3	Seminars
CD4	Mini projects/projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of nptel materials and internets
CD9	Simulation

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	Course Delivery Method Used
CO1	CD1, CD7, CD 8
CO2	CD1 and CD9
CO3	CD1, CD2 and CD3
CO4	CD1 and CD2
CO5	CD1 and CD2

COURSE INFORMATION SHEET

Course code: CH 101

Course title: Chemistry

Pre-requisite(s): Intermediate level chemistry

Co- requisite(s):

Credits: 4 L: 3 T: 1 P: 0

Class schedule per week: 04

Class: B.Tech.

Semester /Level: I

Branch: ALL

Name of Teacher:

Course Objectives

This course enables the students:

1.	To create concept of Chemical bonding & Coordination Chemistry.
2.	To understand the basic 3D structure in organic chemistry including stereochemistry, aromaticity and reaction mechanism.
3.	To understand the reaction dynamics and to know different types of catalysis.
4.	To understand the modern techniques related to spectroscopy and structural characterization.
5.	To develop knowledge on the physical state and electrochemistry of molecules.

Course Outcomes

After the completion of this course, students will be:

1.	Able to explain the bonding in a molecular structure.
2.	Able to explain the 3D structure, aromaticity and stereochemistry of organic molecules.
3.	Able to explain the spectroscopic data for structural characterization of the molecules.
4.	Able to predict the rate, molecularity and mechanism of a simple as well as catalytic reaction.
5.	Able to interpret the phases of solid and the electrochemical behavior of the molecules.

(CH 101) Chemistry

Syllabus

Module I: Chemical Bonding
Ionic bond: Radius ratio rule, Born-Landé equation, Born-Haber cycle. *Metallic Bond:* valence bond and band theories, defects in solids, Werner's Theory, Bonding in Transition metal complexes, Ligands, coordination complexes, Ligand Field, Crystal Field Theory, Octahedral, Tetrahedral and square planar complexes, CFSE, Jahn Teller theorem, electronic spectra, magnetism, and isomerization in coordination compounds. **[9L]**

Module II: Organic Structure and Stereochemistry
Covalent bond: Lewis structure, Valence Bond theory, Molecular orbital theory, Molecular orbital of diatomic and polyatomic system, hybridization, conjugated molecules, Huckel molecular orbital theory of conjugated systems. Isomerism, Geometrical isomerism: *cis–trans* and syn-anti isomerism; Optical isomerism & Chirality; Wedge, Fischer, Newmann and Sawhorse Projection formulae and interconversions; E/Z, D/L, R/S nomenclature system; Conformational studies of ethane, n-butane, Cyclohexane. **[9L]**

Module III: Kinetics and Catalysis:
Order & molecularity of reactions: chain, parallel, Competing, Side, Consecutive reactions; Kinetics of Fast reactions, Characteristics of catalyst, types of catalysis, catalytic poison; Theories of catalysis; Acid base catalysis: including kinetics, Enzyme catalysis, Mechanism and

kinetics of enzyme catalyzed reaction, Michaelis-Menten equation, Important catalysts in industrial processes; Hydrogenation using Wilkinsons catalyst, Hydroformylation by using Cobalt-catalyst, Phase transfer catalyst. **[9L]**

Module-IV: Spectroscopic Techniques

Absorption and emission Spectroscopy, Lambert-Beers Law, Principles and applications of UV-Visible, Factors influencing for UV-VIS spectrum; Rotational and Vibrational spectroscopy, Principle of FT-IR, and NMR spectroscopy; Modern techniques in structural elucidation of compounds by UV-VIS, IR, & NMR Spectroscopy. **[9L]**

Module V: Phase and Chemical equilibrium

Phase Rule: Terms Involved, Phase diagram of one component (Water) & two component (Pb/Ag) system & their applications. Law of chemical equilibrium, equilibrium constants and their significance, Weak and strong electrolytes, Standard electrode potential and its application to different kinds of half cells, EMF and its measurement and application, Batteries and Fuel Cells, Chemical and Electrochemical corrosion, Factors affecting the rate of corrosion. **[9L]**

Text books:

- Huheey, J. E., Inorganic Chemistry: Principles of Structure and Reactivity, 4^{th} edition, Pearson.
- Morrison, R. N. & Boyd, R. N. Organic Chemistry, Seventh Edition, Pearson
- Atkins, P. W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.

Reference books:

- Lee, J. D. Concise Inorganic Chemistry ELBS, 1991.
- Mortimer, R. G. Physical Chemistry 3rd Ed., Elsevier (2009).
- William Kemp, Organic Spectroscopy, 3rd Ed., 2008 Macmillan.

Gaps in the syllabus (to meet Industry/Profession requirements) : NA

POs met through Gaps in the Syllabus : NA

Topics beyond syllabus/Advanced topics/Design : NA

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	Y
Tutorials/Assignments	Y
Seminars	N
Mini projects/Projects	N
Laboratory experiments/teaching aids	Y
Industrial/guest lectures	Y
Industrial visits/in-plant training	N
Self- learning such as use of NPTEL materials and internets	Y
Simulation	N

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25
End Sem Examination Marks	50
Quiz	10+10
Teacher's assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Mid Sem Examination Marks	√	√	√		
End Sem Examination Marks	√	√	√	√	√
Quiz I	√	√			
Quiz II			√	√	

Indirect Assessment –

1. Student Feedback on Faculty

2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Graduate Attributes

Course Outcome #	Graduate Attributes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2		3	3	3		3	2	2		3
2	3	3		3	3	3		3	2	2		3
3	3	1		2	1	2		3	2	2		3
4	3			3	2	2		2	2	2		3
5	2	3		3	3	3	3	2	2	2		3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1 and CD2
CD2	Tutorials/Assignments		CO2	CD1 and CD2
CD3	Seminars		CO3	CD1 and CD2
CD4	Mini projects/Projects		CO4	CD1 and CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1 and CD2
CD6	Industrial/guest lectures		-	-
CD7	Industrial visits/in-plant training		-	-

CD8	Self- learning such as use of NPTEL materials and internets		-	-
CD9	Simulation		-	-

COURSE INFORMATION SHEET

Course code: EC101
Course title: Basics of Electronics & Communication Engineering
Pre-requisite(s): N/A
Co- requisite(s): N/A
Credits: L: 3 T: 1 P: 0 C: 4
Class schedule per week: 04
Class: B. Tech.
Semester / Level: 01/01
Branch: ALL B. Tech.
Name of Teacher: All

Course Objectives:

This course enables the students:

•	To understand PN Junction, diodes and their applications.
•	To comprehend BJT, FET and their bias configurations.
•	To grasp importance of feedback in amplifier circuits, op amp and its applications.
•	To understand number system, Logic Gates and Boolean algebra.
•	To apprehend fundamentals of communication technology.

Course Outcomes:

After the completion of this course, students will be able to:

CO1	Explain PN Junction, diodes and their applications.
CO2	Appraise the BJT, FET and their biasing techniques.
CO3	Comprehend feedback in amplifier circuits, op amp and its applications.
CO4	Translate one number system into another, build circuits with Logic Gates, electronic components and OPAMP IC 741 and analyze the measurement results using CRO.
CO5	Appraise the fundamentals of communication technology.

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
<u>Module-1</u> Diodes and Applications: Introduction to PN junction diodes; Characteristics of semiconductor diodes: V-I characteristics, diode-resistance, temperature-dependence, diode-capacitance; DC & AC load lines; Breakdown Mechanisms; Zener Diode – Operation and Applications; Diode as a Rectifier: Half Wave and Full Wave Rectifiers with and without C-Filters.	**12**
<u>Module-2</u> **Bipolar Junction Transistors (BJT):** PNP and NPN Transistors, Basic Transistor Action, Input and Output Characteristics of CB, CE and CC Configurations, dc and ac load line analysis, operating point, Transistor biasing: Fixed bias, emitter bias/self-bias, Low-frequency response of CE amplifier. **Field Effect Transistors:** JFET, Idea of Channel Formation, Pinch-Off and saturation Voltage, Current-Voltage Output Characteristics; MOSFET: Basic structure, operation and characteristics.	**12**
<u>Module-3</u> **Sinusoidal Oscillators**: Concept of positive and negative feedback, Barkhausen criterion for sustained oscillations, Determination of Frequency and Condition of oscillation, Hartley and Colpitt's oscillator **Operational Amplifiers:** Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Inverting and non-inverting amplifiers, Offset error voltages and currents; Power supply rejection ratio, Slew Rate and concept of Virtual Ground, Summing and Difference Amplifiers, Differentiator and Integrator, RC phase shift oscillator.	**8**
<u>Module-4</u> **Logic Gates and Boolean algebra:** Introduction to Boolean Algebra and Boolean operators, Symbolic representation, Boolean algebraic function and Truth table of different Digital logic Gates (AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR); Realization of Basic logic gates using universal gates, Adder, Subtractor, adder/subtractor.	**8**
<u>Module-5</u> **Electronic communication:** Introduction to electronic communication system, Electromagnetic Communication spectrum band and applications, Elements of Electronic Communication System; Merits and demerits of analog and digital	**10**

communication, Modes of communication; Signal radiation and propagation; Need for modulation; Introduction to Amplitude modulation and Angle modulation.	

Text Books:

- Millman J., Halkias C.C., Parikh Chetan, "Integrated Electronics: Analog and Digital Circuits and Systems", Tata McGraw-Hill, 2/e.
- Mano M.M., "Digital Logic and Computer Design", Pearson Education, Inc, Thirteenth Impression, 2011.
- Singal T. L., "Analog and Digital Communications", Tata McGraw-Hill, 2/e.
- Haykin S., Moher M., "Introduction to Analog & Digital Communications", Wiley India Pvt. Ltd., 2/e.

Reference Book:

- Boylstead R.L., Nashelsky L., "Electronic Devices and Circuit Theory", Pearson Education, Inc, 10/e.

Gaps in the syllabus (to meet Industry/Profession requirements): NA

POs met through Gaps in the Syllabus: 3, 11, 12

Topics beyond syllabus/Advanced topics/Design: NA

POs met through Topics beyond syllabus/Advanced topics/Design: 2, 3, 11, 12

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure:
Direct Assessment

Assessment Tool	% Contribution during CO Assessment
First Quiz	10
Mid Semester Examination	25
Second Quiz	10
Teacher's Assessment	5
End Semester Examination	50

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes:

Mapping of Course Outcomes onto Program Outcomes:

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	1	2	3	1	1	2	2	3	2	2	3	3	1
CO2	3	3	1	2	3	1	1	2	2	3	2	2	3	3	1
CO3	3	3	1	2	3	1	1	2	2	3	2	2	3	3	1
CO4	3	3	1	2	3	1	1	2	2	3	2	2	3	3	1
CO5	3	3	1	2	3	1	1	2	2	3	2	2	3	3	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/LCD Projectors	CO1, CO2, CO3, CO4	CD1
CD2	Quizzes	CO1, CO2, CO3, CO4	CD2
CD3	Assignments/Seminars	CO1, CO2, CO3, CO4	CD3
CD4	Mini Projects/Projects		
CD5	Laboratory Experiments/Teaching Aids		
CD6	Industrial/Guest Lectures		
CD7	Industrial Visits/In-plant Training		
CD8	Self- learning such as use of NPTEL Materials and Internets		
CD9	Simulation		

COURSE INFORMATION SHEET

Course code: ME 101
Course title: Basics of Mechanical Engineering
Pre-requisite(s):
Co- requisite(s):
Credits: 4 (L: 3, T: 1, P: 0)
Class schedule per week: 04
Class: B. Tech
Semester / Level: 1 &2
Branch: Mechanical Engineering
Name of Teacher:

Course Objectives

This course envisions imparting the students to:

•	To introduce system of forces, and write equation of equilibrium.
•	To analyse motion of particle and rigid body subjected to force.
•	To grasp the importance of internal, external combustion engines and heat transfer
•	To apprehend the fundamentals of friction and vibration.
•	To understand the different sources of energy.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Write and solve the equations of equilibrium for particles and structures members subjected to forces.
CO2	Write and solve the equations of motion for particles and rigid bodies subjected to forces.
CO3	Discuss the basics of Boilers, IC Engines and heat transfer
CO4	Aware of different types of vibrations and friction.
CO5	Outline the non-conventional energy resources

SYLLABUS

Module	**Lectures/hour**
Module -I System of Forces and Structure Mechanics : Addition of Forces, Moment of a	9

Force, Couple, Varignon's theorem, Free Body Diagram, Equilibrium in Two and Three Dimensions, Equivalent Forces and Moment. Types of Trusses, Plane and Space Trusses. Analysis of Plane Trusses by: Method of Joints and Method of Sections, Analysis of Frames with Hinged Joints. Hooke's Law of elasticity, Stress and Strain, Relation between elastic constants, Thermal Stresses, Properties of surfaces such as centroid and area moment of inertia.	
Module –II Kinematics & Kinetics of rigid bodies: Types of rigid body motion– translation, rotation about fixed axis, equations defining the rotation of a rigid body about a fixed axis, plane motion, absolute and relative velocity in plane motion, instantaneous center of rotation. Equation of translational and rotational motion, Newton's law and D'Alembert's principle –inertia force and inertia couple.	9
Module – III Friction and Vibration: Interfacial Friction (a) Laws of dry friction, static & kinetic co-efficient of friction, Analysis of static, kinetic and rolling friction.(b) Analysis of frictional forces in inclined planes, wedges, screw jacks and belt drives. Vibrations: Types of vibration, free un-damped longitudinal vibrations, free damped longitudinal vibrations	9
Module - IV Boilers and Internal Combustion Engine: Boiler Mountings and Accessories, Fire Tube and Water Tube Boilers, Cochran Boiler, Babcock and Wilcox Boiler. Basic components and terminology of IC engines, working of four stroke/two stroke - petrol/diesel engine, classification and application of IC engines. Heat transfer: various modes of heat transfer, one dimensional steady state conduction, Application to composite walls and cylinder.	9
Module –V Non-Conventional Energy and their resources: Renewable and Non-renewable Energy Resources, Advantages and Disadvantages of Renewable Resources, Renewable Energy Forms and Conversion, Solar Energy, Wind Energy, Tidal Energy, Ocean Thermal Energy; Geothermal Energy, Nuclear Energy, Hydro Energy	9

Text Books

1. Engineering Mechanics, Irving H. Shames, P H I. ltd, 2011.
2. Engineering Mechanics, S. Timoshenko, D. H. Young, J. V. Rao, Sukumar Pati, McGraw Hill education, 2017.

3. Theory of vibrations with applications, Thomson and Dahleh, Pearson Education, 5th Edition, 2008.

4. Boiler operator, Wayne Smith, LSA Publishers, 2013.

5. Internal Combustion Engines, M. L. Sharma and R. P. Mathur, Dhanpat Rai Publications, 2014.

6. Heat Transfer, J. P. Holman, Souvik Bhattacharya, Mcgraw Higher Ed Publishers, 2011.

7. Fundamentals of Renewable Energy Processes, Aldo Vieira Da Rosa, Elsevier publication, 2012.

Reference Books

1. Engineering Mechanics : statics, James L. Meriam, L. G. Kraige, Wiley, 7th Edition, 2011.

2. Engineering Mechanics, S. Rajasekaran & G. Sankarasubramaniam, Vikash publishing house, 2018.

3. Engineering Vibration, Daniel J. Inman, Pearson, 2013.

4. An Introduction to Steam Boilers, David Allan Low, Copper Press Publisher, 2012.

5. Internal Combustion Engines – V Ganesan, McGraw hill, 2017.

6. Heat and Mass Transfer: Fundamentals and Applications, Yunus A. Cengel, Afshin J. Ghajar, McGraw Hill Education Publisher, 2017.

7. Non Conventional Energy Resources, B. H. Khan, McGraw Hill Education Publisher, 2017.

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
First Quiz	10
Mid Semester Examination	25
Second Quiz	10
Teacher's Assessment	5
End Semester Examination	50

Indirect Assessment

1. Students' Feedback on Course Outcome.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	2	2	1	1	1	1	1	1	-	3	2	-
CO2	3	2	2	2	2	1	1	1	1	1	1	-	3	2	-
CO3	3	2	2	2	2	1	1	1	1	1	1	-	3	2	-
CO4	3	1	1	2	2	1	1	1	1	1	1	-	3	2	-
CO5	3	1	1	2	1	1	1	1	1	1	1	-	2	2	-

Correlation Levels 1, 2 or 3 as defined below:
1: Slight (Low)   2: Moderate (Medium)   3: Substantial (High)

Mapping between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/LCD Projectors	CO1-5	CD1, CD2 , CD5,CD8
CD2	Tutorials/Assignments	CO1-5	CD1, CD2
CD3	Seminars		
CD4	Mini Projects/Projects		
CD5	Laboratory Experiments/Teaching Aids	CO1-5	CD1, CD8

CD6	Industrial/Guest Lectures		
CD7	Industrial Visits/In-plant Training		
CD8	Self- learning such as use of NPTEL Materials and Internets	CO1-5	
CD9	Simulation		

COURSE INFORMATION SHEET

Course code: CH 102
Course title: Chemistry Lab
Pre-requisite(s): Intermediate level Chemistry
Co- requisite(s):
Credits: 1.5 L: 0 T: 0 P: 3
Class schedule per week: 03
Class: B. Tech.
Semester / Level: I
Branch: Chemistry
Name of Teacher:

Syllabus

- Gravimetric estimation of Nickel by Dimethylglyoxime.
- Quantitative estimation of Ca^{2+} and Mg^{2+} ions by complexometric titration using Na_2-EDTA.
- To verify Bears Law using Fe^{3+} solution by spectrophotometer/colorimeter and to determine the concentration of a given unknown Fe^{3+} solution.
- Separation of binary organic mixture by acid-base extraction and analysis using given FTIR and NMR spectrum.
- Preparation of Diazoamino Benzene and report the melting point and yield of product.
- Draw melting point-mass percent composition diagram for two component mixture and determine the Eutectic Temperature.
- To study the kinetics of acid-catalyzed hydrolysis of ethyl acetate and to evaluate the value of the rate constant.
- To determine the rate law for the reaction between iodide and hydrogen peroxide in an acidic environment and to determine the effect of a catalyst on the rate of reaction.
- To determine the strength of the given strong acid by strong base Potentiometrically.
- To determine the transition temperature of the given salt hydrate.
- Qualitative detection of special elements in organic compounds.

- To draw the pH-titration curve of strong acid vs strong base.

Reference book:

- Experimental Physical Chemistry, By B. Viswanathan, P. S. Raghavan, Narosa Publishing House (1997).
- Vogels Textbook of Practical Organic Chemistry
- Experiments in General chemistry, C. N. R. Rao and U. C. Agarwal
- Experimental Organic Chemistry Vol 1 and 2, P R Singh, D S gupta, K S Bajpai, Tata McGraw Hill

COURSE INFORMATION SHEET

Course code: EC102
Course title: Electronics & Communication Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3 C: 1.5
Class schedule per week: 03
Class: B. Tech.
Semester / Level: 01/01
Branch: ALL B. Tech.
Name of Teacher: ALL

Course Objectives:
This course enables the students:

A.	To demonstrate the measurement of voltage, frequency using CRO
B.	To explain PN junction characteristics and its applications.
C.	To understand the frequency response of BJT amplifier and OPAMP.
D.	To Realize logic gates and implement simple Boolean expression.
E.	To explain the Amplitude Modulation and Frequency Modulation

Course Outcomes:
After the completion of this course, students will be able to:

CO1	Make use of CRO for measuring different parameters
CO2	Appraise PN junction characteristics and its applications.
CO3	Experiment with Diodes, BJT and OPAMP
CO4	Design specified circuit using given electronic components/ICs/logic gates.
CO5	Demonstrate the working of Amplitude Modulation and Frequency Modulation

Syllabus

List of Compulsory experiments:

- **Name of the Experiment: MEASURMENTS USING CRO**

AIM-1: To understand the Measurement of voltage, time period and frequency of different signals on CRO.

AIM-2: To measure the frequency and phase of two different signals using Lissajous pattern.

- **Name of the Experiment: PN JUNCTION CHARACTERISTICS**

AIM-1: To determine the forward bias V-I characteristics of PN junction diode and finding its forward cut-in voltage.

AIM-2: To determine the reverse bias V-I characteristics of PN junction diode and finding its reverse breakdown voltage.

- **Name of the Experiment: ZENER DIODE**

AIM-1: To design a basic voltage regulator circuit using Zener diode.

AIM-2: To determine the reverse bias V-I characteristics of Zener diode and finding its reverse breakdown voltage.

- **Name of the Experiment: RECTIFIERS WITH FILTERS**.

AIM-1: To understand the basic operation principle of Half-wave rectifier circuit and measurement of rectification efficiency and ripple factor with and without C-Filter.

AIM-2: To understand the basic operation principle of Full-wave rectifier circuit and measurement of rectification efficiency and ripple factor with and without C-Filter.

AIM-3: Simulate Half wave, Full wave and Bridge rectifier circuits and determine the following in each case ripple factor

- ratio of rectification
- TUF.

AIM-4: Simulate Half wave rectifier circuit and observe the effect on rectification at high frequency.

- **Name of the Experiment: CE TRANSISTOR AMPLIFIER**

AIM-1: To understand the basic operation principle of CE transistor amplifier circuit and finding its frequency response..

AIM-2: To determine the gain bandwidth product of CE transistor amplifier from its frequency response.

AIM-3: To determine the minimum input voltage for which the CE transistor amplifier

saturates for given gain.

- **Name of the Experiment: FIELD EFFECT TRANSISTOR**

AIM-1: To determine the output and transfer characteristics of JFET.

AIM-2: To measure the voltage gain of JFET.

- **Name of the Experiment: RC OSCILLATOR**.

AIM-1: To design a RC phase shift oscillator using IC-741 Op-Amp.

AIM-2: To measure its frequency of oscillation and finding the percentage of error in

Comparison with the ideal one.

- **Name of the Experiment: OPERATIONAL AMPLIFIERS**

AIM-1: To design the Inverting and Non-inverting amplifier using IC 741 OP-AMP.

AIM-2: To find its frequency response and calculate the gain bandwidth product.

AIM-3: To determine the minimum input voltage for which the inverting and non-inverting

amplifier saturates for the gains 100 and 101 respectively.

- **Name of the Experiment: LOGIC GATES**

AIM-1: To understand basic Boolean logic functions (NOT, AND, OR).

AIM-2: To realize the basic logic gates (AND, OR, NOT) using NAND Gate (IC-7400).

- **Name of the Experiment: BOOLEAN FUNCTION**

AIM-1: To understand AND Gate IC (IC 7408) and OR Gate IC (IC 7432)

AIM-2: To implement of the Boolean expression F = (A.B.C + D.E) using AND Gate(IC 7408) and OR Gate (IC 7432).

- **Name of the Experiment: AMPLITUDE MODULATION**

AIM-1: To analyze the Amplitude modulation for three different cases (under modulation, critical modulation and over modulation) using standard setup.

. AIM-2: To determine the percentage of error between the ideal and actual observations.

- **Name of the Experiment: FREQUENCY MODULATION**

AIM-1: To analyze the Frequency modulation using standard setup.

AIM-2: To determine the value of frequency deviation from the observation.

Text Books:

- Millman J., Halkias C.C., Parikh Chetan, “Integrated Electronics: Analog and Digital Circuits and Systems”, Tata McGraw-Hill, 2/e.
- Mano M.M., “Digital Logic and Computer Design”, Pearson Education, Inc, Thirteenth Impression, 2011.
- Singal T. L., “Analog and Digital Communications”, Tata McGraw-Hill, 2/e.
- Haykin S., Moher M., “Introduction to Analog & Digital Communications”, Wiley India Pvt. Ltd., 2/e.

Reference Book:

- Boylstead R.L., Nashelsky L., “Electronic Devices and Circuit Theory”, Pearson Education, Inc, 10/e.

Gaps in the syllabus (to meet Industry/Profession requirements): NA

POs met through Gaps in the Syllabus: N/A.

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/

<u>Course Outcome (CO) Attainment Assessment tools & Evaluation procedure</u>

<u>Direct Assessment</u>

Assessment Tool	% Contribution during CO Assessment
Progressive Evaluation	**(60)**
Attendance Marks	**12**
Day-to-day performance Marks	**06**
Lab Viva marks	**20**
Lab file Marks	**12**
Lab Quiz-I Marks	**10**
End SEM Evaluation	**(40)**
Lab Quiz-II Marks	**10**
Lab performance Marks	**30**

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)	Program Specific Outcomes (PSOs)

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	2	3	1	2	1	2	2	2	2	2	2	1
CO2	3	3	1	2	3	1	2	1	2	2	2	2	2	2	1
CO3	3	2	1	2	3	1	2	1	2	2	2	2	2	2	1
CO4	3	3	1	2	3	1	2	1	2	2	2	2	2	2	1
CO5	3	2	1	2	3	1	2	1	2	2	2	2	2	2	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods:

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/LCD Projectors	CO1	CD1, CD5, CD9
CD2	Tutorials/Assignments	CO2	CD1, CD5, CD9
CD3	Seminars/ Quiz (s)	CO3	CD1, CD5, CD9
CD4	Mini Projects/Projects	CO4	CD1, CD5, CD9
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1, CD5, CD9
CD6	Industrial/Guest Lectures		
CD7	Industrial Visits/In-plant Training		
CD8	Self- learning such as use of NPTEL Materials and Internets		
CD9	Simulation		

(Semester-II)

COURSE INFORMATION SHEET

Course code: MA 107
Course title: Mathematics II
Pre-requisite(s):

Co- requisite(s): Mathematics - I

Credits: L: 3 T: 1 P: 0 C:4
Class schedule per week: 3 Lectures, 1 Tutorial.
Class: BTech
Semester / Level: II / 1
Branch: All
Name of Teacher:

Course Objectives: This course enables the students to understand

1.	various methods to solve linear differential equations of second and higher order
2.	special functions viz. Legendre's and Bessel's and different properties associated with them
3.	diverse mathematical techniques for solving partial differential equations of first order and higher order, along with their applications in wave and heat equations using Fourier series
4.	the theory of functions of a complex variable, complex differentiation and integration
5	about random variables and elementary probability distribution.

Course Outcomes: After the completion of this course, students will be able to

CO1	investigate the occurrence of differential equations in science and engineering and use methods available for their solutions.
CO2	gain an understanding on complex variable functions and using their properties in real life problems.
CO3	construct appropriate probability models in solving real world problems
CO4	demonstrate a depth of understanding in advanced mathematical topics
CO5	enhance and develop the ability of using the language of mathematics in engineering

Syllabus

MODULE – I: Ordinary Differential Equations – I

Linear differential equations, Wronskian, Linear independence and dependence of solutions, Linear differential equations of 2^{nd} and higher order with constant coefficients, Operator method, Legendre's and Euler – Cauchy's form of linear differential equation, Method of variation of parameters. **[9 L]**

MODULE – II: Ordinary Differential Equations – II

Ordinary and singular points of differential equation, Power and Frobenius' series solutions. Bessel's differential equation, Bessel function of first kind and its properties. Legendre's differential equation, Legendre's polynomial and its properties.

[9 L]

MODULE – III: Fourier series and Partial Differential Equations

Fourier series: Euler formulae for Fourier series, Dirichlet conditions, Half range Fourier series.

Partial Differential Equations: Linear partial differential equations, Lagrange's method. Method of separation of variables and its application in solving one dimensional wave and heat equations. **[9L]**

MODULE – IV: Complex Variable-Differentiation & Integration

Function of a complex variable, Limit, Continuity, Differentiability, Analyticity, Analytic functions, Cauchy – Riemann equations. Harmonic functions, Harmonic Conjugate. Cauchy's theorem, Cauchy's Integral formula, Taylor and Laurent series expansions. Singularities and its types, Residues, Residue theorem.

[9L]

MODULE – V: Applied Probability

Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, variance, moment generating function. Introduction to Binomial, Poisson and Normal Distribution.

[9L]

Text Books:

- E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- D. G. Zill and W.S. Wright, Advanced Engineering Mathematics, Fourth Edition, 2011.
- J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
- R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing, 3rd Ed, 2009.
- R. A . Johnson, I. Miller and J. Freund: Probability and Statistics for Engineers, PHI
- S. C. Gupta and V.K . Kapoor.: Fundamental of Mathematical Statistics, Sultan Chand and Sons

Reference Books:

- W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th

  Edition ., Wiley India, 2009.

- N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
- G. F. Simmons, Differential Equations with Applications and Historical Notes, TMH, 2nd ed., 2003.
- P. L. Meyer: Introductory Probability and Statistical Applications, Oxford & IBH.

Gaps in the Syllabus (to meet Industry/Profession requirements)

- Making students solve engineering problems using the studied concepts.
- Experimentally visualising the analytical concepts.
- Difficult to produce extensive proves of the state of the art definitions and theorems.

POs met through Gaps in the Syllabus

3, 4, 12

Topics beyond syllabus/Advanced topics/Design

- Proofs of the said theorems
- For students to come up with innovative ideas and carry out project works during the running semester

is beyond syllabus

- Industrial visits to train them of the challenges in the industry and support students to do Projects at

industries

POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 12

Course outcome (co) attainment assessment tools & evaluation procedure

Direct assessment

Assessment tool	% contribution during co assessment
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –

1. Student feedback on course outcome

Mapping of course outcomes onto program outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO2	3	2	2	2	1	1	2	1	3	3	2	2	2	3	3
CO3	3	3	2	2	1	1	1	1	3	3	2	2	2	3	3
CO4	2	2	3	1	1	1	1	1	3	3	2	2	2	3	3
CO5	3	3	3	3	3	1	1	1	1	1	1	2	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If satisfying< 34%=1, 34-66% =2, > 66% = 3

CD Code	Course delivery methods
CD1	Lecture by use of boards/lcd projectors/ohp projectors
CD2	Tutorials/assignments
CD3	Seminars
CD4	Mini projects/projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of nptel materials and internets
CD9	Simulation

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	Course Delivery Method Used
CO1	CD1, CD7, CD 8
CO2	CD1 and CD9
CO3	CD1, CD2 and CD3
CO4	CD1 and CD2
CO5	CD1 and CD2

COURSE INFORMATION SHEET

Course code: PH113
Course title: PHYSICS
Pre-requisite(s): Intermediate Physics and Intermediate Mathematics
Co- requisite(s):
Credits: 4 L:3 T:1 P:0
Class schedule per week: 3+1
Class: B. Tech
Semester / Level: I
Branch: ALL
Name of Teacher:

Code: PH 113	**Title :PHYSICS**	**L-T-P-C** **[3-1-0-4]**
Course Objectives This course enables the students: • To explain principles of physical optics. • To construct Maxwell's equations from basic principles and use it to solve electromagnetic		

plane wave equations.

- To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering.
- To illustrate the phenomena of old quantum theory and derive Heisenberg uncertainty principle and Schrödinger's equations.
- To understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.

Course Outcomes

After the completion of this course, students will be able:

- To interpret the intensity variation of light due to Polarization, interference and diffraction.
- To formulate and solve the engineering problems on electromagnetism
- To explain special theory of relativity and apply its concepts in various fields of physics and engineering.
- To explain fundamentals of quantum mechanics and apply it to problems on bound states
- To analyze working principle of lasers and to summarize its applications.

Module-1	**Physical Optics:** Polarization, Malus' Law, Brewster's Law, Double Refraction, Interference in thin films (Parallel films), Interference in wedge-shaped layers, Newton's rings, Fraunhofer diffraction by single slit, Double slit.	**[8]**
Module-2	**Electromagnetic Theory:** Curl, Gradient, Divergence, Gauss theorem, Stokes theorem, Gauss's law, Applications, Concept of electric potential, Relationship between E and V, Polarization of dielectrics, dielectric constant, Boundary conditions for E & D, Gauss's law in magnetostatics, Ampere's circuital law, Boundary conditions for B & H, Equation of continuity of charge, Displacement current, Maxwell's equations.	**[10]**
Module-3	**Special Theory of Relativity:** Introduction, Inertial frame of reference, Galilean transformations, Postulates, Lorentz transformations and its conclusions, Length contraction, time dilation, velocity addition, Mass change, Einstein's mass energy relation.	**[6]**
Module-4	**Quantum Mechanics:** Planck's theory of black-body radiation, Compton effect, Wave particle duality, De Broglie waves, Davisson and Germer's experiment, Uncertainty principle, physical interpretation of wave function, Schrodinger equation in one dimension, free particle, particle in an infinite square well.	**[10]**
Module-5	**Lasers:** Spontaneous and stimulated emission, Einstein's A and B coefficients, Population-inversion, Light amplification, Basic laser action,Ruby and He-Ne lasers, Properties and applications of laser radiation, Elementary ideas of fiber optics and application of fiber optic cables.	**[6]**

Text books:

T1: A. Ghatak, Optics, 4^{th} Edition, Tata Mcgraw Hill, 2009

T2: Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press (2001)

T3: Arthur Beiser, Concept of Modern Physics, 6th edition 2009, Tata McGraw- Hill

Reference books:

R1: Fundamentals of Physics, Halliday, Walker and Resnick

Gaps in the syllabus (to meet Industry/Profession requirements) : NA

POs met through Gaps in the Syllabus : NA

Topics beyond syllabus/Advanced topics/Design : NA

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods	
Lecture by use of boards/LCD projectors/OHP projectors	Y
Tutorials/Assignments	Y
Seminars	N
Mini projects/Projects	N
Laboratory experiments/teaching aids	N
Industrial/guest lectures	N
Industrial visits/in-plant training	N
Self- learning such as use of NPTEL materials and internets	Y
Simulation	N

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25
End SemExamination Marks	50
Quiz	10+10
Teacher's assessment	5

AssessmentComponents	CO1	CO2	CO3	CO4	CO5
Mid Sem Examination Marks	√	√	√		
End Sem Examination Marks	√	√	√	√	√
Quiz I	√	√			
Quiz II			√	√	

Indirect Assessment –

- Student Feedback on Faculty
- Student Feedback on Course Outcome

Mapping between Objectives and Outcomes of this course

Mapping between Course Objectives and Course Outcomes

Course Objectives	1	2	3	4	5
A	3	2	2	1	3
B	2	3	2	1	3

C	1	1	3	1	1
D	-	1	1	3	3
E	3	2	1	1	3

Mapping of Course Outcomes onto Graduate Attributes

Course Outcome #	Graduate Attributes										
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2		3	3	3		3	2	2		3
2	3	3		3	3	3		3	2	2		3
3	3	1		2	1	2		3	3	3		3
4	3			3	2	2		2	2	2		3
5	2	3		3	3	3	3	2	2	2		3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1 and CD2
CD2	Tutorials/Assignments		CO2	CD1 and CD2
CD3	Seminars		CO3	CD1 and CD2
CD4	Mini projects/Projects		CO4	CD1 and CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1 and CD2
CD6	Industrial/guest lectures		-	-
CD7	Industrial visits/in-plant training		-	-
CD8	Self- learning such as use of NPTEL materials and internets		-	-
CD9	Simulation		-	-

COURSE INFORMATION SHEET

Course code: CS101
Course title: **Programming for Problem Solving**
Pre-requisite(s): Mathematics-I
Co- requisite(s): Programming for Problem Solving Lab
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: II
Branch: All

Course Objectives
This course enables the students:

1.	To learn computer language.

2.	To Learn coding for problems.
3.	To learn the problem-solving process through computer.
4.	To know the limitations of system during program execution.

Course Outcomes

After the completion of this course, students will be able:

1.	To formulate simple algorithms for arithmetic and logical problems.
2.	To translate the algorithms to programs.
3.	To test and execute the programs and correct syntax and logical errors.
4.	To apply programming to solve simple numerical method problems, differentiation of function and simple integration.
5.	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

Syllabus

Module I **[10 L]**

Introduction to Programming:

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems.

Representation of Algorithm: Flowchart/Pseudo code with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module II **[5 L]**

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals, Iterations, Loops.

Module III **[7 L]**

Array, Character array, strings. Case studies Discuss the various Problems related to Basic science (Newton's Law, Kirchhoff's Law, Roots of an equation etc.,) Sorting, Searching.

Module IV **[8 L]**

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module V **[10 L]**

Structures, Defining structures and Array of Structures

Pointers: Defining pointers, Use of Pointers in self-referential structures, Link List, File Handling

Text Books:

- Problem solving and Program design in C: Jery R Hanly Paerson Education.7th Edison
- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- R.G.Dromey, How to Solve it by Computer, Pearson Education

Reference Books

- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice.

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	2	1	3	1	2	1	2	3	1	1
CO2	3	3	3	3	3	1	1	2	1	2	1	2	2	3	2
CO3	3	3	2	3	3	1	1	1	1	2	1	3	2	3	2
CO4	3	3	3	3	2	1	1	2	1	2	1	3	3	2	3
CO5	3	3	2	2	3	1	1	2	1	2	1	2	2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course Code: EE 101
Course Title: Basics of Electrical Engineering
Pre-requisite(s): Basic Sciences
Co- requisite(s):
Credits: L: 3 T: 1 P: 0
Class schedule per week: 04
Class: B. Tech.
Semester / Level: First
Branch: Electrical & Electronics Engineering
Name of Teacher:

Course Objectives

This course envisions to impart to students to:

1	Classify different electrical circuit elements and apply suitable laws and theorems for the analysis of electrical systems.
2	Represent series / parallel electric / magnetic circuits;
3	Employ three phase circuits for transfer of electrical power both under balanced and unbalanced condition.
4	Interpret the system responses under different operating conditions such as resonance, mutual coupling and star-delta conversion.
5	Assess the working of different A.C. electrical machines.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve electrical circuits using Kirchhoff's laws and apply concepts of magnetic circuits in electrical systems.
CO2	Analyze A.C. electrical circuits having dependent and independent sources for computation of responses such as voltage, current, power.
CO3	Evaluate the advantages of 3 phase system in electrical industrial applications and differentiate between balanced and unbalanced operation.
CO4	Assess the applicability of circuit theorems for practical applications.
CO5	Integrate the sources of energy for transferring power to the consumers (load).

SYLLABUS

MODULE	(NO. OF LECTURE HOURS)
Module – I	**10**

Introduction: Importance of Electrical Engineering in day-to-day life, Electrical elements, properties and their classification, Ideal and Real Sources, Source Conversion **D.C. Circuits**: KCL and KVL, Loop current and Nodal voltage method Steady state analysis with independent and dependent sources; Star-Delta conversion. **Magnetic Circuits:** Introduction, Series-parallel magnetic circuits, Analysis of Linear and Non-linear magnetic circuits, Energy storage, A.C. excitation, Eddy currents and Hysteresis losses.	
Module – II **Single-phase AC Circuits: Series Circuits:** Common signals and their waveforms, RMS and Average value, Form factor & Peak factor of sinusoidal waveform, Impedance of Series circuits. Phasor diagram, Active Power, Power factor. Power triangle. **Parallel Circuits:** Admittance method, Phasor diagram. Power, Power factor. Power triangle, Series- parallel Circuit, Power factor improvement, **Series and Parallel Resonance**: Resonance curve, Q–factor, Dynamic Impedance and Bandwidth.	**10**
Module – III **Three-Phase Circuits:** Line and Phase relation for Star and Delta connection, Power relations, Analysis of balanced and unbalanced 3 phase circuits, Measurement of Power.	**7**
Module – IV **Circuit Theorems:** Superposition theorem, Thevenin's & Norton's Theorem, Maximum Power Transfer theorem for Independent and Dependent Sources for DC and AC circuits. **Coupled Circuits** (Dot rule), Self and mutual inductances, Coefficient of coupling.	**8**
Module – V principles of AC Generators, motors and transformers, working principles of measuring equipments such as digital voltmeter, ammeter, power factor meter and wattmeter.	**5**

Text Books:

1. Hughes Electrical Technology, Pearson, 10th edition, 2011.
2. Fitzgerald and Higginbotham, Basic Electrical Engineering, McGraw Hill Inc, 1981.
3. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering, 3rd Edition, TMH, 2009.

Reference Books:

- W. H. Hayt, Jr J. E. Kemmerly and S. M. Durbin, Engineering Circuit Analysis, 7th Edn TMH, 2010.

- Electrical Engineering Fundamental, Vincent Del Toro, Prentice Hall, New Delhi.

Gaps in the Syllabus (to meet Industry/Profession requirements)

- Application of principles of magnetic circuits to electrical machines like transformers, generators and motors.
- Field applications of three phase equipment and circuits in power system.
- Applications of circuit theorems in electrical and electronics engineering.

POs met through Gaps in the Syllabus

3, 4, 12

Topics beyond syllabus/Advanced topics/Design

- Concepts of electric, magnetic and electromagnetic fields
- 3 - Φ power generation and transmission
- Power factor improvement for three phase systems
- Utility of reactive power for creation of electric and magnetic fields

POs met through Topics beyond syllabus/Advanced topics/Design

2, 3, 4, 12

Course Outcome (CO) Attainment Assessment Tools & Evaluation Procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
First Quiz	10
Mid Semester Examination	25
Second Quiz	10
Teacher's Assessment	5
End Semester Examination	50

Indirect Assessment

1. Students' Feedback on Course Outcome.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	1	3	1	1	1				2	3	2	3
CO2	3	3	3	1	3	1	1	1				2	3	2	3
CO3	3	3	3	3	3	1	2	2		1	1	2	3	2	3
CO4	3	3	3	1	3		1	1		1	1	2	3	2	3

CO5	3	3	3	3	3	1	1	1	1	1	1	2	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD Code	Course Delivery Methods	Course Outcome	Course Delivery Method Used
CD1	Lecture by use of Boards/LCD Projectors	CO1	CD1, CD7, CD 8
CD2	Tutorials/Assignments	CO2	CD1 and CD9
CD3	Seminars	CO3	CD1, CD2 and CD3
CD4	Mini Projects/Projects	CO4	CD1 and CD2
CD5	Laboratory Experiments/Teaching Aids	CO5	CD1 and CD2
CD6	Industrial/Guest Lectures		
CD7	Industrial Visits/In-plant Training		
CD8	Self- learning such as use of NPTEL Materials and Internets		
CD9	Simulation		

COURSE INFORMATION SHEET

Course code: PH114
Course title: PHYSICS LAB
Pre-requisite(s): Intermediate Physics (Theory and Lab)
Co- requisite(s):
Credits: 1.5 L:0 T:0 P:3
Class schedule per week: 3
Class: B. Tech
Semester / Level: I
Branch: ALL
Name of Teacher:
Its Course Outcomes, Course Objectives and Graduate Attributes are similar to those of PH113.

List of Experiments

- Error analysis in Physics Laboratory
- To determine the frequency of AC mains with the help of sonometer
- To determine the wavelength of sodium light by Newton's rings Method
- To determine the resistance per unit length of a Carey Foster's bridge wire and then to find the resistivity of the material of a given wire.
- Measurement of mechanical equivalent of heat by electrical method
- Determination of refractive index of the material of a prism using spectrometer and

sodium light

- To determine the frequency of electrically maintained tuning fork by Melde's experiment
- Measurement of voltage and frequency of a given signal using cathode ray oscilloscope
- To determine the wavelength of prominent spectral lines of mercury light by a plane transmission grating using normal incidence
- To determine the electromotive force (emf) of an unknown cell using a stretched wire potentiometer
- To study the frequency response and quality factor of series LCR circuit.
- To find the specific rotation of sugar solution by using a polarimeter.
- To determine the Hall voltage and calculate the Hall coefficient and carrier concentration of a semiconductor sample

COURSE INFORMATION SHEET

Course code: CS102
Course title: **PROGRAMMING FOR PROBLEM SOLVING LAB**
Pre-requisite(s):
Co- requisite(s): Programming For Problem Solving
Credits: L: 0 T: 0 P: 1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: All

Sample Program List

Module 1 & Module 2: Introduction and Control Flow [3L]

- Write an interactive program that will read in a +ve integer value and determine the following

i) If the integer is a prime number ii) If the integer is a Fibonacci number

- WAP in C to compute sinx = x $- x^3/3! + x^5/3! - x^7/7!$ ….. Continue adding successive terms in the series until the value of the next term becomes smaller (in magnitude) than 10^{-5}. Test the program for x = 1, x = 2, and x = 3. In each case display the number of terms used to obtain the final answer.
- WAP to generate every 3rd integer beginning with I = 2 and continue for all integers that are less than 150. Calculate the sum of those integers that are evenly divisible by 5.
- WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two year limits given by user.
- WAP to display the following pattern :

			11			
		11	10	11		
	11	10	9	10	11	
11	10	9	8	9	10	11

- Using Ternary / Conditional operator find the greatest among 3 numbers.

- WAP to convert a decimal number into an equivalent number of the input base. Test your program for base 2,8,10 & 16.
- WAP to read a number n, and print it out digit-by-digit, as a series of words. For e.g. 123 would be printed as "one two three".
- WAP to check whether any input +ve integer is palindrome or not.
- WAP to simulate a simple calculator (+ - / * %) that takes two operands and an operator as input and displays the result.
- WAP to find the GCD of two input +ve integer numbers.
- WAP to swap the values of two variables without using a third variable.

Module 3 : Array **[1L]**

- Read a line of mixed text, and then write it out with all lower case and uppercase letters reversed, all digits replaced by 0s and all other characters (non-letters and non-digits) replaced by '*'.
- WAP to find the product of two matrices A and B. Display the source matrices and product matrix C in matrix format.
- WAP to find whether a given matrix is a triangular matrix or not.
- WAP to find the transpose of a matrix. Display the source and the transposed matrix in matrix format.
- Implement Prob. No. – 14 to 16 using functions for reading, manipulating and displaying the corresponding matrices in matrix form.
- WAP to sort a list of strings alphabetically using a 2-dim. Character array.

- WAP to display the row sum and the column – sum of an input 2- dim. Matrix. Display the source matrix with row and column sum.

Module 4 : Functions, Pointer & String **[4L]**

- Write a recursive function to calculate S = 2 + 4 + 6 + 8 + …… +2N. Implement the function in a complete C program.
- Write a function that accepts two arguments an array and its size n. It performs Bubble up sort on the array elements. Using indirection operator '*' implement this in a complete C program. Display the source and the sorted array.
- Using pointer, write a function that receives a character string and a character as argument. Delete all occurrences of this character in the string. The function should return corrected string with no holes.
- Write a function for reading character string using pointer. Calculate the length of the string (without using strlen ()). Finally print the string in reverse order, using pointer.
- Implement prob. No. 14 using pointers representation of 2 – dim. array.
- Implement prob. No. 15 using pointer representation of 2 dim. array.
- Implement prob. No. 16 using pointer representation of 2 dim. array.
- WAP to sort a list of strings into alphabetical order using array of pointers.

Module 5: Structure and File **[3L]**

- Create records of 60 students, where each record has fields-name, roll, gpa and fees. Write a function update () to reduce the fees of those students who have obtained gpa greater than 8.5 by 25% of the original fees. Write a complete program to exercise this function in the main program and display all the records before and after updation.
- Define a structure that describes a hotel. It should have members that include the name, address, grade, average room charge and number of rooms. Write a function to perform the following operations:
- To print out hotels of a given grade in order of charges.

- To print out hotels with room charges less than a given value.
- WAP to concatenate the contents of two files into a third file.
- WAP to copy the content of one file into another file. Names of both the files are to be input as command line arguments

Text Books:

- Problem solving and Program design in C: Jery R Hanly Paerson Education.7th Edison
- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- R.G.Dromey, How to Solve it by Computer, Pearson Education

Reference Books

- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	3	2	1	2	2	1	2	1	1	2	3	2
CO2	3	3	3	3	2	1	2	2	2	1	1	2	2	3	2
CO3	3	3	3	3	2	1	2	2	1	2	1	2	3	3	2
CO4	3	3	3	3	2	2	2	2	2	2	2	2	3	2	2
CO5	3	2	2	1	2	3	1	1	1	2	2	2	3	3	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: PE 101
Course title: WORKSHOP PRACTICE
Pre-requisite(s): Nil
Co- requisite(s): Nil
Credits: 1.5 L:0 T:0 P: 3
Class schedule per week: 3
Class: B.Tech.
Semester / Level: I or II / First
Branch: All
Name of Teacher:

Course Objectives:

This course enables the students to:

1	Familiarize with the basic manufacturing processes.
2	Impart knowledge and skill to use tools, machines, equipment, and measuring instruments.
3	Practice on manufacturing of components using workshop trades.
4	Educate students of safe handling of machines and tools.
5	Exercise individual as well as group activity with hands-on training in different workshop trades.

Course Outcomes:

At the end of the course, a student should be able to:

CO1	Be conversant with the basic manufacturing processes.
CO2	Identify and apply suitable tools and instruments for machining, welding, fitting, carpentry, foundry and forging.
CO3	Manufacture different components using various workshop trades.
CO4	Take safety and precautionary measures of self and machines during operations.
CO5	Develop skills to work as an individual or in a team during trade practices.

<u>SYLLABUS</u>

LIST OF EXPERIMENT:

- **MACHINE SHOP**

  EXPERIMENT – I: Center Lathe

  Objective: To study lathe machine and to machine a given job on center lathe as per drawing.

- **MACHINE SHOP**

  EXPERIMENT-II: Shaper Machine

  Objective: To study Shaper machine and to machine a given job on shaper as per drawing.

- **CARPENTRY SHOP**

  EXPERIMENT-I: Carpentry Tools and Instruments

  Objective: To study the various tools, instruments and equipment used in carpentry practice.

- **CARPENTRY SHOP**

  EXPERIMENT-II: Carpentry Practice

  Objective: To perform the carpentry work by making a wooden job using different tools.

- **FITTING SHOP**

  EXPERIMENT-I: Fitting Tools and Measuring Instruments

  Objective: To study the various tools used in fitting shop and perform fitting operations (like marking, chipping, hack-sawing, filing, drilling etc.)

- **FITTING SHOP**

  EXPERIMENT-II: Fitting Assembly Practice

Objective: To make a job clamping plate as per given drawing by fitting operations and to check for its assembly with a given component.

- **FORGING SHOP**

EXPERIMENT-I: Forging Tools

Objective: To study different tools and equipment used in hand forging practice.

- **FORGING SHOP**

EXPERIMENT-II: Forging Practice

Objective: To learn about hand forging practice by making a job (make a square bar from round blank and bend it at a sharp corner of 90 degree as per drawing).

- **FOUNDRY SHOP**

EXPERIMENT-I: Green Sand Moulding

Objective: To get acquainted with various tools and equipment used in making green sand mould (to practice green sand mould making with single piece pattern).

- **FOUNDRY SHOP**

EXPERIMENT-II: Aluminium Casting

Objective: To get acquainted with melting and pouring of metal in a mould (given two-piece patterns of handle) and to make aluminium casting.

- **WELDING SHOP**

EXPERIMENT-I: Manual Metal Arc Welding

Objective: To study arc welding processes including arc welding machines (AC & DC), electrodes and equipment. To joint two pieces of given metal by arc welding process.

- **WELDING SHOP**

EXPERIMENT-II: Gas Welding

Objective: To study gas welding processes including types of flames produced, filler metals and fluxes etc. To joint two pieces of given metal by gas welding process.

Books recommended:

TEXT BOOK

- S K Hajra Choudhury, A K. Hajra, "Elements of Workshop Technology: Vol- I and Vol - II", Media Promotors Pvt Ltd. **(T1)**
- B S Raghuwanshi, "A course in Workshop Technology", Dhanpat Rai Publications. **(T2)**

EFERENCE BOOK

- P.N. Rao, "Manufacturing Technology Vol-1and Vol-II", Tata McGraw Hill. **(R1)**
- Kalpakjian, "Manufacturing Engineering and Technology", Pearson. **(R2)**

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Delivery Methods:

CD1	Lecture by use of boards/LCD projectors/OHP projectors	√
CD2	Assignments/Seminars	
CD3	Laboratory experiments/teaching aids	√
CD4	Industrial/guest lectures	
CD5	Industrial visits/in-plant training	
CD6	Self- learning such as use of NPTEL materials and internets	
CD7	Simulation	√

Course Evaluation:

Direct Assessment-

Assessment Tool	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz 1	10
Viva-voce	20
End Semester Examination	**% Distribution**
Examination: Experiment Performance	30
Quiz 2	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Day to day performance & Lab files	√	√	√	√	√
Quiz 1	√	√	√		
Quiz 2	√	√	√		
Viva-voce	√	√	√	√	
Examination: Experiment Performance	√	√	√	√	√

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes (COs) onto Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2				1					2	3	2	2
CO2	3	1	2									1	3	2	3
CO3	3	2	2	1								2	2	2	3
CO4	2					2						1	1	1	2
CO5	2	2	2	1		1			3	1		1	2	2	2

< 34% = 1, 34-66% = 2, > 66% = 3

Mapping Between Course Outcomes (Cos) and Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD3, CD6
CO2	CD1, CD3
CO3	CD1, CD3
CO4	CD1, CD3
CO5	CD3

(Semester III)

COURSE INFORMATION SHEET

Course code: BE101
Course title: Biological Science for Engineers
Pre-requisite(s): NIL
Co- requisite(s): NIL
Credits: 2 L:2 T:0 P:0
Class schedule per week: 02
Class: B. Tech
Semester / Level: III-IV /First
Branch: All
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Recognize and understand the basic cell biology, biomolecules, related metabolic pathways and applicable bioenergetics.
2.	Relate common biological phenomenon at molecular level.
3.	Describe the chemical nature of enzymes and mechanism of action for their function in biochemical reactions.
4.	Correlate the molecular methods of biological signal generation and propagation in living system.
5.	Comprehend the steps involved in common application of biotechnology such as applicable for creation of transgenics, stem cells, plant metabolites production, PCR, ELISA.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Demonstrate an understanding of fundamental biochemical principles, such as the structure/function of biomolecules involved in living system.

CO2	Interpret the bio mechanism involved in signal generation and transmission.
CO3	Correlate the basic methods involved in common biotechnological application.
CO4	Apply and effectively communicate scientific reasoning and data involved in common biotechnological applications.

BE101 Biological Science for Engineers

Credit:2

Module-1:
Basic Cell Biology: Origin of life, Cell theory, Cell Structure and function, Biomolecules, Cell cycle and cell division, Biological Organization. **[5L]**

Module-2:
Bioenergetics and Metabolism: Gibbs free energy and thermodynamics, aerobic and anaerobic respiration, Glycolysis, Krebs cycle and electron transport chain, Beta oxidation, Photosynthesis. **[6L]**

Module-3:
Enzymes and its Application: Classification of enzymes, Structure and mechanism of enzyme action and uses of enzymes, factors affecting enzyme activity, Immobilization of enzymes and their application. **[5L]**

Module-4:
Biological Signal Generation and Propagation: Nerve cell structure and signal propagation. Mechanism of vision and hearing, cell signaling, Circadian rhythm. **[6L]**

Module-5:
Engineering Biological Systems and its Applications:
Central dogma of molecular biology, Methods in genetic engineering and application, PCR, ELISA and its application, stem cell and tissue engineering. Artificial Intelligence in Biology, Plant factory. **[6L]**

Books Recommended
Recommended Text Book

1. Purves et al, (1998) Life: *The Science of Biology*, 4th Ed.
2. R. Dulbecco, The Design of Life.
3. Lehninger A, Principals of Biochemistry , 5th Ed

Reference Book

1. Stryer, L. (2002). *Biochemistry*. New York: W.H. Freeman.
2. K. Wilson & K.H. Goulding, (2006) *A biologist's guide to Principles and Techniques of Practical Biochemistry*.

Gaps in the syllabus (to meet Industry/Profession requirements)

POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25
End Sem Examination Marks	50
Assignment / Quiz (s)	10+10
Teacher’s Assesment	5

Assessment Components	CO1	CO2	CO3	CO4
Mid Sem Examination Marks	√	√	√	√
End Sem Examination Marks	√	√	√	√
Quiz I	√	√	√	
Quiz II	√	√	√	

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	1	1	1	1	2	1	2	1	1	2	2	1
CO2	3	2	2	1	1	2	2	2	1	1	1	2	3	2	2
CO3	3	3	3	2	2	1	3	2	1	2	1	2	2	3	2
CO4	2	2	2	2	3	2	3	2	2	1	1	1	1	2	2

If satisfying< 34%=1, 34-66% =2, > 66% = 3

Mapping Between COs and Course Delivery (CD) methods			
CD	**Course Delivery methods**	**Course Outcome**	**Course Delivery Method**
CD 1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, 2, 3, 4	CD1, CD2, CD3, CD8
CD 2	Tutorials/Assignments	CO1, 2, 3, 4	CD1, CD2, CD3, CD8
CD 3	Seminars		
CD 4	Mini projects/Projects		
CD 5	Laboratory experiments/teaching aids		
CD 6	Industrial/guest lectures		
CD 7	Industrial visits/in-plant training		
CD 8	Self- learning such as use of NPTEL materials and internets		
CD 9	Simulation		

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT201
Course title: **Basics of Intelligent Computing**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P: 0

Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: All

Course Objectives
This course enables the students:

A.	To know the basic functions of different AI branches.
B.	To understand the functionalities of IoT .
C.	To know the application of fuzzy logic.
D.	To understand the basic functionalities of a cloud based system.
E.	To find the basic functions of soft computing.

Course Outcomes:
After the completion of this course, students will be able to:

1.	Identify the difference between different branches of AI.
2.	Analyze a fuzzy based system.
3.	Design Neural Networks to solve problems.
4.	Analyze a problem in terms of ANN point of view.
5.	Identify the components of a cloud-based system.

SYLLABUS

Module I
Introduction
Definition of Computing, Conventional Computing vs. Intelligent Computing, Necessity of Intelligent Computing, Current trends in Intelligent Computing

AI Concepts
Introduction to AI, AI problems and Solution approaches, Fundamentals of problem solving using Search and Heuristics, Overview of Knowledge-base creation, and Intelligent Agents, Classification of AI.

(8 L)

Module II

Introduction to Soft Computing

Hard Computing vs. Soft Computing, Paradigms of Soft Computing, Real Life applications of Soft Computing

Fuzzy Logic

Classical Sets Vs Fuzzy Sets, Membership Functions, Fuzzy operations, Fuzzy Relations, Fuzzy Composition (Max-Min, Max-Product), Defuzzification, Fuzzy Inference System

Genetic Algorithm

Principle of Optimization, Traditional vs Evolutionary optimization, Genetic Algorithm: Working Cycle of GA, Encoding, Crossover, Mutation.(8 L)

Module III

Introduction to Artificial Neural Networks:

Biological Neuron to Artificial Neuron, Mc-Culloh Pitts Perceptron Model, Layer of Neurons, Activation Function, Artificial Learning, Types of Learning, Introduction to Back Propagation Networks, Applications of Neural Network. (8L)

Module IV

Introduction to Cloud computing

Conventional Computing, Historical developments, Defining a Cloud, Cloud Computing reference model, Overview of Virtualization: Introduction, Types of cloud, Cloud Platforms: Amazon Web Services, Microsoft Azure, Cloud Applications (8L)

ModuleV

Introduction to IOT

The IoT Paradigm, Concept of Things, IoT Hardware, IoT Protocols, IoT Architecture, enabling technologies of IoT, IoT Designing and its levels. (8L)

Text books:

1. Rich Elaine, Knight Kevin, Nair S. B. Artificial Intelligence, 3rd Edition, Tata Mc. Graw Hill.
2. Padhy N. P., Simon S. P. Soft Computing: With MATLAB Programming, Oxford University Press, 2015.
3. Buyya Raj Kumar, Vecchiola Christian &Selvi S.Thamarai , Mastering Cloud Computing, McGraw Hill Publication, New Delhi, 2013.
4. Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.

Reference Books:

Raj Pethuru and Raman AnupamaC.,The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.

Konar Amit, Computational Intelligence: Principles, Techniques and Applications, Springer.

Shivanandam and Deepa, Principles of Soft Computing, 2nd Edition, John Wiley and Sons, 2011.

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	1	1	1	2	2	1	1	1	2	3	1	1
CO2	3	3	3	2	1	2	2	2	2	1	1	2	2	3	2
CO3	3	3	3	2	2	1	2	2	2	2	1	3	2	3	2
CO4	3	3	3	3	2	2	2	3	2	2	1	3	3	2	3
CO5	2	2	1	1	2	1	2	3	1	1	1	2	2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: MA205
Course title: Discrete Mathematics
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P:0 C: 4
Class schedule per week: 3 Lectures, 1 tutorial
Class: I. M.Sc. /B. Tech
Semester / Level: 2
Branch:
Name of Teacher:

Course Objectives: This course enables the students to

1.	exposed to a wide variety of mathematical concepts that are used in the Computer Science discipline, which may include concepts drawn from the areas of Number Theory, Graph Theory and Combinatorics.
2.	come across a number of theorems and proofs. Theorems will be stated and proved formally using various techniques.
3.	gain the various graphs algorithms along with its analysis
4.	apply graph theory based tools in solving practical problems.

Course Outcomes: After the completion of this course, students will be able to

CO 1.	to model and analyze computational processes using analytic and combinatorial methods
CO 2.	solve the problems of graph theory using graph algorithms
CO 3.	apply computer programs (e.g. SAGE) to study graphs.
CO 4.	apply counting techniques to solve combinatorial problems and identify, formulate, and solve computational problems in various fields.
CO 5.	apply graph theory in the areas of computer science, operation research, biology, chemistry, physics, sociology, and engineering

SYLLABUS

MA205 **Discrete Mathematics**

Module I

Mathematical logic and Mathematical Reasoning, Compound Statements, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Well-ordering principal, Recursive Definition and Algorithms. [9L]

Module II

Recurrence Relations, Classification of Recurrence Relations and their solutions by Characteristic Root method, Generating function and their various aspects, Utility of Generating function in solving Recurrence Relations.

[9L]

Module III

Set, Operations on Set, Computer representation of Set, Relations, Properties/Classification of Relations, Closure operations on Relations, Matrix representation of Relations, Digraphs. Functions and their Representation, Classification of Functions, Warshall's algorithm, Discrete Numeric Functions, Growth of Functions, Big O, Big Q, Hash Function, Growth Functions.

[9L]

Module IV

Binary Operations, Groups, Product and Quotients of Groups, Semi group, Products and Quotients of Semi groups, Permutation Group, Composition of Permutation, Inverse Permutation, Cyclic Permutation, Transposition, Even and Odd Permutation, Coding of Binary Information and Error Correction, Decoding and Error Correction.

[9L]

Module V

Introduction to Graph, Graph Terminologies and their Representation, Connected & Disconnected graphs, Isomorphic Graph, Euler & Hamilton graphs. Introduction to Trees, Versatility of Trees, Tree traversal. Spanning Trees, Minimum Spanning Tree.

[9L]

Text Books:

1. **Mott, Joe L., Abraham Kandel, and Theodore P. Baker** Discrete Mathematics for ComputerScientists& Mathematicians, PHI, 2nd edition 2002.
2. **Swapan Kumar Chakraborty and BikashKanti Sarkar**: Discrete Mathematics, Oxford Univ.Publication, 2010.
3. **Kolman, Bernard, Robert C. Busby, and Sharon Ross.** Discrete mathematical structures,Prentice-Hall, Inc., 2003**.**

Reference Books:

1. **BikashKanti Sarkar and Swapan Kumar Chakraborty,** *Combinatorics and Graph Theory*, PHI,2016.

2. **Seymour Lipschuz and Mark Lipson**,*Discrete Mathematics*, Shaum's outlines, 2003.
3. **Liu, Chung Laung,** *Elements of Discretemathematis*, Mcgraw Hill, 2ndedition, 2001.
4. Bondy and Murty, Grapg Theory with Applications, American Elsevier,1979.
5. Robin J. Wilson, Introduction to Graph Theory, Pearson, 2010.

6. Course delivery methods	
Lecture by use of boards/lcd projectors/ohp projectors	√
Tutorials/assignments	√
Seminars	
Mini projects/projects	√
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of nptel materials and internets	√
Simulation	

<u>Course outcome (co) attainment assessment tools & evaluation procedure</u>

<u>Direct assessment</u>

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –
1. Student feedback on course outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments

CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	1	2	1	1	1	1	1	1	2	3	3	1
CO2	2	3	3	1	1	2	1	1	1	1	1	2	2	2	2
CO3	2	3	3	3	2	1	1	2	1	2	1	1	2	2	1
CO4	3	3	2	1	1	1	1	1	2	2	1	2	3	2	1
CO5	3	2	2	1	3	1	2	2	1	2	2	2	3	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: EC203
Course title: Digital System Design
Pre-requisite(s): EC101 Basics of Electronics & Communication Engineering
Co- requisite(s):
Credits: L: 3 T:0 P:0 C:3
Class schedule per week: 3x1
Class: B. Tech
Semester / Level: III/02
Branch: ECE
Name of Teacher:

Course Objectives
This course enables the students to:

A.	Understand the basics of the digital electronics.
B.	Apply the knowledge of digital electronics to construct various digital circuits.
C.	Analyse the characteristics and explain the outputs of digital circuits.
D.	Evaluate and asses the application of the digital circuits.
E.	Design digital machine for simple computing and control.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Explain the concept of digital electronics.
CO2	Apply the knowledge to produce digital electronics circuits.
CO3	Analyse and categorize digital circuits.
CO4	Justify the uses of different digital circuits.
CO5	Schematize and demonstrate simple computing machines.

<u>SYLLABUS</u>

Module – 1:
Basics of Digital Electronics: Number representation, Binary number system, Number base conversion, Octal, Hexadecimal and BCD codes, binary Arithmetic, Logic gates, Introduction to VHDL and Verilog, VHDL Models, Logic Families: TTL, ECL, and CMOS Logic Circuits, Logic levels, voltages and currents, fan-in, fan-out, speed, power dissipation. Comparison of logic families.

Module – 2:
Simplification of Boolean functions: Boolean Algebra, Basic theorems and Properties, De Morgan's theorem, Canonical & Standard forms, Simplification of Boolean function using Karnaugh map, POS& SOP simplification, Prime implicant, NAND and NOR implementation,.

Module – 3:
Design of Combinational Circuits: Analysis and design procedure, Parity Generators and Checkers, Adders, Subtractors, Look ahead carry, Adder, 4-bit BCD adder/subtractor, Magnitude comparator, Decoders, Encoders, Multiplexers, De-multiplexers, , Design of 1 bit ALU for basic logic and arithmetic operations.

Module – 4:
Design of Sequential Circuits and Memories: Basic Latch, Flip-Flops (SR, D, JK, T and Master-Slave), Triggering of Flip Flops, Synchronous and asynchronous counters, Registers, Shift Registers, Memories and Programmable Logic design, Types of memories, Memory Expansion and its decoding, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL)

Module – 5:
Design of simple computing machines: SAP-I concepts with stress on timing diagrams, Microinstructions, Fetch and Execution cycle variable machine cycle, Hardware control Matrix, Macroinstructions, Microprogramming , Bus concepts, Multiplexed Minimum system. Pipelining concepts.

Books recommended:
Textbooks:

1. "Digital Design", Morris Mano and Michael D. Ciletti ,5th edition PHI
2. "Digital System Design using VHDL", Charles H Roth, Thomson Learning

Reference books:

1. Digital computer Electronics AP Malvino, 3rd Edition Mc Graw Hill

Gaps in the syllabus (to meet Industry/Profession requirements): Hands-on-practical on microprocessor trainer Kit

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Cours**Course Delivery Methods**

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Course Outcomes and Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	3	1	2	1	1	2	1	2	2	2	1
CO2	3	3	3	2	3	2	3	2	2	2	1	2	3	2	1
CO3	2	2	3	2	2	2	2	2	2	2	1	2	2	2	1
CO4	2	3	3	3	3	3	3	3	2	2	1	3	3	2	2
CO5	2	2	2	3	3	2	3	3	2	2	2	2	1	1	3

< 34% = 1, 34-66% = 2, > 66% = 3

Mapping between Course Outcomes and Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3, CD6, CD7
CO2	CD1, CD2, CD3, CD6, CD7
CO3	CD1, CD2, CD3, CD6, CD7
CO4	CD1, CD2, CD3, CD6, CD7
CO5	CD1, CD2, CD3, CD6, CD7

COURSE INFORMATION SHEET

Course code: CS201
Course title: **Data Structures**
Pre-requisite(s): Programming for Problem Solving
Co- requisite(s): Data Structure Lab
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives
This course enables the students:

A.	To be familiar with basic techniques of algorithm analysis.

B.	To understand basic concepts about arrays, stacks, queues, linked lists, trees and graphs.
C.	To understand concepts of searching and sorting techniques.
D.	To implement various linear & non-linear data structures; and searching & sorting algorithms.
E.	To assess how the choice of data structures impacts the performance of a program.

Course Outcomes

After the completion of this course, students will be able to:

1.	Define various linear and non-linear data structures like stack, queue, linked list, tree and graph.
2.	Explain operations like insertion, deletion, traversal, searching, sorting etc. on various data structures.
3.	Design various data structures and their operations.
4.	Analyze the performance of data structure based operations including searching and sorting.
5.	Justify the choice of appropriate data structure as applied to specified problem definition.

SYLLABUS

Module I

Basic Concepts

Definition and basics of: Data Structure, ADT, Algorithms, Time and Space Complexity, Asymptotic Notations (O, θ, Ω), Time complexity computation of non-recursive algorithms (like Matrix addition, Selection sort – using step count), Array – basic operations, concept of multi-dimensional array, Polynomial operations using Array, Sparse Matrix.

(8L)

Module II

Stack and Queue

Stack ADT: basic operations, Queue ADT: basic operations, Circular Queue, Evaluation of Expressions, Another application or Mazing Problem.

(8L)

Module III

Linked List

Singly Linked List: concept, representation and operations, Circular Linked List, Polynomial and Sparse Matrix operations using LL, Doubly Linked List: basic concept.

(8L)

Module IV

Tree and Graph

Basic concepts and terminologies, Binary Search Tree and Heap, Disjoint Set, Graph: concept and terminologies, Concept of BFS, DFS, Spanning Tree, Connected Components.

(8L)

Module V

Searching and Sorting

Sequential Search and Binary Search, Insertion Sort, Heap Sort, Radix Sort,External Sorting: k-way merging approach.

(8L)

Text book:

1. SahniHorwitz,, Freed Anderson, Fundamentals of Data Structures in C, 2nd Edition (or latest) , University Press.(T1)

Reference books:

1. TharejaReema, Data Structures Using C, 2nd Edition, Oxford University Press.(R1)
2. Tanenbaum, Langsam, Augenstein, Data Structures using C, Pearson. (R2)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1
CO2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
CO3	3	3	3	1	2	1	1	1	1	1	1	2	2	2	1
CO4	3	3	2	1	2	1	1	1	1	1	1	2	2	3	1
CO5	2	2	3	2	2	1	1	2	1	1	1	2	3	2	1

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7

CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: EE102
Course title: EE102 ELECTRICAL ENGINEERING LABORATORY
Pre-requisite(s): Physics, Fundamentals of Mathematics and Electrical Engineering.

Credits:	L	T	P
	0	0	3

Class schedule per week: 3

Course Overview: Concepts of measuring instruments, AC RLC series parallel circuit operation, resonance, KVL and KCL, circuit theorems, 3-phase star and delta connections, measurement of low and high resistance of D.C. machine, measurement of power by three voltmeter, three-ammeter methods, measurement of power of 3-phase induction motor by two-wattmeter method.

Course Objectives

This course enables the students :

A.	To describe students practical knowledge of active and passive elements and operation of measuring instruments
B.	To demonstrate electrical circuit fundamentals and their equivalent circuit models for both 1-φ and 3- φ circuits and use circuit theorems
C.	To establish voltage & current relationships with the help of phasors and correlate them to experimental results
D.	1. To conclude performance of 1 – Φ AC series circuits by resonance phenomena 2. To evaluate different power measurement for both 1-φ and 3- φ circuits

Course Outcomes

After the completion of this course, students will be able to:

1.	classify active and passive elements, explain working and use of electrical components, different types of measuring instruments;
2.	illustrate fundamentals of operation of DC circuits, 1-φ and 3- φ circuits and also

	correlate the principles of DC, AC 1-φ and 3- φ circuits to rotating machines like Induction motor and D.C machine.;
3.	measure voltage, current, power, for DC and AC circuits and also represent them in phasor notations;
4.	analyse response of a circuit and calculate unknown circuit parameters;
5.	recommend and justify power factor improvement method in order to save electrical energy.

SYLLABUS

LIST OF EXPERIMENTS :

1. **Name: Measurement of low & high resistance of DC shunt motor**
   Aim: (i) To measure low resistance of armature winding of DC shunt motor
   (ii) To measure high resistance of shunt field winding of DC shunt motor

2. **Name: AC series circuit**
   Aim: (i) To obtain current & voltage distribution in AC RLC series circuit and to draw phasor diagram
   (ii) To obtain power & power factor of single phase load using 3- Voltmeter method and to draw phasor diagram

3. **Name: AC parallel circuit**
   Aim: (i) To obtain current & voltage distribution in AC RLC parallel circuit and to draw phasor diagram
   (ii) To obtain power & power factor of single phase load using 3- Ammeter method and to draw phasor diagram

4. **Name: Resonance in AC RLC series circuit**
   Aim : (i) To obtain the condition of resonance in AC RLC series circuit
   (ii) To draw phasor diagram

5. **Name: 3 phase Star connection**
   Aim : (i) To establish the relation between line & phase quantity in 3 phase star connection
   (ii) To draw the phasor diagram

6. **Name: 3 phase Delta connection**
   Aim : (i) To establish the relation between line & phase quantity in 3 phase delta connection
   (ii) To draw phasor diagram

7. **Name: 3 phase power measurement**
Aim : (i) To measure the power input to a 3 phase induction motor using 2 wattmeter method
(ii) To draw phasor diagram

8. **Name: Self & mutual inductance**
Aim : To determine self & mutual inductance of coils

9. **Name: Verification of Superposition, Thevenin's and Reciprocity theorem**
Aim : (i) To verify Superposition theorem for a given circuit
(ii) To verify Thevenin's theorem for a given circuit

10. **Name: Verification of Norton's, Tellegen's and Maximum Power transfer theorem**
Aim : (i) To verify Norton's theorem for a given circuit
(ii) To verify Maximum Power transfer theorem for a given circuit

Gaps in the syllabus (to meet Industry/Profession requirements)

1. Application of principles of magnetic circuits to electrical machines like transformers, generators and motors
2. Visualize Phase sequence

POs met through Gaps in the Syllabus :a, b, c, g

Topics beyond syllabus/Advanced topics/Design

1. Assignment : Simulation of electrical circuits with dependent/independent sources by various techniques (Mesh current/Node Voltage/Thevenin's theorem/Norton's theorem/Maximum power transfer theorem etc.) using MATLAB/PSIM/C++ softwares
2. Active/reactive power calculation for 3 – Φ circuits

POs met through Topics beyond syllabus/Advanced topics/Design: e,f, i, j, k

Mapping of lab experiment with Course Outcomes

Experiment	**Course Outcomes**				
	1	**2**	**3**	**4**	**5**
1	3	3	3	2	
2	3	3	3	3	2
3	3	3	3	3	2
4	3	3	3	3	2
5	3	3	3	1	
6	3	3	3	1	
7	3	3	3	2	2
8	3	3	3	3	
9	3	3	3	2	
10	3	3	3	2	

3=High, 2=Medium, 1=Low

Course Delivery methods	
CD1	Lecture by use of boards/LCD projectors
CD2	Tutorials/Assignments

CD3	Mini projects/Projects
CD4	Laboratory experiments/teaching aids
CD5	Self- learning such as use of NPTEL materials and internets
CD6	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
(1) Progressive Evaluation (60)	
Day to Day performance & Lab files	30
Quiz (s)	10
Viva	20
(2) End Semester (40)	
Examination Experiment performance	30
Quiz	10
Grand Total	100

Assessment Compoents	CO1	CO2	CO3	CO4	CO5
Progressive Evaluation Marks					
End Semester Marks					

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping of Course Outcomes onto Course Objectives

Course Outcome #	Course Objectives			
	A	**B**	**C**	**D**
1	3	3	3	3
2	3	3	3	3

3	3	3	3	3
4	3	3	3	3
5	2	3	3	3

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	2	1	1	1	2	2	1	2	1	1	1	1	1
CO2	3	3	3	1	2	2	2	2	1	2	1	1	2	1	1
CO3	3	3	3	2	2	2	2	2	1	2	1	1	3	2	1
CO4	3	3	3	2	2	2	2	2	2	2	1	1	3	2	1
CO5	3	3	3	3	3	2	3	3	3	3	2	2	3	3	2

Mapping of Course Outcomes onto Program Educational Objectives

Course Outcome #	**Program Educational Objectives**			
	1	2	3	4
1	3	3	2	2
2	3	3	3	
3	3	3	3	2
4	3	3	3	
5	3	3	2	2

Mapping Between COs and Course Delivery (CD) methods

Course Outcome	**Course Delivery Method**
CO1	CD1,CD2,CD4, CD5
CO2	CD1,CD4,CD5
CO3	CD1,CD3,CD4,CD5,CD6
CO4	CD1,CD2,CD4, CD5

CO5	CD4, CD5

COURSE INFORMATION SHEET

Course code: EC204
Course title: Digital System design Lab
Pre-requisite(s): EC101 Basics of Electronics & Communication Engineering
Co- requisite(s):
Credits: L:0 T:0 P:3 C:1.5
Class schedule per week: 03
Class: B. Tech
Semester / Level: III/ 02
Branch: ECE
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Understand the basics of logic gates, input, output, power supply and gates IC's.
2.	Apply the knowledge of digital electronics to construct combinational and sequential circuits.
3.	Analyse controlled digital circuits with different Boolean function.
4.	Evaluate combinational/sequential circuits and memories.
5.	Translate real world problems into digital logic formulations using VHDL.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Describe the knowledge of basic logic gates and their design using universal gates.
CO2	Demonstrate the working of combinational and sequential circuits.

CO3	Integrate and experiment with controlled digital circuits.
CO4	Appraise combinational/sequential circuits and memories.
CO5	Schematize, simulate and implement combinational and sequential circuits to solve real world problems using VHDL systems.

SYLLABUS

List of experiments:

1. Design and implement a controlled CMOS Inverter.
2. To study and verify the truth table of NAND and EX-OR gate using IC 7400.
3. Design and implement SEVEN segment display unit.
4. Design and verify half adder and full Adder circuits using gates and IC 7483.
5. Design and implement a 3:8 Decoder.
6. Design and implement 8:3 priority encoder.
7. Design a 4 bit magnitude comparator using combinational circuits.
8. Design and implement 8:1 multiplexer and 1:4 demultiplexer.
9. Design ALU with functions of ADD, SUB, INVERT, OR, AND. XOR, INC, DEC and CMP.
10. Design and verify decade Counter.
11. Design a ROM (8X4) using decoder, gates and diodes.
12. Design of pre settable up/down counter.

Implement all the above experiments using VHDL platform and verify.

Books recommended:

Textbooks:

1. “Digital Design”, Morris Mano and Michael D. Ciletti ,5th edition PHI
2. “Digital System Design using VHDL”, Charles H Roth, Thomson Learning

Reference books:

2. Digital computer Electronics AP Malvino, 3rd Edition Mc Graw Hill

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Course Outcomes and Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2	1	1	1	2	2	1	2	1	1	1	1	1

CO2	3	3	3	1	2	2	2	2	1	2	1	1	2	1	1
CO3	3	3	3	2	2	2	2	2	1	2	1	1	3	2	1
CO4	3	3	3	2	2	2	2	2	2	2	1	1	3	2	1
CO5	3	3	3	3	3	2	3	3	3	3	2	2	3	3	2

< 34% = 1, 34-66% = 2, > 66% = 3

Mapping between Course Outcomes and Course Delivery Method

Course Outcomes	Course Delivery Method
CO1	CD1, CD3, CD6, CD7
CO2	CD1, CD3, CD6, CD7
CO3	CD1, CD3, CD6, CD7
CO4	CD1, CD3, CD6, CD7
CO5	CD1, CD3, CD6, CD7

COURSE INFORMATION SHEET

Course code: CS202
Course title: **Data Structures Lab**

Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: All

Course Objectives

This course enables the students:

A.	To assess how the choice of data structures and algorithm design methods impact the performance of programs.
B.	To choose the appropriate data structure and algorithm design method for a specified application.
C.	To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.
D.	Analyse and compare the different algorithms

Course Outcomes

After the completion of this course, students will be able to:

1.	Be able to design and analyze the time and space efficiency of the data structure
2.	Analyze run-time execution of previous learned sorting methods, including selection, merge sort, heap sort and Quick sort
3.	Have practical knowledge on the applications of data structures
4.	Be capable to identity the appropriate data structure for given problem

SYLLABUS

1. Program to Find the Number of Elements in an Array
2. Develop and Implement a menu driven program in C for the following Array operations
    a. Creating Array of N Integer elements.
    b. Display of Array elements with suitable headings.
    c. Inserting an element (ELEM) at a given valid position (POS).
    d. Deleting an element at a given valid position (POS).
    e. Exit
3. Programs for Stack, Queues and Circular Queues using Arrays
4. Program to convert an Infix Expression into Postfix and Postfix Evaluation

5. Program to implement stack using arrays
6. Program to implement stack using linked list
7. Program to implement multiple stack in a single array
8. Program to convert infix notation to postfix notation using stacks
9. Program to implement queue using arrays
10. Program to implement queue using pointers
11. Program to reverse elements in a queue
12. Program to implement circular queue using arrays
13. Program to create add remove & display element from single linked list
14. Program to create add remove & display element from double linked list
15. Program to count number of nodes in linear linked list
16. Program to create add remove & display element from circular linked list
17. Programs to implement stack & queues using linked representation
18. Program to concatenate two linear linked lists
19. Program to accept a singly linked list of integers & sort the list in ascending order.
20. Program to reverse linked list
21. Program to represent polynomial using linked list
22. Program to add two polynomials using linked list
23. Program for the creation of binary tree, provide insertion & deletion in c
24. Program for pre-order, post-order & in-order traversals of a binary tree using non reccursive.
25. Program to count no, of leaves of binary tree
26. Program for implementation of B-tree (insertion & deletion)
27. Program for implementation of multi-way tree in c
28. Program for implementation of AVL tree
29. Program to implement bubble sort program using arrays
30. Program to implement merge sort using arrays
31. Program to implement selection sort program using arrays
32. Program to implement insertion sort program using arrays
33. Program to implement topological sort using arrays
34. Program to implement heap sort using arrays
35. Program to implement heap sort using pointers
36. Program to implement bubble sort program using pointers
37. Program to implement linear search using pointers
38. Program to implement binary search using pointers
39. Program to implement linear search using arrays
40. Program to implement binary search using arrays

Text books:

1. Baluja G S, "Data Structure through C", Ganpat Rai Publication, New Delhi, 2015.
2. Pai G A V, "Data Structures and Algorithms: Concepts, Techniques and Applications", 2ndEdn, Tata McGraw-Hill, 2008.
3. Horowitz E., Sahni S., Susan A., "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2010.

Reference books:

1. Tremblay J. P., Sorenson P. G, "An Introduction to Data Structures with Applications", 2nd Edn, McGraw-Hill, Inc. New York, NY, USA.
2. Lipschutz Seymour, "Data Structures", 6th Edn, 9th Reprint 2008, Tata McGraw-Hill.

3. Drozdek Adam, “Data Structures and Algorithms in C++”, Thomson Learning, New Delhi – 2007.
4. Feller J., Fitzgerald B., “Understanding Open Source Software Development”, Pearson Education Ltd. New Delhi

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√

Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	2	1	2	2	1	2	1	1	2	3	2
CO2	3	3	3	3	2	1	2	2	2	1	1	2	2	3	2
CO3	3	3	3	3	2	1	2	2	1	2	1	2	3	3	2
CO4	3	3	3	3	2	2	2	2	2	2	2	2	3	2	2
CO5	3	2	2	1	2	3	1	1	1	2	2	2	3	3	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

(Semester IV)

COURSE INFORMATION SHEET

Course code: MA 203
Course title: Numerical Methods
Pre-requisite(s): NIL
Co- requisite(s): ---NIL
Credits: L: 2 T: 0 P: 0 C: 2
Class schedule per week: 2 Lectures
Class: B Tech
Semester / Level: 2
Branch: ALL
Name of Teacher:
Course Objectives: This course enables the students to

1.	derive appropriate numerical methods to solve algebraic and transcendental equations
2.	derive appropriate numerical methods to solve linear system of equations
3.	approximate a function using various interpolation techniques
4.	to find the numerical solution of initial value problems and boundary value problems

Course Outcomes: After the completion of this course, students will be able to

CO 1	solve algebraic and transcendental equation using an appropriate numerical method arising in various engineering problems
CO 2	solve linear system of equations using an appropriate numerical method arising in computer programming, chemical engineering problems etc.
CO 3.	Approximate a function using an appropriate numerical method in various research problems
CO 4	evaluate derivative at a value using an appropriate numerical method in various research problems
CO 5	solve differential equation numerically

Syllabus

MA 203 Numerical Methods 2-0-0-2

Module I: Errors and Nonlinear Equations

Error Analysis: Definition and sources of errors, propagation of errors, floating-point arithmetic **Solution of Nonlinear equations:** Bisection method, Regula-Falsi method, Secant method, Newton-Raphson method and its variants, General Iterative method. [05L]

Module II: System of Linear Equations

Gauss-Elimination, Gauss-Jordan, LU-Decomposition, Gauss-Jacobi and Gauss- Siedel methods to solve linear system of equations and Power method to find least and largest eigenvalues. [05L]

Module III: Interpolation

Lagrange's interpolation, Newton's divided differences interpolation formulas, inverse interpolation, interpolating polynomial using finite differences. [05L]

Module IV: Differentiation and Integration

Differentiation using interpolation formulas, Integration using Newton-Cotes formulas: Trapezoidal rule, Simpson's rule [05L]

Module V: Solution of Ordinary Differential Equations

Euler's method, modified Euler's method, Runge - Kutta Methods of second and fourth order to solve initial value problems. [05L]

Text Books:

1. Jain M.K, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age Publications, 2004.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI.
3. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. S.C. Chapra and R. P. Canale, Numerical Methods for Engineers, McGraw Hill, 1985.
2. C.F. Gerald and P.O. Wheatley, Applied Numerical Analysis, Pearson Education, Seventh Edition, 2003.
3. R. W. Hamming: Numerical Methods for Scientists and Engineers, Second Edition, Dover

Course delivery methods	
Lecture by use of boards/lcd projectors/ohp projectors	√
Tutorials/assignments	√
Seminars	
Mini projects/projects	√
Laboratory experiments/teaching aids	
Industrial/guest lectures	
Industrial visits/in-plant training	
Self- learning such as use of nptel materials and internets	√
Simulation	

<u>Course outcome (co) attainment assessment tools & evaluation procedure</u>

<u>Direct assessment</u>

Assessment tool	% contribution during co assessment
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment components	CO1	CO2	CO3	CO4	CO5
Mid semester examination	√	√	√		
End semester examination	√	√	√	√	√
Quiz (s)	√	√	√		
Assignment	√	√	√	√	

Indirect assessment –

1. Student feedback on course outcome

<u>Mapping of course outcomes onto program outcomes</u>

Course Outcome	Program Outcomes (POs)	Program Specific Outcomes (PSOs)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	1	1	1	2	1	2	1	1	3	2	1
CO2	3	3	3	2	2	1	1	2	1	2	1	2	3	3	1
CO3	3	3	2	3	2	2	2	2	2	2	1	1	2	2	1
CO4	2	2	3	3	2	2	2	2	3	3	2	2	2	2	1
CO5	2	3	3	3	3	2	2	2	2	2	2	2	3	3	1

If satisfying< 34%=1, 34-66% =2, > 66% = 3.

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CE101
Course title: **Environmental Science**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 2 T: 0 P: 0
Class schedule per week: 2
Class: B. Tech
Semester / Level: I
Branch: All

Course Objectives
This course enables the students:

1	To develop basic knowledge of ecological principles and their applications in environment.
2	To identify the structure and composition of the spheres of the earth, the only planet sustaining life.
3	To analyse, how the environment is getting contaminated and probable control mechanisms for them.
4	To generate awareness and become a sensitive citizen towards the changing environment.

Course Outcomes

After the completion of this course, students will be:

1	Able to explain the structure and function of ecosystems and their importance in the holistic environment.
2	Able to identify the sources, causes, impacts and control of air pollution.
3	Able to distinguish the various types of water pollution happening in the environment and understand about their effects and potential control mechanisms.
4	Able to judge the importance of soil, causes of contamination and need of solid waste management.
5	Able to predict the sources of radiation hazards and pros and cons of noise pollution.

Syllabus

Module 1. Ecosystem and Environment

Concepts of Ecology and Environmental science, ecosystem: structure, function and services, Biogeochemical cycles, energy and nutrient flow, ecosystem management, fate of environmental pollutants, environmental status and reports on climate change.

(8L)

Module 2: Air Pollution

Structure and composition of unpolluted atmosphere, classification of air pollution sources, types of air pollutants, effects of air pollution, monitoring of air pollution, control methods and equipment for air pollution control, vehicular emissions and control, indoor air pollution, air pollution episodes and case studies.

(8L)

Module 3: Water Pollution

Water Resource; Water Pollution: types and Sources of Pollutants; effects of water pollution; Water quality monitoring, various water quality indices, water and waste water treatment: primary, secondary and tertiary treatment, advanced treatments (nitrate and phosphate removal); Sludge treatment and disposal.

(8L)

Module 4: Soil Pollution and Solid Waste Management

Lithosphere – composition, soil properties, soil pollution, ecological & health effects, Municipal solid waste management – classification of solid wastes, MSW characteristics, collection, storage, transport and disposal methods, sanitary landfills, technologies for processing of MSW: incineration, composing, pyrolysis.

(8L)

Module 5: Noise pollution & Radioactive pollution

Noise pollution: introduction, sources: Point, line and area sources; outdoor and indoor noise propagation, Effects of noise on health, criteria noise standards and limit values, Noise measurement techniques and analysis, prevention of noise pollution; Radioactive pollution: introduction, sources, classification, health and safety aspects, Hazards associated with nuclear reactors and disposal of spent fuel rods-safe guards from exposure to radiations, international regulation, Management of radioactive wastes.

(8L)

Text books:

1. A, K. De. (3rd Ed). 2008. Environmental Chemistry. New Age Publications India Ltd.
2. R. Rajagopalan.2016.Environmental Studies: From Crisis to Future by, 3rd edition, Oxford University Press.
3. Eugene P. Odum. 1971. Fundamentals of Ecology (3rd ed.) -. WB Sunders Company, Philadelphia.
4. C. N. Sawyer, P. L. McCarty and G. F. Parkin. 2002. Chemistry for Environmental Engineering and Science. John Henry Press.
5. S.C. Santra. 2011. Environmental Science. New Central Book Agency.

Reference books:

1. D.W.Conell. Basic Concepts of Environmental Chemistry, CRC Press.
2. Peavy, H.S, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International
3. G.M. Masters& Wendell Ela. 1991. Introduction to Environmental Engineering and Science, PHI Publishers.

Gaps in the syllabus (to meet Industry/Profession requirements)

POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors √
Tutorials/Assignments √
Seminars √
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

<u>Course Outcome (CO) Attainment Assessment tools & Evaluation procedure</u>
<u>Direct Assessment</u>

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25

End Sem Examination Marks	50
Quiz (s) (1 & 2)	10+10
Teacher's assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Mid sem exam	√	√	√	√	√
End Sem Examination Marks	√	√	√	√	√
Assignment	√	√	√	√	√

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	2	2	1	3	3	2	2	2	1	1	2	1	1
CO2	2	3	2	3	2	3	3	2	2	2	1	1	2	2	1
CO3	2	3	2	3	2	3	3	2	2	2	1	1	2	2	1
CO4	2	3	2	3	2	3	3	2	2	2	1	2	2	2	1
CO5	2	3	3	3	2	3	3	2	2	2	1	2	2	2	1

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Mapping Between Cos and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1, CD2
CD2	Tutorials/Assignments		CO2	CD1, CD2
CD3	Seminars		CO3	CD1, CD2

CD4	Mini projects/Projects		CO4	CD1, CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1, CD2
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CS203
Course title: **Computer Organization Architecture**
Pre-requisite(s): Digital Logic
Co- requisite(s):
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic architecture and organization of systems along with their performances.
2.	To Familiar with Digital Logic circuits, Data representation and Instruction Set Architecture.
3.	To build a complete data path for various instructions.
4.	To understand the pipeline concepts and Hazards.
5.	To familiar with Memory and I/O Organization.

Course Outcomes
After the completion of this course, students will be to:

1.	Explain the merits and pitfalls in computer performance measurements and analyze the impact of instruction set architecture on cost-performance of computer design
2.	Explain Digital Logic Circuits ,Data Representation, Register and Processor level Design and Instruction Set architecture
3.	Solve problems related to computer arithmetic and Determine which hardware blocks and control lines are used for specific instructions
4.	Design a pipeline for consistent execution of instructions with minimum hazards
5.	Explain memory organization, I/O organization and its impact on computer cost /performance.

Syllabus

Module I

Basic Structures of Computers

Introduction to Digital Logic, Basic Structure of Computers: Computer Types, Functional Units, Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts: Fixed and floating point Representation and Arithmetic Operations, Performance, Historical Perspective. (5L)

Module II

Instruction Set Architecture

Memory Locations and Addresses: Byte Addressability, Big-Endian and Little-Endian Assignments, Word Alignment, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Subroutines, Additional Instructions, Dealing with 32-Bit Immediate Values. (5L)

Module III

Basic Processing Unit & Pipelining

Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control, CISC-Style Processors.

Pipelining: Basic Concept, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Pipeline Performance Evaluation. (10L)

Module IV

Memory Organization

Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access, Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Memory Management Requirements, Secondary Storage. (10L)

Module V

Input Output & Parallel Processing

Basic Input Output

Accessing I/O Devices, Interrupts

Input Output Organization

Bus Structure, Bus Operation, Arbitration, Interface, Interconnection Standards.

Parallel Processing

Hardware Multithreading, Vector (SIMD) Processing, Shared-Memory Multiprocessors, Cache Coherence, Message-Passing Multicomputers, Parallel Programming for Multiprocessors, Performance Modeling. (10L)

Text Book:

Patterson David A., Hennessy John L., Computer Organization and Design: The Hardware / Software Interface, 5th Edition, Elsevier.(T1)

Reference Books:

Hamachar Carl et. al , Computer Organization and Embedded Systems, 6th Edition, McGraw Hill. (R1)

Mano M. Morris, Computer System Architecture, Revised 3rd Edition, Pearson.(R2)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u><u>N/A</u>

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	1	1	1	2	1	2	1	2	1	2	2	3	3	3
CO2	3	1	1	1	2	1	2	1	2	1	2	2	3	3	3
CO3	3	2	2	2	3	1	2	1	2	1	2	2	3	3	3

CO4	3	2	2	2	3	1	2	1	2	2	3	3	3	3	3
CO5	3	2	3	3	3	1	2	1	3	1	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS204
Course title: **Object Oriented Programming and Design Patterns**
Pre-requisite(s): Data Structure
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	The course shall allow students to understand the basic tenets of OOP.
2.	The course will exemplify the basic syntax and constructs of JAVA.
3.	The course will help students understand the application OOP principles in various use cases.
4.	The course will explain basic JAVA GUI components and their working.
5.	The course aims to expose students to newer JAVA constructs like NIO, Lambdas etc.

Course Outcomes

After the completion of this course, students will be:

1.	Identify the difference between procedural and OO programming.
2.	Construct programs using various OOP principles.
3.	Design UI using JAVA GUI components.
4.	Operate on files and strings in real life scenarios.
5.	Analyze thread performance and inter thread communication issues

SYLLABUS

Module I

Introduction to Classes, Objects and Java

Introduction to Object Technology, Java, Understanding the Java development environment, Programming in Java, Memory concepts, Doing basic Arithmetic, Comparing entities, Classes, Objects, Methods, Strings, Primitive vs reference types.

(8L)

Module II

Control Statements, Methods and Arrays

Basic selection statements, Iterative constructs, Relative and Logical operators, break, continue, Methods, static methods, parameter passing, argument promotion and casting, scopes, method overloading. Arrays and ArrayList in Java, Enhanced for statement, Passing arrays to methods, Multidimensional arrays, Using command line arguments.

(8L)

Module III

Object Oriented Concepts: Polymorphism & Inheritance

Controlling access to class members, the use of this keyword, getters and setters, Composition, enum, the use of static and final, Garbage collection. Superclass and subclass, protected members, constructors in subclass, the Object class, Introduction to polymorphism, Abstract classes and methods, Assignment between subclass and superclass variables, Creating and using interfaces.

(8L)

Module IV

Exception Handling & GUI Design

When to use exception handling, Java exception hierarchy, finally block, Stack unwinding, Chained exceptions, Declaring new exception types, Assertions, try with resources. Simple I/O with GUI, Basic GUI Components, GUI Event handling, Adapter classes, Layout managers, Using panels.

(8L)

Module V

Strings, characters & Files

Working with the String and StringBuilder class, Character class, Tokenizing strings, Regular Expressions, Files and Streams, Using NIO classes, Sequential file handling, Object serialization, JFileChooser, Introduction to threading, Introduction to Generics and lambda expressions.

(8L)

Text book:

Deitel P., Deitel H., Java How to Program, 10th Edition, Pearson Publications, 2016.(T1)

Reference book:

Wu C. T., Object Oriented Programming in Java, 5th Edition, McGrawHill Publications, 2010.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	2	1	3	3	3	3	2	1	1	1	1	2	3	2	3
CO4	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS206
Course title: **Design and Analysis of Algorithm**
Pre-requisite(s): Data Structure
Co- requisite(s): Algorithms Lab
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To analyze the performance of recursive and nor-recursive algorithms.
2.	To understand various algorithm design techniques.
3.	To use of different paradigms of problem solving.
4.	To find efficient ways to solve a given problem.
5.	To compare various algorithms of a given problem.

Course Outcomes
After the completion of this course, students will be able to:

1.	Define the concepts and mathematical foundation for analysis of algorithms.
2.	Explain different standard algorithm design techniques, namely, divide & conquer, greedy, dynamic programming, backtracking and branch & bound.
3.	Demonstrate standard algorithms for fundamental problems in Computer Science.
4.	Design algorithms for a given problem using standard algorithm design techniques.

5.	Analyze and compare the efficiency of various algorithms of a given problem.

SYLLABUS

Module I
Algorithms and Complexity
Introduction, Algorithm Complexity and various cases using Insertion Sort, Asymptotic Notations, Time complexity of Recursive Algorithm, Solving Recurrences using Iterative, Recursion Tree and Master Theorem. (8L)

Module II
Divide and Conquer
Discussion of basic approach using Binary Search, Merge Sort , Quick Sort , Selection in Expected linear time, Maximum Subarray , Matrix Multiplication , Introduction of Transform and Conquer and AVL Tree . (8L)

Module III
Dynamic Programming
Introduction and Approach, Rod Cutting, LCS, Optimal BST, Transitive closure and All-pair Shortest Path, Travelling Salesperson Problem. (8L)

Module IV
Greedy and other Design Approaches
Introduction to greedy using fractional knapsack, Huffman Code, Minimum Spanning Tree – Prim and Kruskal, Single Source Shortest Path Dijkstra's and Bellman-Ford, Introduction to Backtracking using N-Queens problem, Introduction to Branch and Bound using Assignment Problem or TSP. (8L)

Module V
NP Completeness and Other Advanced Topics
Non-deterministic algorithms – searching and sorting, Class P and NP, Decision and Optimization problem, Reduction and NPC and NPH, NP Completeness proof for: SAT, Max-Clique, Vertex Cover, Introduction to Randomized Algorithms, Introduction to Approximation Algorithms. (8L)

Text Book:

1. Cormen Thomas H. et al., Introduction to Algorithms. 3rd Edition, PHI Learning, latest edition.(T1)

Reference Books:

1 Horowitz E., Sahani, Fundamentals of Computer Algorithms, Galgotia Publication Pvt. Ltd. (R1)
2 Dave and Dave, Design and Analysis of Algorithms, 2^{nd} Edition, Pearson. (R2)
3 Goodrich, Tamassia. Algorithm Design. Wiley. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	3	2	1	1	1	1	1	2	1	2	3	3	2
CO2	2	2	3	2	1	1	1	1	1	2	1	2	3	3	2
CO3	2	2	3	2	1	1	1	1	1	2	2	2	3	3	3
CO4	3	3	3	3	2	1	1	1	1	2	2	3	3	3	3
CO5	3	3	3	3	2	1	1	1	1	2	2	3	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS211
Course title: **Operating System**
Pre-requisite(s): Data Structure, Computer System Architecture, Basic Course on Computer Programming
Co- requisite(s): None
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: BTech
Semester / Level: V
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Present the main components of OS and their working
2.	Introduce the concepts of process and thread and their scheduling policies
3.	Handling synchronization of concurrent processes and deadlocks
4.	Analyze the different techniques for managing memory, I/O, disk and files
5.	Design the components of operating system

Course Outcomes
After the completion of the course student will be able to:

1.	Describe the main components of OS and their working
2.	Explain the concepts of process and thread and their scheduling policies
3.	Solve synchronization and deadlock issues
4.	Compare the different techniques for managing memory, I/O, disk and files

5.	Design components of operating system

Syllabus

Module I **[8L]**

Operating system Overview

Operating system Objective and Functions, Evolution of Operating System, Major Advances in OS Components, Characteristics of Modern Operating Systems

Process Description and Control

Process Concept, Process States, Process Description, Process Control, Threads, Types of Threads, Multicore and Multithreading

Module II **[8L]**

Scheduling

Type of scheduling, Uniprocessor Scheduling, Multiprocessor Scheduling

Module III **[8L]**

Concurrency

Mutual Exclusion and Synchronization

Principle of Concurrency, Mutual Exclusion, Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem

Deadlock and Starvation

Principle of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Dining Philosopher Problem

Module IV **[8L]**

Memory Management

Memory Management Requirements, Memory Partitioning, Paging, Segmentation

Virtual Memory

Hardware and Control Structures, Operating System Policies for Virtual Memory

Module V **[8L]**

I/O Management and Disk Scheduling

I/O device, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, RAID, Disk Cache

File Management

Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, File Allocation and Free Space Management

Text Book:

1. StallingsW., Operating systems - Internals and Design Principles, , 8th Edition, Pearson, 2014.

Reference Books:

1. SilberchatzAbraham, Galvin Peter B.,Gagne Greg, Operating System Principles, 9th Edition, Wiley Student Edition, 2013.
2. Tanenbaum Andrew S., Modern Operating Systems, 4th Edition, Pearson, 2014.
3. Dhamdhere D. M. ,Operating Systems A concept - based Approach, 3rd Edition, McGrawHill Education, 2017.
4. Stuart B. L., Principles of Operating Systems, 1st Edition, 2008, Cengage learning, India Edition.
5. Godbole A. S., Operating Systems, 3rd Edition, McGrawHill Education, 2017.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2	2	1	1	2	1	1	1	1	2	2	2	1
CO2	2	2	2	2	1	1	2	1	1	1	1	2	2	2	1
CO3	2	2	3	2	2	2	2	2	1	2	1	3	3	2	2
CO4	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3
CO5	3	2	2	2	2	3	1	1	1	1	1	1	3	3	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: MA204
Course title: **Numerical Methods Lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 2 C:1
Class schedule per week: 2
Class: B. Tech
Semester / Level: III/II
Branch: All

Course Objectives
This course enables the students to understand

1.	derive appropriate numerical methods to solve algebraic, transcendental equations and linear system of equations
2.	approximate a function using various interpolation techniques, to find the numerical solution of initial value problems
3.	ncepts in probability theory, the properties of probability distributions
4.	estimation of mean, variance and proportion, the concepts of statistical hypothesis

Course Outcomes
After the completion of this course, students will be able to

1.	solve algebraic, transcendental equation and linear system of equations using an appropriate numerical method arising in various engineering problems
2.	evaluate derivative at a value using an appropriate numerical method in various research problems, solve differential equation numerically
3.	learn basic probability axioms, rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.
4.	find the point and interval estimates, analyse data statistically and interpretation of the results

Syllabus
List of Assignments

1. Find a simple root of $f(x)=0$ using bisection method. Read the end points of the interval (a,b) in which the root lies, maximum number of iterations n and error tolerance eps.
2. Find a simple root of $f(x)=0$ using Regula-Falsi method. Read the end points of the interval (a,b) in which the root lies, maximum number of iterations n and error tolerance eps.
3. Find a simple root of $f(x)=0$ using Newton Raphson method. Read any initial approximation x_0, maximum number of iterations n and error tolerance eps.
4. Solution of a system of $n \times n$ linear equations using Gauss elimination method with partial pivoting. The program is for 10×10 system or higher order system.
5. Matrix inversion and solution of $n \times n$ system of equations using Gauss-Jordan method. If the system of equations is larger than 15×15 change the dimensions of the float statement.
6. Program to solve a system of equation using Gauss-Seidel iteration method. Order of the matrix is n, maximum number of iterations $niter$, error tolerance is eps and the initial approximation to the solution vector is x_0. If the system of equations is larger than 10×10 change the dimension in float.
7. Program to find the largest Eigen value in magnitude and the corresponding Eigen vector of a square matrix A of order n using power method.
8. Program for Lagrange interpolation.
9. Program for Newton divided difference interpolation.
10. Program for Newton's forward and backward interpolation.
11. Program for Gauss's central difference interpolation (both backward and forward).
12. Program to evaluate the integral of $f(x)$ between the limits a to b using Trapezoidal rule of integration based on n subintervals or $n+1$ nodal points. The values of a,b and n are to be read. The program is tested for $f(x)=1/(1+x)$.
13. Program to evaluate the integral of $f(x)$ between the limits a to b using Simpson's rule of integration based on $2n$ subintervals or $2n+1$ nodal points. The values of a,b and n are to be read and the integrand is written as a function subprogram. The program is tested for $f(x)=1/(1+x)$.

14. Program to solve an IVP, $dy/dx = f(x), y(x_0) = y_0$ using Euler method. The initial value x_0, y_0 the final value x_f and the step size h are to be read. The program is tested for $f(x,y) = -2xy^2$.

15. Program to solve an IVP, $dy/dx = f(x), y(x_0) = y_0$ using the classical Runge-Kutta fourth order

method with step size h, $h/2$ and also computes the estimate of the truncation error. Input parameters are: initial point, initial value, number of intervals and the step length h. Solutions with h, $h/2$ and the estimate of the truncation error are available as output. The right hand side The program is tested for $f(x,y) = -2xy^2$.

Text Books:

1. S.S.Sastry-Introductory Methods of Numerical Analysis-PHI, Private Ltd., New Delhi.
2. N.Pal& S. Sarkar- Statistics: Concepts and Applications, PHI, New Delhi-2005.

Reference Books:

1 R.V.Hogg et.al- Probability and Statistical Inpane, 7th Edn, Pearson Education, New Delhi-2006.

2. R.L.Burden&J.D.Faires- Numerical Analysis, Thomson Learning-Brooks/Cole, Indian Reprint, 2005.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure
Direct Assessment

Assessment Tool	% Contribution during CO Assessment

Progressive Evaluation	(60)
Attendance Marks	12
Lab file Marks	12
Viva Marks	24
Day-to-day performance Marks	12
End SEM Evaluation	(40)
Lab quiz Marks	20
Lab performance Marks	20

Assessment Components	CO1	CO2	CO3	CO4	CO5
Progressive Evaluation	√	√	√	√	√
End SEM Evaluation	√	√	√	√	√

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

<u>Mapping between Objectives and Outcomes</u>

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	3	2	1	1					1	2	2	3	2
CO2	2	2	3	2	1	1				2	1	2	2	3	2
CO3	2	2	3	2	1	1			1	2	2	2	2	3	2
CO4	3	3	3	2	1	1	2	2	1	2	2	3	3	3	3
CO5	3	3	3	2	1	1	2	2	1	2	2	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT202
Course title: **Basic IT Workshop**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 2
Class schedule per week: 2
Class: B. Tech
Semester / Level: IV/II
Branch: All

Course Objectives

This course enables the students:

1.	Understand and use the basic Matlab functions and understand its environment and variables
2.	Know about handling operations and advanced features like menus and toolbars
3.	Implement programs with the use of arrays, strings and graphical data representations
4.	Understand Python, Data Types, Operators, Arrays
5.	Implement Functions and loops, object oriented programming using Python

Course Outcomes

After the completion of this course, students will be able:

1.	Apply features of Matlab and algorithms to solve problems
2.	Develop application programs with the help of various tool boxes available in Matlab.
3.	Apply data analysis through graphical data representations
4.	Implement programs with the use of arrays, strings in Matlab
5.	Implement Functions and loops, using Python

Syllabus

Module I

Introduction to MATLAB and Basics Part I:

Introduction, Advantage, Disadvantage of MATLAB, MATLAB Environment, Variables and Array, Built-in Functions of MATLAB, Subarrays, Multidimensional Arrays, Data Files.

Module II

MATLAB Basic Part II:

Scalar and Array Operations, Hierarchy of Operations, Introduction to Plotting, Polar Plots, Subplots, MATLAB profiler. String Functions, Complex Data, Three-Dimensional Plot

Module III

MATLAB Advanced Features:

Sparse Arrays, Cell Arrays,Structure Arrays, I/O Functions, Object Handles, Position and Units, Graphical User Interface: Dialog Boxes, Menus, Toolbars.

Module IV

Introduction to Python Basics

Basics, I Python, Data Types, Operators, Arrays, Plotting

Module V

Python Programming Part 2:

Functions and loops, object oriented programming, Numerical Formalism

Sample list of Assignments:

Sample Assignments on Python

Data Types, Input- Outputs, Variables

1. Write a program in Python to swap two variables.

2. Write a program in Python to check the input character is an alphabet or not.

Loop

3. Write a program in python to shuffle a deck of card using the module random and draw 5 cards.

4. Write a program in python to find the factors of a number.

Array and Lists

5. Write a program in python to transpose a given matrix M = [[1, 2], [4, 5], [3, 6]].

6. Write a program in python to print the median of a set of numbers in a file.

Function

6. Write a function in Python to find the resolution of a JPEG image.

7. Write a program in python and use in-built functions to convert a decimal number to binary, octal and hexadecimal number.

8. Write a program in python to sort words in alphabetical order.

Plot

9. Use Matplotlib to draw histogram to represent average age of population given as Age [21, 54, 66, 44, 32,42, 54, 62, 93, 45, 32, 70]

10. Create a 3-D plot in Python for the function $\sqrt{y^2 - x^2}$ over the interval -3 ≤ x ≤ 3 and -3 ≤ x ≤ 3.

Sample Assignments on MATLAB

Assignment Statements:

1. Given two sides a= 3.2 and b=4.6 of a triangle and angle theta= 60^0 between these two sides. Find the length of the third side and the area of the triangle.

2. Write a MATLAB statement to calculate the sum of the series:

S= 1- x^2/2! + x^4/4! – x^6/6! + x^8/8! for x= 1.5

Arrays

3. The array A is given below. Extend the 2-D array to 3-D array by including another 2-D array as second element in the third dimension.

$$A = 123; 543; 136;$$

4. Let a matrix A of size (3x4) is defined as, $= \ 12356791011 \quad 4812$. Reshape the matrix A into matrix B of the size (6x2).

5. Let a column vector z be given as z = [2; 3; 4; 5].

(i) Form a diagonal matrix A, using the elements of z as he main diagonal elements of A.

(ii) Form the matrix B, using the elements of vector z as elements of upper diagonal of B.

(iii) Form the matrix C, using the elements of vector z as elements of first lower diagonal of C.

Polynomials

6. Integrate the polynomial y = $4x^3 + 12x^2 + 16x + 1$. Take the constant of integration as 3.

7. Find the polynomial of degree 2 to fit the following data:

x	0	1	2	4
y	1	6	20	100

Input-Output statement and files

8. Write a program in MATLAB to illustrate the use of 'pause' command.

9. Write a program in MATLAB to illustrate the use of fwrite function for writing binary data of different formats to a file named 'check.txt'.

Plots

10. Plot the curve given by the equation y = sin(x) where x varies from 0 to 2π. Also label the x-axis and y-axis and provide a suitable title for the plot

11. Plot a bar graph for the data given as x = [1 2 3 4 5 6] and y = [10 15 25 30 27 19]

12. Given $x = t^2$ and $y = 4t$ for $-4 < t < 4$. Using MATLAB obtain a 3-D plot showing the matrix in (x, y) space as a factors of time.

Control structures

13. Write a program in MATLAB to find the count of even values in the given n numbers.

Functions

14. Write a function in MATLAB to calculate the roots of the quadratic equation $ax^2 + bx + c = 0$, where a, b, c are constants.

Text Books:

1. MATLAB® Programming for Engineers:Stephen J. Chapman, Thomson Corporation, 4th Edition
2. Introduction to Python for Engineers and Scientists, Sandeep Nagar, Apress, 2018

Reference Books

1. Learn Python The Hard Way, Zed A. Shaw, Addison-Wesley, Third Edition

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

<u>POs met through Gaps in the Syllabus:</u>

<u>Topics beyond syllabus/Advanced topics/Design:</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

<u>Mapping between Objectives and Outcomes</u>

<u>Mapping between course outcomes and course delivery method</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	3	2	3	1					1	2	2	2	2
CO2	2	1	3	2	3	1				2	1	2	2	2	3
CO3	2	2	3	2	3	1			2	2	2	2	2	2	3
CO4	2	3	3	2	3	1	2	2	2	2	2	3	3	2	3
CO5	2	3	3	2	3	1	2	2	2	2	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

COURSE INFORMATION SHEET

Course code: CS205
Course title: **OOPDP Lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV/II
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To introduce the student with fundamentals and features of Object Oriented programming.
2.	To be able to write a Java program to solve a well specified problem
3.	To be able to describe, recognize, apply and implement selected design patterns in Java
4.	To be familiar with common errors in Java and its associated libraries
5.	To understand a Java program written by someone else and be able to debug and test the same.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Work in any object oriented environment and program using those features.
CO2	Student will have hands on experience with all basic concepts of Java programming
CO3	Analyse the design pattern of the given problem and further solve with less complexity.
CO4	Use his/her programming skills to resolve the issues coming while programming for bigger problems.
CO5	Work in industry environment with good enough knowledge about Java and OOPs.

Syllabus

List of Programs as Assignments:

1. **Lab Assignment No: 1**

Objective: To understand and Implement basic java program concepts using Scanner class.

Q1. Take input from user a character variable in a program and if the value is alphabet then print "Alphabet" if it’s a number then print "Digit" and for other characters print "Special Character"

Q2. Write a program to add all the values in a given number and check if the sum is prime number or not. Ex: 1234->10, not prime.

2. **Lab Assignment No: 2**

Objective: To Understand and Implement the concept of arrays in java

Q1. Write a program to find the largest 2 numbers and the smallest 2 numbers in the array initialized by the user.

Q2. Write a program to print the element of an array that has occurred the highest number of times Eg) Array -> 10,20,10,30,40,100,99 O/P:10

3. **Lab Assignment No: 3**

Objective: To Understand and Implement the concept of 2-D arrays in java.

Q1.Write a program to reverse the elements of a given 2*2 array. Four integer numbers needs to be passed as Command Line arguments

Eg: C:\>java Sample 1 2 3 4

O/P Expected :

The given array is : 1 2

3 4

The reverse of the array is : 4 3

2 1

Q2. Write a program to find greatest number in a 3*3 array. The program is supposed to receive 9 integer numbers as command line arguments.

4. Lab Assignment No: 4

Objective: To Understand and Implement the concept of classes and Constructors

Q1. Create a class Box that uses a parameterized constructor to initialize the dimensions of a box.(dimensions are width, height, depth of double type). The class should have a method that calculates and returns the volume of the box . Obtain an object and print the corresponding volume in main() function.

Q2. Write a program in Java with class Rectangle with the data fields width, length, area and color. The length, width and area are of double type and color is of string type. The methods are set_length() , set_width() , set_color(), and find_area(). Create two object ofRectangle and compare their area and color. If area and color same for the objects then display “Matching Rectangles” otherwise display “Non Matching Rectangle”.

5. Lab Assignment No: 5

Objective: To Understand and Implement the concept of Inheritance

Q1.Create a class named ‘Animal’ which includes methods like eat() and sleep(). Create a child class of Animal named ‘Bird’ and override the parent class methods. Add a new method named fly(). Create an instance of Animal class and invoke the eat and sleep methods using this object.Create an instance of Bird class and invoke the eat, sleep and fly methods using this object.

Q2. A HighSchool application has two classes: the Person superclass and the Student subclass. Using inheritance, in this lab you will create two new classes, Teacher and CollegeStudent. A Teacher will be like Person but will have additional properties such as salary (the amount the teacher earns) and subject (e.g. “Computer Science”, “Chemistry”, “English”, “Other”). The CollegeStudent class will extend the Student class by adding a year (current level in college) and major (e.g. “Electrical Engineering”, “Communications”, “Undeclared”).

6. Lab Assignment No: 6

Objective: To Understand and Implement the concept of Overloading and Overriding

Q1.Create a class Account with two overloaded constructors. First constructor is used for initializing, name of account holder, account number and initial amount in account. Second constructor is used for initializing name of account holder, account number, address, type of account and current balance. Account class is having methods Deposit(), WithDraw(), and GetBalance().Make necessary assumption for data members and return types of the methods. Create objects of Account class and use them.

Q2. Create a base class Fruit which has name ,taste and size as its attributes. A method called eat() is created which describes the name of the fruit and its taste. Inherit the same in 2 other class Apple and Orange and override the eat() method to represent each fruit taste.

7. **Lab Assignment No: 7**

Objective: To Understand and Implement String class in Java

Q1. Reverse the string but not the words. Eg. I/P: Birla institute of technology

O/P: technology of institute birla.

Q2. Find out and print the maximum possible palindrome in a given string. Eg:

I/P: nononsene O/P: nonon

Q3.Given a string and a non-empty word string, return a string made of each char just before and just after every appearance of the word in the string. Ignore cases where there is no char before or after the word, and a char may be included twice if it is between two words.

If inputs are "abcXY123XYijk" and "XY", output should be "c13i".

If inputs are "XY123XY" and "XY", output should be "13".

8. **Lab Assignment No: 8**

Objective: To Understand and Implement the concept of Abstract classes and Interfaces

Q1. Create an abstract class Compartment to represent a rail coach. Provide an abstract function notice in this class. Derive FirstClass, Ladies, General, Luggage classes from the compartment class. Override the notice function in each of them to print notice suitable to the type of the compartment. Create a class TestCompartment. Write main function to do the following: Declare an array of Compartment of size 10. Create a compartment of a type as decided by a randomly generated integer in the range 1 to 4. Check the polymorphic behavior of the notice method.

Q2.Write a program in java which implement interface Student which has two methods Display_Grade and Attendance for PG_Students and UG_Students (PG_Students and UG_Students are two different classes for Post Graduate and Under Graduate Students respectively).

9. **Lab Assignment No: 9**

Objective: To Understand and Implement Exception handling in java

Q1. Write a program in Java to display name and roll number of students. Initialize respective array variables for 10 students. Handle ArrayIndexOutOfBoundsException, so that any such problem does not cause illegal termination of program.

Q2. Write a program to accept name and age of a person from the command prompt(passed as arguments when you execute the class) and ensure that the age entered is >=18 and < 60. Display proper error messages. The program must exit gracefully after displaying the error message in case the arguments passed are not proper. (Hint : Create a user defined exception class for handling errors.)

10. **Lab Assignment No: 10**

Objective: To Understand and Implement File Handling and multithreading in java

Q1. Write a program to count the number of times a character appears in the Fileand also copy from one file to another. (Case insensitive... 'a' and 'A' are considered to be the same)

Q2. 1. Create class of SalesPersons as a thread that will display fives sales persons name. 2. Create a class as Days as other Thread that has array of seven days.

3. Call the instance of SalesPersons in Days and start both the threads 4. suspendSalesPersons on Sunday and resume on wednesday Note: use suspend, resume methods from thread

Q3. Create two threads, one thread to display all even numbers between 1 & 20, another to display odd numbers between 1 & 20. Note: Display all even numbers followed by odd numbers Hint: use join

11. Lab Assignment No: 11

Objective: To Understand and Implement Applets, AWT and Swings

Q1. Program to create a calculator with the help of AWT packages in Java.

Q2. Program to create a unit converter using Swings in Java.

Q3. APPLETS

a) Working with Frames and various controls.

b) Working with Dialogs and Menus.

c) Working with Panel and Layout.

d) Incorporating Graphics.

e) Working with colors and fonts.

Books recommended:

TEXT BOOKS

1. Krishna P. R., Object Oriented Programming through JAVA, 1st Edition, Universities Press, 2008.
2. Patrick Naghton& H. Schildt – The Complete Reference Java 2, Tata McGraw Hill Publication, New Delhi.
3. Dietel,Dietel - Java How to program , 7th edition; Pearson Education , New Delhi.

REFERENCE BOOKS

1. C. Horstmann,G. Cornell - Core Java 2 Vol I & Vol II ; Pearson Education , New Delhi.
2. Balagurusamy -Programming in Java, 2nd Edition; Tata McGraw Hill Publication; New Delhi.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**

Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	2	1	3	3	3	3	2	1	1	1	1	2	3	2	3
CO4	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CS212
Course title: Operating System Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Gain practical experience with designing and implementing concepts of operating systems such as system calls.
2.	Implement and develop CPU scheduling.
3.	Implement and understand process management, memory management.
4.	To provide a foundation in use of file systems and deadlock handling using C language in Linux environment.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand and implement basic services and functionalities of the operating system using system calls. .
CO2	Use modern operating system calls and synchronization libraries in software/ hardware interfaces.
CO3	Understand the benefits of thread over process and implement synchronized programs using multithreading concepts.
CO4	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO5	Implement memory management schemes and page replacement schemes.

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**

Objective: To Understand and Implement Directory Structure

Q1. WAP to create a File directory system.

2. **Lab Assignment No: 2**

Objective: To Understand and Implement Scheduling processes

Q1. WAP to schedule various processes

3. **Lab Assignment No: 3**

Objective: To Understand and Implement FCFS

Q1. WAP to implement FCFS CPU Scheduling

4. **Lab Assignment No: 4**

Objective: To Understand and Implement SJF
Q1. WAP to implement SJF CPU scheduling.

5. **<u>Lab Assignment No: 5</u>**

Objective: To Understand and Implement SRTF
Q1.WAP to implement SRTF CPU scheduling.

6. **<u>Lab Assignment No: 6</u>**

Objective: To Understand and Implement Scheduling algorithms
Q1. WAP to implement Round Robin Scheduling

7. **<u>Lab Assignment No: 7</u>**

Objective: To Understand and Implement Scheduling algorithms
Q1 WAP to implement SRTF scheduling .

8. **<u>Lab Assignment No: 8</u>**

Objective: To Understand and Implement context switching
Q1. WAP to implement Round Robin Scheduling with context switching.

9. **<u>Lab Assignment No: 9</u>**

Objective: To Understand and Implement context switching.
Q1.WAP to implement SRTF with context switching.

10. **<u>Lab Assignment No: 10</u>**

Objective: To Understand and Implement Page Replacement Techniques
Q1. WAP to implement FCFS page replacement algorithm.
Q2. WAP to implement Optimal page replacement algorithm.

Books recommended:

TEXT BOOKS

Operating System Concepts(2012): Abraham Silberschatz Yale University PETER BAER GALVIN Pluribus Networks GREG GAGNE Westminster College. **(T1)**
Operating Systems (2003) by Deitel, Deitel, and Choffnes. (**T2**)

REFERENCE BOOKS

Operating System Concepts(2012): Abraham Silberschatz Yale University Peter Baer Galvin Pluribus Networks Greg Gagne Westminster College.**(R1)**

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4
Progressive Evaluation	3	3	3	3
End SEM Evaluation	3	3	3	3

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

<u>Mapping between Objectives and Outcomes</u>

Mapping of Course Outcomes onto Program Outcomes

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	2	2	1	1	2	1	1	1	1	2	2	2	1
CO2	2	2	2	2	1	1	2	1	1	1	1	2	2	2	1
CO3	2	2	3	2	2	2	2	2	1	2	1	3	3	2	2
CO4	3	3	3	3	2	2	2	2	2	2	2	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD4
CO2	CD1, CD2,CD5
CO3	CD1, CD2
CO4	CD1, CD3,CD5
CO5	CD1,CD2

COURSE INFORMATION SHEET

Course code: CS207
Course title: **Design of Algorithm Lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
After the completion of this course, students will be able to:

1.	Able to implement various design strategies of algorithms
2.	Able to examine the efficiency of algorithm by changing the places of important steps.
3.	Able to compare approximate and exact solutions.
4.	Able to investigate effect randomness on correctness and efficiency of algorithms.
5.	Able to design approximate, random and parallel solution of different problems.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Able to know the different notions of asymptotic complexity and determine the asymptotic complexity of algorithms including the solving of recurrence relations.
CO2	Able to determine the practical implications of asymptotic notations.
CO3	Able to Implement, analyze, and compare algorithms.
CO4	Able to Know the difference between the dynamic programming concept and a greedy approach.
CO5	Able to know and use basic and advanced graph algorithms including DFS, BFS, and Bellman Ford.

Syllabus
List of Programs as Assignments:

1. **<u>Lab Assignment No: 1</u>**
   Programs on Polynomial vs logarithmic running times

   <u>Lab Assignment No: 2</u>

Programs on Divide-and-conquer algorithms

2. **<u>Lab Assignment No: 3</u>**

Programs on Greedy and dynamic-programming algorithms

3. **<u>Lab Assignment No: 4</u>**

Programs on Binary trees

4. **Lab Assignment No: 5**

Programs on Heaps and priority queues

5. **Lab Assignment No: 7**

Programs on Binary search trees

6. **Lab Assignment No: 8**

Programs on Hash tables

7. **Lab Assignment No: 9**

Programs on Graph traversal

8. **Lab Assignment No: 10**

Programs on Shortest paths in graphs.

Books recommended:

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, MIT Press/McGraw-Hill, 2001. **(T1)**

2. SanjoyDasgupta, Christos H. Papadimitriou and Umesh V. Vazirani, Algorithms, Tata McGraw-Hill, 2008. **(T2)**

3. Jon Kleinberg and ÉvaTardos, Algorithm Design, Pearson, 2005. **(T3)**

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures

CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	3	2	1	1	1	1	1	2	1	2	3	3	2
CO2	2	2	3	2	1	1	1	1	1	2	1	2	3	3	2
CO3	2	2	3	2	1	1	1	1	1	2	2	2	3	3	3
CO4	3	3	3	3	2	1	1	1	1	2	2	3	3	3	3
CO5	3	3	3	3	2	1	1	1	1	2	2	3	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods			
CD	**Course Delivery methods**	**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1, CO2, CO3, CO4, CO5	CD1
CD2	Laboratory experiments/teaching aids		
CD3	Industrial/guest lectures		
CD4	Industrial visits/in-plant training		
CD5	Self- learning such as use of NPTEL materials and internets		

(Semester V)

COURSE INFORMATION SHEET

Course code: IT301
Course title: **Data Communication & Computer Network(DCCN)**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Study the components of the data communication model and communications architecture.
2.	Understand the differences and similarities between the OSI model and the TCP model.
3.	Understand the fundamentals of the theory of signalling.
4.	Understand the basic principles of signal encoding techniques, error-detection, and error-correction techniques.
5.	Understand the characteristics of analog signaling and digital signaling and the strengths and weaknesses of each method.

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify the elements of a communication network.
2.	Illustrate different data communications and networking standards.
3.	Design and implement a simple LAN and a WAN that meet a specific set of criteria.
4.	Identify the new trends and technologies, their potential applications.
5.	Examine the social impact of the networking technology particularly on issues related to security and privacy.

Syllabus
Module I
Data Communications and Networking Overview
A Communications Model, Data Communications, Data Communication Networking, The Need for Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture, Data TransmissionConcepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity. (8L)
Module II
Transmission Media and Signal Encoding Techniques: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals. (8L)
Module III

Digital Data Communication Techniques and Data Link Control: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing, Flow Control, Error Control, High-Level Data Link Control (HDLC). (8L)

Module IV

Multiplexing, Circuit Switching and Packet Switching Multiplexing

Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing, Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Soft switch Architecture, Packet-Switching Principles, X.25, and Frame Relay. (8L)

Module V

Asynchronous Transfer Model

Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

Routing in Switched Networks

Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms. (8L)

Text Book:

Stallings W., Data and Computer Communications, 10thEdn., Pearson Education, PHI, New Delhi, 2014.(T1)

Reference Book:

Forouzan B. A., Data Communications and Networking, 5thEdn. TMH, New Delhi, 2017.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	2	1	1			2	2	3	3	3	3
CO2	3	2	2	2	2	1	1		2	2	2	3	3	3	3
CO3	3	3	2	2	2	2	1		2	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS301
Course title: **Database Management System (DBMS)**
Pre-requisite(s): Data Structures.
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of databases.
2.	Recognize the importance of database analysis and design in the implementation of any database application.
3.	Describe the role of transaction processing in a database system.
4.	Understand various concurrency control mechanisms for a database system.
5.	Describe the roles of recovery and security in a database system.

Course Outcomes
After the completion of this course, students will be able to:

1.	Analyze data organization requirements and their inter relationships.
2.	Illustrate the features of data models and their application for storing data.
3.	Design queries to maintain and retrieve useful information from the databases created.
4.	Analyze the physical database design with respect to their expected performance using normalization and query processing.
5.	Examine the best practices according to concepts of indexing, transaction control and concurrency maintenance

Syllabus
Module I
Database Design and Entity - Relational Model
Purpose of Database System; View of Data, Database Languages, Transaction Management, Database architecture, Database Users and Administrator, Types of database System, Overview of design process, E-R model, Constraints, E–R Diagram, E-R Diagram issues, Weak Entity Sets, Extended E – R Features, Reduction to E–R Schemas. (8L)
Module II
Relational Model
Structure of Relational Database, Codd's Rules, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub Queries, complex queries, views, modification of database, Joined relations, SQL data types & schemas, Integrity constraints, authorization, Embedded SQL, Triggers. (8L)
Module III
Relational Database Design
Functional dependency, Decomposition, Normalization, First normal form, Second normal form, Third normal form, BCNF, Multivalued dependencies and Fourth normal form, Join dependencies and Fifth normal form, DKNF. (8L)
Module IV
Indexing & Hashing
Ordered Indices, B+ Tree index files, B-Tree index files, Multiple key access Static hashing, Dynamic Hashing, Comparison of ordered indexing and hashing, Index definition in SQL.
Query Processing
Measure of Query Cost, Selection Operation, Evaluation of Expressions. (8L)
Module V
Transaction & Concurrency Control
Transaction Concepts & ACID Properties, Transaction States, Implementation of Atomicity & Durability, Concurrent Executions, Serializability& Its Testing, Recoverability, Lock-Based protocols, Validation based protocol, Multiple Granularity, Multiversion Schemes, Deadlock Handling. (8L)

Text Book:

Silberschatz A. et.al, Database System Concepts, 6th Edition, Tata Mc-Graw Hill, New Delhi, 2011. (T1)

Reference Books:

Elmasri R., Fundamentals of Database Systems, 7thEdition, Pearson Education, New Delhi, 2016. (R1)

Ullman Jeffrey D et.al., A First course in Database Systems, 3rd Edition, Pearson Education, New Delhi- 2014.(R2)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>N/A

<u>POs met through Gaps in the Syllabus:</u>N/A

<u>Topics beyond syllabus/Advanced topics/Design:</u>N/A

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course	**Program Outcomes (POs)**	**Program**

Outcome													Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	3	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	3	1	3	3	3	3	2	1	1	2	1	2	3	2	3
CO4	3	1	3	3	3	3	2	1	1	2	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS310
Course title: **Formal language and Automata Theory**
Pre-requisite(s): Discrete Mathematics
Co- requisite(s): NIL
Credits: L:3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Define a system and recognize the behavior of a system.
2.	Design finite state machines and the equivalent regular expressions.
3.	Construct pushdown automata and the equivalent context free grammars
4.	Design Turing machines and Post machines
5.	Learn about the issues in finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.

Course Outcomes

After the completion of this course, students will be able to:

1.	Relate formal languages and mathematical models of computation
2.	Analyze different types of languages and the corresponding machines
3.	Analyze the Pushdown machine and its role in compiler construction
4.	Find the capability of real computers and learn examples of unsolvable problems.
5.	Analyze classes of P, NP, NP-C and NP-Hard problems

Syllabus

Module I

Introduction to Automata: (mathematical model of digital devices, including real computer), State Transition Graph, Finite Automaton (FA) and its types, Deterministic Finite Automaton (DFA), Non-deterministic Finite Automaton (NDFA), Complement, Union, Intersection of FA's , Conversion Strategy from NDFA to DFA , Minimization of FA, Finite Automaton with Output, Applications of FA. (10L)

Module II

Regular Expressions(RE): Introduction , R.E.'s and basic operations, Algebraic laws on Regular Expression, Finite and Infinite Languages, Equivalence of finite Automaton and regular expressions, Constructing NDFA from Regular Expression , Pumping Lemma for Regular Language, Closure properties of Regular Languages, Non-regular languages, Applications of Regular Expression. (6L)

Module III

Grammar: Introduction, Formal Definition of Grammar, The Chomsky Hierarchy of Grammar, Designing Regular grammar from DFA, Context Free Grammar, Closure properties of Context Free Languages, , CFG and Normal form: Chomsky Normal Form, Greibach Normal Form, Non-Context Free Language, Applications of CFGs. (8L)

Module IV

Push Down Automation (PDA): Introduction, Definition of PDA, Types of Pushdown Automata (DPDA and NPDA), Converting CFG to PDA, Derivation (Parsing), Parsing Techniques, Ambiguous and Unambiguous Grammar, Demerits of Ambiguous Grammar. (8L)

Module V

Turing Machine(TM): Single Tape TM, Variations of TM, Halting Problem, Turing Machine and Languages, Enumerable Languages, Decidable, Recognizable and Undecidable languages, Solvable and Unsolvable problems, Post Correspondence Problems(PCP), Classes of Problems: P, NP, NP-C and NP-Hard. (8L)

Text Book:

Hopcroft J.E., Motwani R. and Ullman J.D, Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2008. (T1)

Reference Books:

Mishra K.L.P. andChandrasekaran N. , Theory of Computer Science: Automata, Languages and Computation, 3rd Edition, PHI.(R1)

Martin John C., Introduction to Languages and the Theory of Computation, 3rd Edition, TataMcGraw Hill Publishing Company, New Delhi, 2007. (R2)

Lewis Harry R. and Papadimitriou Christos H., Elements of the theory of Computation, 2nd Edition, Prentice-Hall of India Pvt. Ltd. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	2	3	3	1	2	1	1	2	1	1	1	3	3	2
2	3	3	1	3	1	2	2	1	1	1	2	1	2	2	1
3	3	3	3	3	3	1	1	1	2	2	1	2	2	3	1
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	1
5	2	2	1	2	3	1	1	1	1	3	2	3	2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT305
Course title: **Software Engineering**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Students are effective team members, aware of cultural diversity, who conduct themselves ethically and professionally
2.	Students use effective communication skills and technical skills to assure production of quality software, on time and within budget.
3.	Students build upon and adapt knowledge of science, mathematics, and engineering to take on more expansive tasks.
4.	Able to increase level of self-reliance, technical expertise, and leadership.

Course Outcomes

After the completion of this course, students will be:

1.	Explain the software engineering principles and techniques
2.	Apply Software Project Management Practices
3.	Apply the knowledge gained for their project work as well as to develop software following software engineering standards
4.	Develop self-reliance, technical expertise, and leadership.

Syllabus

Module I

Introduction

Some Definitions, FAQs about software engineering, the evolving role of software, Software process models, Waterfall model, the prototyping model, spiral model, RAD and Incremental model, Management activities, Project planning and Project Scheduling. (8L)

Module II

Software Requirements

Functional and non-functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS.

Requirement Engineering Process: Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management. (8L)

Module III

Design Engineering

Design Process and Design Quality, Design Concepts, Design Models, Object oriented Design, UML: Class diagram, Sequence diagram, Collaboration diagram. (8L)

Module IV

Verification and Validation

Verification and Validation Planning, S/W inspection, static analysis.

Software Testing

Testing functions, Test care design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability. (8L)

Module V

Process metrics, Software Measurement, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Quality assurance and standards, Quality planning, Quality control, **S**/W Maintenance in detail. (8L)

Text Book:

Sommerville, Software Engineering, 7th Edition, Pearson Education Publication. (T1)

Reference Books:

Pressman R. S.,Software Engineering: A Practiioners Approach, 5th Edition., TMA, New Delhi.(R1)

Mall Rajib, Fundamental of Software Engineering, 4th Edition, PHI Learning Private Limited.(R2)

Peters J. F. &Pedrycz W., Software Engineering, John Wiley & Sons, Inc. 2000.(R3)

Behforooz A. & Hudson F.J., Software Engineering Fundamentals, Oxford Univ. Press, New York, 2000.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments

CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	3	1	1	2	1	2	3	3	1	1	1	3	2
2	2	3	1	2	2	2	2	2	2	3	2	1	1	2	3
3	2	3	3	3	3	1	1	1	2	3	1	2	2	3	3
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	2
5	2	2	1	2	3	1	1	1	1	3	2	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

PROGRAM ELECTIVE -I

COURSE INFORMATION SHEET

Course code: IT320
Course title**: User Interface Design**
Pre-requisite(s): CS204 OOPDP
Co- requisite(s):NIL
Credits: L: 3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students

1.	To impart the basic concepts of User Interface Design.
2.	To develop understanding about human computer interaction methods that utilize more general, widespread and easier-to-learn capabilities.
3.	The cognitive and perceptual constraints that affect interface design
4.	Techniques for evaluating the usability of an interface
5	How to communicate the results of a design process, both in oral and written form

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Identify the key terms related to user interfaces and user interface design and implementation
2.	Identify and describe various types of computer users and computer use contexts
3.	Identify and describe various types of user interfaces
4.	Describe and explain the user interface design process
5	Identify and describe common abstract user interface components, such as radio buttons and group boxes

Syllabus
Module I
Introduction: Importance of user interface – definition, importance of good design, brief history – Graphical User Interface – Web User Interface – Theories, Principles and Guidelines of User interface design. (7L)
Module II
Design Process: Obstacles in development path deigning for people-Understanding Human Interaction with computers, Importance of Human Characteristics, Human consideration, Human Interaction speeds – Understanding Business function. (8L)

Module II
Screen Designing: Design goals - screen meaning and purpose, organizing screen elements ordering of screen data and content – screen navigation and flow – visually pleasing composition – amount of information – focus and emphasis – presenting information simply and

meaningfully – information retrieval on web – Statistical graphics – Technological considerations in Interface Design. (8L)

Module IV

Menus and navigation schemes: structures of menus-functions of menus- contents of menus -formatting of menus – phrasing the menu- selecting menu choices-navigating menus-kinds of graphical menus- Selection of windows-Window characteristics-components of windows-window presentation styles-types of windows-window management-organising window functions-window operations-Selection of device based and screen based controls - text and messages – icons and images – Multimedia – colours- uses, problems, choosing colours. (8L)

Module V

Distributed and Collaborative Interaction: Device consistency-distribution of the user interface-event distribution-graphical package layer-programmable API-Model semantics distribution-data layer distribution-asynchronous collaboration-Software tools-specification methods- interface building tools –evaluation and critiquing tools-Interaction devices keyboard and function keys - pointing devices- speech recognition, digitization and generation – image and video displays – printers. (9L)

Text books:

Wilbert O. Galitz,"The Essential Guide to User Interface Design", 3rd Edition, Wiley Dreamtech,Delhi, 2007.(T1)

Shneiderman Ben, "Designing the User Interface", 5th Edition, Pearson Education Asia, Delhi, 2014.(T2)

Reference books:

Olsen Dan R., "Human Computer Interaction",Cengage, New Delhi,2009.(R1)

Carroll John M.,"Human Computer Interaction", Pearson Education Asia, Delhi, 2002.(R2)

Cooper Alan, "The Essentials of User Interface Design ", Wiley Dreamtech, Delhi, 2002.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution

Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	2	3	1	1	2	1	2	1	2	3	2	3
CO2	2	3	3	3	2	3	2	2	2	3	2	3	3	2	3
CO3	3	3	3	3	3	3	1	2	2	3	2	3	3	3	3
CO4	3	3	3	3	3	1	1	1	2	2	2	3	3	2	3
CO5	3	3	3	2	3	2	2	1	2	2	1	2	3	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code:IT322
Course title: **Cloud Computing**
Pre-requisites: IT201 Basics of Intelligent Computing
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the elements of distributed computing and core aspects of cloud Computing.
2.	Understand the concepts and aspects of virtualization and application of virtualization technologies in cloud computing environment
3.	Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS and gain comprehensive knowledge of different types of clouds.
4.	Be familiar with application development and deployment using services of different cloud computing technologies provider: Google app Engine, Amazon Web Services (AWS) and Microsoft Azure.
5.	Understanding the key security, compliance, and confidentiality challenges in cloud computing.

Course Outcomes:
After the completion of this course, students will be able to:

1.	Recall the various aspects of cloud computing and distributed computing
2.	Understand the specifics of virtualization and cloud computing architectures.
3.	Develop and deploy cloud application using services of different cloud computing technologies provider: Google app Engine, Amazon Web Services (AWS) and Microsoft Azure.
4.	Evaluate the security and operational aspects in cloud system design, identify and deploy appropriate design choices when solving real-world cloud computing problems.
5.	Provide recommendations on cloud computing solutions for a Green enterprise.

Syllabus

Module I

Introduction: Essentials, Benefits and need for Cloud Computing - Business and IT Perspective - Cloud and Virtualization - Cloud Services Requirements - Cloud and Dynamic Infrastructure - Cloud Computing Characteristics Cloud Adoption. (8L)

Module II

Principles of Parallel and Distributed Computing: Eras of computing, Parallel vs. Distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing.

(8L)

Module III

Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples.

Storage virtualization:Storage Area Networks - Network-Attached storage - Cloud Server Virtualization - Virtualized Data Centre. (8L)

Module IV

Cloud computing architecture: Introduction, Cloud reference model, Types of clouds, Economics of the cloud, Open challenges. (8L)

Module V

Cloud platforms in industry and Cloud applications : Amazon web services, Google app engine, Microsoft azure, Observations, Scientific applications, Scientific, Business and Consumer applications. (8L)

Text Book:

Buyya Raj Kumar, Vecchiola Christian &Thamarai S. Selvi, "Mastering Cloud Computing", McGraw Hill Publication, New Delhi, 2013.(T1)

Reference Books:

Velte T., Velte A. and Elsenpeter R., "Cloud Computing: A Practical Approach", McGraw Hill, India.(R1)

Buyya R., Broberg J., "Cloud Computing: Principles and Paradigms", Wiley.(R2)

Hwang K., Fox G. and Dongarra J., "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann, 2012.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**	**Program Specific Outcomes (PSOs)**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	3	2	3	2	2	1	2	2	2	3	3	3
CO2	3	3	3	3	3	3	2	2	1	2	2	2	3	2	3
CO3	3	3	3	2	3	3	2	2	1	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	3	2	2	2	2	2	2	2	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS320
Course title: **Optimization Technique**
Pre-requisite(s)::CS206Design and Analysis of Algorithm
Co- requisite(s):Nil
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic idea of Network Optimization Models.
2.	To introduce the basic concept of Dynamic Programming.
3.	To understand the idea of Nonlinear Programming.
4.	To know about the basic concepts of Heuristic Programming.
5.	Provide the students to practice on Linear Programming for Problem solving.

Course Outcomes
After the completion of this course, students will be able to :

1.	Prepare the operational models for the real-world applications using Linear Programming
2.	Apply the techniques to solve the Network Optimization models
3.	Analyse the computational feasibility of the solutions using the Deterministic and Probabilistic Dynamic Programming
4.	Model problems using Non-Linear Programming and evaluate the suitability of the available techniques for the problem at hand
5	Apply the meta-heuristic algorithms for real world optimization

Syllabus

Module I

Introduction to Linear Programming,Solving Linear Programming Problems –Graphical Method,The Simplex Method,The Revised Simplex Method, Duality Theory , Dual Simplex Method, Sensitivity Analysis. (8L)

Module II

Integer Programming,Gomory's Cutting Plane Method, The Branch-and-Bound Technique for Binary and Mixed-Integer programming.Network Optimization Models, The Network Simplex Method. (8L)

Module III

Dynamic Programming: Characteristics of Dynamic Programming Problem,Deterministic Dynamic Programming, Probabilistic Dynamic Programming. (8L)

Module IV

Nonlinear Programming: Graphical Illustration of Nonlinear Programming Problems, Types of Nonlinear Programming Problems, Unconstrained Optimization, The Karush-Kuhn-Tucker (KKT) Conditions for Constrained Optimization, Quadratic Programming, Separable Programming, Convex Programming. (8L)

Module V

Queueing Theory : Basic Structure of Queueing Models, Examples of Real Queueing Systems, Role of Exponential Distribution, The Birth-and-Death Process,Different Queuing Models.

Heuristic Programming and Metaheuristics: The Nature of Meta-Heuristics, Search, Simulated Annealing, Genetic Algorithms. (8L)

Text Book:

Hiller ,S. & Lieberman ,G.J.,"Operations Research", 9/e , TMH, New Delhi–2012.(T1)

Reference Books:

Taha ,H.A.,"Operations Research", 9/e , Pearson Education , New Delhi-2013.(R1)

Pai,P.P.,"Operations Research", 1/e, Oxford University Press 2012.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment

Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	3	3	2	1	1	2	2	1	2	3	2	3
CO2	3	3	3	3	3	2	1	1	2	2	1	2	3	3	3
CO3	3	3	2	3	3	3	1	1	2	2	1	2	3	2	3
CO4	3	3	3	3	3	2	1	1	2	2	1	2	3	3	3

CO5	3	3	3	3	3	2	1	1	3	3	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS321
Course title**: Soft Computing**
Pre-requisite(s): MA205Discrete Mathematics
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the concept of fuzzy logic and controllers
2.	To understand the various architectures of ANN and its learning methods
3.	To learn about basic concepts of genetic algorithm and its operators
4.	To understand the Artificial Neural Networks
5.	To understand the Genetic Algorithms

Course Outcomes

After the completion of this course, students will be able to:

1.	Solve numerical on Fuzzy sets and Fuzzy Reasoning.
2.	Develop Fuzzy Inference System (FIS).
3.	Solve problems on Genetic Algorithms
4.	Explain concepts of neural networks
5.	Develop neural networks models for various applications.

Syllabus
Module I
Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Fuzzy types and levels, MF Formulation and Parameterization, MF of two dimensions, Fuzzy Union, Intersection and Complement, Fuzzy Number,Fuzzy measure. (8L)

Module II

Fuzzy Logic: Fuzzy Rules and Fuzzy Reasoning:Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Defuzzification,FuzzyReasoning.Fuzzy Inference System: Introduction, Mamdani Fuzzy Models, Other Variants, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models. (8L)

Module III

Fundamentals of Genetic Algorithms: Basic Concepts, Creation of Offsprings, Encoding, Fitness Functions, Reproduction, Genetic Modelling: Inheritance Operators, Cross over, Inversion and detection, Mutation operator, Bitwise operators. (8L)

Module IV

Introduction to Artificial Neural Networks: What is a Neural Network? Human Brain, Models of Neuron, Neural Network viewed as Directed Graphs, Feedback, Network Architecture, Knowledge Representation, Learning processes:(Error correction, Memory-Based, Hebbian ,Competitive,Boltzman ,Supervised,Unsupervised),Memory,Adaptation. (8L)

Module V

Perceptrons, Adaline, Back Propagation Algorithm, Methods of Speeding, Convolution Networks, Radical Basis Function Networks, Covers Theorem, Interpolation Learning, The Hopfield Network. (8L)

Text Books:

1. Jang J.S.R., Sun C.T. and Mizutani E., "Neuro-Fuzzy and Soft Computing" PHI/Pearson Education, New Delhi 2004.(T1)
2. Rajasekaran S. & Vijayalakshmi G.A. Pai, PHI, New Delhi 2003.(T2)
3. Ross T. J., "Fuzzy Logic with Engineering Applications." TMH, New York, 1997.(T3)
4. HaykinsSimon ,"Neural Networks :A Comprehensive Foundation, Pearson Education,2002.(T4)

Reference Books:

1. Ray K.S. ,"Soft Computing and Its application", Vol 1, Apple Academic Press, 2015. (R1)
2. Lee K.H. ,"First Course on Fuzzy Theory and App.", Adv in Soft Computing Spinger, 2005.(R2)
3. Zimmermann H.Z. ,"Fuzzy Set Theory and its App " , 4th Edition, Spinger Science, 2001.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50

Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	2	1	1	1	2	2	1	2	2	3	2
CO2	3	3	3	3	3	3	3	1	3	3	1	2	3	3	3
CO3	3	3	3	3	2	2	1	1	2	2	1	2	3	3	2
CO4	3	3	3	3	3	2	1	1	1	2	1	2	3	3	2
CO5	3	3	3	3	3	2	1	1	1	2	1	2	3	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS391
Course title: **Introduction to Distributed System**
Pre-requisite(s): NIL
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Identifying trends in distributed systems
2.	Introducing peer to peer services and distributed file systems
3.	Understanding the issues in process and resource management
4.	Understanding the requirements for designing and supporting distributed systems

Course Outcomes
After the completion of this course, students will be able to:

1.	Define distributed systems and their architecture.
2.	outline peer to peer services and distributed file systems
3.	Elaborate on concepts of process and resource management
4.	Analyze the requirements for designing and supporting distributed systems
5.	Discuss and design the working of distributed systems

Syllabus
Module I
Introduction: Introduction to “Large-Scale”distributed systems, Consequences of “large-scale” Some large-scale distributed systems, Architectures of large scale distributed systems. (8L)

Module II
Design principles of Distributed system: Introduction to peer-to-peer systems, The peer-to-peer paradigms, Services on structured overlays, Building trust in P2P systems. (8L)

Module III
Communication in Distributed system: System Model – Inter Process Communication – the API for internet protocols – External data representation and Multicast communication.
Peer to Peer Services: Peer-to-peer Systems - Introduction - Napster and its legacy - Peer-to-peer - Middleware - Routing overlays.
File System: Features-File model -File accessing models- File sharing semantics
Naming: Identifiers, Addresses, Name Resolution - Name Space Implementation - Name Caches - LDAP. (8L)
Module IV
Remote Method Invocation and Objects: Remote Invocation - Introduction - Request-reply protocols - Remote procedure call - Remote method invocation.
Case study: Java RMI – Group communication - Publish-subscribe systems - Message queues - Shared memory approaches -Distributed objects - Case study: Enterprise Java Beans -from objects to components. (8L)
Module V
Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation.
Resource Management: Introduction- Features of Scheduling Algorithms -Task Assignment Approach - Load Balancing Approach - Load Sharing Approach. (8L)

Text Books:

Coulouris G., Dollimore J., and Kindberg T., "Distributed Systems Concepts and Design", 5th Edition, Pearson Education, 2012.(T1)
Distributed Systems: Design and Algorithms, Editors(s):SergeHaddadFabriceKordonLaurentPautetLaure Petrucci, Wiley online Library.(T2)

Reference Books:

A. S. Tanenbaum, M. Van Steen, "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.(R1)
P. K. Sinha, "Distributed Systems: Concepts and Design", Prentice Hall, 2007.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)	Program Specific

												Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	2	2	2	2	1	2	1	1	2	1	3	3	2	2
CO2	3	2	2	2	2	1	2	1	2	2	1	3	3	2	2
CO3	3	2	3	3	2	2	2	2	2	2	3	3	3	3	3
CO4	3	2	3	2	3	2	2	2	2	3	2	3	3	2	3
CO5	3	2	3	3	3	1	2	2	2	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT330
Course title: **Cryptography and Network Security**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

1.	To Learn Basic Concepts of Cryptography and Network Security and Apply them in various Real life Application.
2.	To understand the basic concepts of Network Security
3.	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
4.	To understand how to deploy encryption techniques to secure data in transit across data networks
5.	To design security applications in the field of Information technology

Course Outcomes

After the completion of this course, students will be:

1.	Understand the basic concept of Cryptography and Network Security and their

	mathematical models, and to be familiar with different types of threats
2.	Learning and applying various Ciphering Techniques.
3.	Apply Symmetric and Asymmetric Cryptographic Algorithms and Standards in Networks.
4.	Examine the issues and structure of Authentication Service and Electronic Mail Security
5.	To explain and classify different malicious programs, worms and viruses, and to learn the working and design principles of Firewalls

Syllabus

Module I

Introduction to Cryptography: ComputerSecurity concepts, The OSI Security Architecture, Security Attacks, Security Services, A model for Network Security, Classical Encryption Techniques. (8L)

Module II

Mathematical Foundations of Cryptography: Modular Arithmetic, Euclidean Algorithm, Groups, Rings, Fields, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2^n), Prime Numbers, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithms. (8L)

Module III

Symmetric and Asymmetric Cryptography: Difference Between Symmetric and Asymmetric Cryptography, DES, Triple DES, AES, RSA Cryptosystem, Symmetric and Asymmetric Key Cryptography Together, Elgamal Cryptosystem, Elliptic Curve Cryptosystems, , Diffie-Hellman Key Exchange , Cryptographic Hash Functions, Message Authentication Codes, Digital Signature. (8L)

Module IV

Internet Security Protocols : Basic Concepts, Security Socket Layer (SSL), Secure Hyper Text Transfer Protocol (SHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET), SSL Versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol(WAP) Security, Security in GSM. (8L)

Module V

Network Security: Users, Trusts and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, Worms, Viruses, Intrusion Detection Systems (IDS), Firewalls: Definitions, Constructions and Working Principles. (8L)

Text Book:

Forouzan B. A., Mukhopadhyay D., "Cryptography and Network Security", 3rd Edition, Mcgraw Higher Education, 2016. (T1)

Reference Books:

Stallings W., "Cryptography and Network Security: Principles and Practice", 7th Edition, Pearson, 2017.(R1)

Kahate A., "Crptography and Network Security", 3rd Edition, McGraw Hill Education, New Delhi, 2013.(R2)

Schneier B., "Applied Cryptogaphy: Protocols, Algorithms And Source Code In C", 2nd Edition, Wiley, 2007. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

-

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	3	3	2	2	1	2	2	2	3	1
CO2	3	3	3	3	3	3	3	2	2	2	1	2	1	2	3
CO3	3	2	3	3	3	2	2	2	2	2	2	2	2	3	3
CO4	3	2	3	3	2	2	1	2	2	2	2	2	1	2	3
CO5	3	2	3	3	1	2	2	2	2	1	1	2	2	1	3

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

OPEN ELECTIVE -I

COURSE INFORMATION SHEET

Course code: CS270
Course title: **Fundamentals of Computer Science**
Pre-requisite(s): Nil
Co- requisite(s):
Credits: L:3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objective
This course enables the students:

1.	Use a variety of hardware and software on campus and do simple file editing.
2.	Discuss computer organization in simple terms, including major future directions.
3.	Describe how a computer actually performs instructions.
4.	Discuss the data organization concepts that apply to physical storage, data structures, files, and databases.
5.	Discuss the features of a programming language and the nature of the language translation process.

Course Outcomes:
After the completion of this course, students will be:

1.	Distinguish between program writing and algorithm development and apply various problem solving techniques.
2.	Describe the functions of an operating system and discuss the problems inherent in providing multiprogramming.
3.	Distinguish between good and bad programming design methods.
4.	Describe data organization concepts.
5.	Discuss methods of measuring algorithm performance and the limits of computability.

Syllabus:
Module I
History of Computing.Computer Generations, Significant Events of recent computing history, Using the terminal, Editing text files, System commands, Using electronic mail Data representation. Binary numbers, Integers - 2's complement, sign-magnitude, Fractions - binary, hexadecimal, Exponents - binary, hexadecimal, excess notation, Characters - ASCII, EBCDIC. (8L)
Module II

Computer Architecture,CPU organization - registers, op codes, execution cycle, Memory organization - addresses, base &bound.Device operations - interrupts, parity, commands, physical actions. Modern architectures - pipelining, vector and array processors,Future architectures - data driven, demand driven and inference machines. (8L)

Module III

Algorithm Development ,Top-down approach,Common tasks - searching, sorting, merging Techniques - repetition, recursion, divide-and-conquer Programming Languages. Language levels, Data types, Operators, Control statements and conditions, Input and output Specifications, Paradigms - procedural, functional, specification, declaration, object-oriented. (8L)

Module IV

Software Engineering Modularization Documentation Design methodologies Software life cycle Systems Software (3 hrs)OperatingsystemsCompilers, interpreters and assemblers, Linkers and loaders. (8L)

Module V

Data Organization,Data Structures: Consecutive storage - arrays, stacks, queues, trees Files - access and organization, Data base approaches - relational, network, distributed. Algorithm Analysis, Measuring time and space, Effects of data structures, Computability. (8L)

Text Books:

Brookshear, J.G., Computer Science, An Overview, Benjamin/Cummings, 1994. (T1)

Reference Books:

Rajaraman V., Computer Fundamentals, 6th edition, Adabala N, PHI.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution

Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	1	1	1	1	1	1	1	1	1	2	3	1	1
CO2	2	2	2	1	2	1	1	1	2	2	2	2	2	2	2
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO4	2	3	3	2	2	1	1	1	2	2	2	2	2	2	1
CO5	3	3	3	3	2	1	1	2	2	2	3	3	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS271
Course title: **Fundamentals of Computer Science Lab**
Pre-requisite(s): Nil
Co- requisite(s):
Credits: L:0 T:0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objective
This course enables the students:

1.	Use a variety of hardware and software on campus and do simple file editing.
2.	Discuss computer organization in simple terms, including major future directions.
3.	Describe how a computer actually performs instructions.
4.	Discuss the data organization concepts that apply to physical storage, data structures, files, and databases.
5.	Discuss the features of a programming language and the nature of the language translation process.

Course Outcomes:
After the completion of this course, students will be:

	Distinguish between program writing and algorithm development and apply various problem solving techniques.
2.	Analyze and discuss the problems and their solutions through programming
3.	Distinguish between good and bad programming design methods.
4.	Write algorithms to solve problems.
5.	Discuss methods of measuring algorithm performance and the limits of computability.

Syllabus

1. To find the sum of individual digits of a given number

2. To print the Fibonacci series for 1 to n value

3. To print a prime numbers up to 1 to n

4. To calculate the sum. Sum=1-x2/2!+ x4/4!- x6/6!+ x8/8!-x10/10!

5. Programs that use recursive function to find the factorial of a given integer.

6. Program that use non recursive function to find the factorial of a given integer.

7. To find the GCD of two given integers by using the recursive function

8. Two integer operands and one operator form user, performs the operationand then prints the result.(Consider the operators +,-,*, /, % and use Switch Statement)

9. To find both the largest and smallest number in a list of integers.

10. To perform the addition of two matrices

11. Functions to insert a sub string into given main string from a given position.

12. To generate Pascal's triangle

13. To convert the given binary number to 2's complement

14. To read the two complex numbers and perform the addition and multiplicationof these two numbers.

15. Program which copies one file to another

Text Books/ reference Book:

Rajaraman V., Computer Fundamentals, 6th edition, Adabala N, PHI.(R1)

E. Balaguruswamy, Programming in ANSI C, &th Edition, TMH.

Gaps in the syllabus (to meet Industry/Profession requirements):

<u>POs met through Gaps in the Syllabus:</u>

<u>Topics beyond syllabus/Advanced topics/Design:</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	2	2	2	1	1	1	1	2	3	2	2
CO2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2
CO3	3	3	3	3	3	2	1	1	1	1	2	2	3	3	3
CO4	2	2	2	1	1	1	1	1	1	1	1	2	2	2	1
CO5	3	3	3	3	2	1	1	1	1	1	1	2	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS201
Course title: **Data Structures**
Pre-requisite(s): Programming for Problem Solving
Co- requisite(s): Data Structure Lab
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives
This course enables the students:

F.	To be familiar with basic techniques of algorithm analysis.
G.	To understand basic concepts about arrays, stacks, queues, linked lists, trees and graphs.
H.	To understand concepts of searching and sorting techniques.
I.	To implement various linear & non-linear data structures; and searching & sorting algorithms.
J.	To assess how the choice of data structures impacts the performance of a program**.**

Course Outcomes

After the completion of this course, students will be able to:

1.	Define various linear and non-linear data structures like stack, queue, linked list, tree and graph.
2.	Explain operations like insertion, deletion, traversal, searching, sorting etc. on various data structures.
3.	Design various data structures and their operations.
4.	Analyze the performance of data structure based operations including searching and sorting.
5.	Justify the choice of appropriate data structure as applied to specified problem definition.

SYLLABUS

Module I

Basic Concepts

Definition and basics of: Data Structure, ADT, Algorithms, Time and Space Complexity, Asymptotic Notations (O, θ, Ω), Time complexity computation of non-recursive algorithms (like Matrix addition, Selection sort – using step count), Array – basic operations, concept of multi-dimensional array, Polynomial operations using Array, Sparse Matrix.

(8L)

Module II

Stack and Queue

Stack ADT: basic operations, Queue ADT: basic operations, Circular Queue, Evaluation of Expressions, Another application or Mazing Problem.

(8L)

Module III

Linked List

Singly Linked List: concept, representation and operations, Circular Linked List, Polynomial and Sparse Matrix operations using LL, Doubly Linked List: basic concept.

(8L)

Module IV

Tree and Graph

Basic concepts and terminologies, Binary Search Tree and Heap, Disjoint Set, Graph: concept and terminologies, Concept of BFS, DFS, Spanning Tree, Connected Components.

(8L)

Module V

Searching and Sorting

Sequential Search and Binary Search, Insertion Sort, Heap Sort, Radix Sort,External Sorting: k-way merging approach.

(8L)

Text book:

2. SahniHorwitz,, Freed Anderson, Fundamentals of Data Structures in C, 2nd Edition (or latest) , University Press.(T1)

Reference books:

3. TharejaReema, Data Structures Using C, 2nd Edition, Oxford University Press.(R1)
4. Tanenbaum, Langsam, Augenstein, Data Structures using C, Pearson. (R2)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1
CO2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
CO3	3	3	3	1	2	1	1	1	1	1	1	2	2	2	1
CO4	3	3	2	1	2	1	1	1	1	1	1	2	2	3	1
CO5	2	2	3	2	2	1	1	2	1	1	1	2	3	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS202
Course title: **Data Structures Lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: II

Branch: All

Course Objectives
This course enables the students:

A.	To assess how the choice of data structures and algorithm design methods impact the performance of programs.
B.	To choose the appropriate data structure and algorithm design method for a specified application.
C.	To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.
D.	Analyse and compare the different algorithms

Course Outcomes
After the completion of this course, students will be able to:

1.	Be able to design and analyze the time and space efficiency of the data structure
2.	Analyze run-time execution of previous learned sorting methods, including selection, merge sort, heap sort and Quick sort
3.	Have practical knowledge on the applications of data structures
4.	Be capable to identity the appropriate data structure for given problem

<u>SYLLABUS</u>

1. Program to Find the Number of Elements in an Array
2. Develop and Implement a menu driven program in C for the following Array operations
    a. Creating Array of N Integer elements.
    b. Display of Array elements with suitable headings.
    c. Inserting an element (ELEM) at a given valid position (POS).
    d. Deleting an element at a given valid position (POS).
    e. Exit
3. Programs for Stack, Queues and Circular Queues using Arrays
4. Program to convert an Infix Expression into Postfix and Postfix Evaluation
5. Program to implement stack using arrays
6. Program to implement stack using linked list
7. <u>Program to implement multiple stack in a single array</u>
8. Program to convert infix notation to postfix notation using stacks
9. Program to implement queue using arrays
10. Program to implement queue using pointers
11. Program to reverse elements in a queue
12. Program to implement circular queue using arrays
13. Program to create add remove & display element from single linked list
14. Program to create add remove & display element from double linked list
15. Program to count number of nodes in linear linked list
16. Program to create add remove & display element from circular linked list
17. Programs to implement stack & queues using linked representation
18. Program to concatenate two linear linked lists
19. Program to accept a singly linked list of integers & sort the list in ascending order.

20. Program to reverse linked list
21. Program to represent polynomial using linked list
22. Program to add two polynomials using linked list
23. Program for the creation of binary tree, provide insertion & deletion in c
24. Program for pre-order, post-order & in-order traversals of a binary tree using non reccursive.
25. Program to count no, of leaves of binary tree
26. Program for implementation of B-tree (insertion & deletion)
27. Program for implementation of multi-way tree in c
28. Program for implementation of AVL tree
29. Program to implement bubble sort program using arrays
30. Program to implement merge sort using arrays
31. Program to implement selection sort program using arrays
32. Program to implement insertion sort program using arrays
33. Program to implement topological sort using arrays
34. Program to implement heap sort using arrays
35. Program to implement heap sort using pointers
36. Program to implement bubble sort program using pointers
37. Program to implement linear search using pointers
38. Program to implement binary search using pointers
39. Program to implement linear search using arrays
40. Program to implement binary search using arrays

Text books:

1. Baluja G S, "Data Structure through C", Ganpat Rai Publication, New Delhi, 2015.
2. Pai G A V, "Data Structures and Algorithms: Concepts, Techniques and Applications", 2ndEdn, Tata McGraw-Hill, 2008.
3. Horowitz E., Sahni S., Susan A., "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2010.

Reference books:

1. Tremblay J. P., Sorenson P. G, "An Introduction to Data Structures with Applications", 2nd Edn, McGraw-Hill, Inc. New York, NY, USA.
2. Lipschutz Seymour, "Data Structures", 6th Edn, 9th Reprint 2008, Tata McGraw-Hill.
3. Drozdek Adam, "Data Structures and Algorithms in C++", Thomson Learning, New Delhi – 2007.
4. Feller J., Fitzgerald B., "Understanding Open Source Software Development", Pearson Education Ltd. New Delhi

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

POs met through Topics beyond syllabus/Advanced topics/Design: through experiments involving design/modelling of device/circuits on advanced topics

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets

CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	2	1	2	2	1	2	1	1	2	3	2
CO2	3	3	3	3	2	1	2	2	2	1	1	2	2	3	2
CO3	3	3	3	3	2	1	2	2	1	2	1	2	3	3	2
CO4	3	3	3	3	2	2	2	2	2	2	2	2	3	2	2
CO5	3	2	2	1	2	3	1	1	1	2	2	2	3	3	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA201
Course title: **Object Oriented Programming using Java**
Pre-requisite(s): Nil
Co- requisite(s):
Credits: L: 3 T: 0 P:0
Class schedule per week: 3
Class: B.Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
This course enables the students:

A.	Learn about Object oriented programming concepts
B.	Learn how to use the JDK
C.	Improve their programming skills in core Java

D.	Use the Java packages, applets for software development

Course Outcomes

After the completion of this course, students will be able to:

1.	Use the knowledge of object oriented programming through Java
2.	Successfully use the JDK of various versions for programming
3.	Apply the knowledge gained for project work as well as Advanced Java
4.	Apply latest know-how related to the new developments in the field of Java
5.	develop GUI applications.

Syllabus

MODULE I

Procedure-Oriented Programming, Object-Oriented programming, Benefits of OOP, Applications of OOP, Basics, Evolution of Java, Structure of JAVA Program, Simple Java Program, Tokens, Comments, Identifiers, Operators, Literals, Control Structures. Java Environment Setup, Compiling a Java Program, Java Virtual Machine, Philosophy of Java and Benefits. (6L)

MODULE II

Data types and program statements: Primitive and reference data types, variables and constants, enumerated constants, labelled statement, expression and null statements, compound statement, control statement – decision and loops, jump statement, declaration statement, try-throw-catch-finally statement, declaring and creating arrays, accessing array elements, assigning values to array elements, multidimensional arrays. (9L)

MODULE III

Functions, Data Abstraction and classes: Declaration, definition and call, main method arguments, reference variables, method overloading, parameter passing by value for primitive types, object references and arrays, scope of variables, return from methods.

Class and object, class members and initialization, access rights of members – public, private and protected access modifiers, constructor and copy constructor, mutability, finalization, dynamic memory management, garbage collection, this keyword, static members, scope of variables, interface – declaration, implementation and extending, package and package visibility. (9L)

MODULE IV

Inheritance and Collection classes: multi level and single inheritance, multiple inheritance of interfaces, Object class, access rights in subclasses and packages, constructor calling sequence, super keyword, dynamic binding of methods, abstract class, overriding, shadowing and hiding, finalize, association, aggregation and composition. String, StringBuffer, Date, Calendar, Math, Object, Class, Exception class. (8L)

MODULE V

Input/Output and JAVA Applets: Stream clases – InputStream, OutputStream, Buffered Stream, file classes and handling, pushback streams, reader and writer classes, file reader and writer, serialization.Applet code example, HTML tags for applet, applet lifecycle, color, font and basic GUI handling, basic graphics, animation. (8L)

Text books:
E. Balagurusamy - Programming in Java, 2nd Edition; Tata McGraw Hill Publication; New Delhi.(T1)

Reference books:
Patrick Naghton& H. Schildt – The Complete Reference Java 2, Tata McGraw Hill Publication, New Delhi.(R1)

Dietel,Dietel - Java How to program , 7th edition; Pearson Education , New Delhi.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	1	3	3	2	2	1	1	1	1	2	3	2	2
CO2	2	2	1	2	2	1	1	1	1	1	1	1	2	2	2
CO3	2	3	2	3	3	1	1	1	1	1	2	2	3	3	3
CO4	3	2	2	1	3	1	1	1	1	1	1	2	2	2	1
CO5	3	3	3	3	2	1	1	1	1	1	1	2	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CA202

Course title: **Object Oriented Programming using Java Lab**
Pre-requisite(s): Nil
Co- requisite(s):
Credits: L: 0 T: 0 P:3
Class schedule per week: 3
Class: B.Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To write programs using abstract classes.
2.	To write programs for solving real world problems using java collection frame work.
3.	To write multithreaded programs and impart hands on experience with java programming.
4.	To write GUI programs using swing controls in Java.
5.	To introduce java compiler and eclipse platform.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Impart hands on experience with java programming.
CO2	Write programs using abstract classes.
CO3	Write multithreaded programs.
CO4	Write GUI programs using swing controls in Java.
CO5	Simulate basic Engineering problems

Syllabus

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
3.
    a. Develop an applet in Java that displays a simple message.
    b. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.
4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
6. Write a Java program for the following:

    i. Create a doubly linked list of elements.
    ii. Delete a given element from the above list.
    iii. Display the contents of the list after deletion.

2. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.
3. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
4. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
5. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
6. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

7. Write a Java program that correctly implements the producer – consumer problem using the concept of interthread communication.
8. Write a Java program to list all the files in a directory including the files present in all its subdirectories.
9. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order
10. Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.

REFERENCE BOOKS

1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

<u>POs met through Gaps in the Syllabus:</u>

<u>Topics beyond syllabus/Advanced topics/Design:</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	1	3	3	2	2	1	1	1	1	2	3	2	2
CO2	2	2	1	2	2	1	1	1	1	1	1	1	2	2	2
CO3	2	3	2	3	3	1	1	1	1	1	2	2	3	3	3
CO4	3	2	2	1	3	1	1	1	1	1	1	2	2	2	1
CO5	3	3	3	3	2	1	1	1	1	1	1	2	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7

CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS204
Course title: **Object Oriented Programming and Design Patterns**
Pre-requisite(s): Data Structure
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	The course shall allow students to understand the basic tenets of OOP.
2.	The course will exemplify the basic syntax and constructs of JAVA.
3.	The course will help students understand the application OOP principles in various use cases.
4.	The course will explain basic JAVA GUI components and their working.
5.	The course aims to expose students to newer JAVA constructs like NIO, Lambdas etc.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the difference between procedural and OO programming.
2.	Construct programs using various OOP principles.
3.	Design UI using JAVA GUI components.
4.	Operate on files and strings in real life scenarios.
5.	Analyze thread performance and inter thread communication issues

SYLLABUS

Module I
Introduction to Classes, Objects and Java

Introduction to Object Technology, Java, Understanding the Java development environment, Programming in Java, Memory concepts, Doing basic Arithmetic, Comparing entities, Classes, Objects, Methods, Strings, Primitive vs reference types.

(8L)

Module II
Control Statements, Methods and Arrays

Basic selection statements, Iterative constructs, Relative and Logical operators, break, continue, Methods, static methods, parameter passing, argument promotion and casting, scopes, method overloading. Arrays and ArrayList in Java, Enhanced for statement, Passing arrays to methods, Multidimensional arrays, Using command line arguments.

(8L)

Module III
Object Oriented Concepts: Polymorphism & Inheritance

Controlling access to class members, the use of this keyword, getters and setters, Composition, enum, the use of static and final, Garbage collection. Superclass and subclass, protected members, constructors in subclass, the Object class, Introduction to polymorphism, Abstract classes and methods, Assignment between subclass and superclass variables, Creating and using interfaces.

(8L)

Module IV
Exception Handling & GUI Design

When to use exception handling, Java exception hierarchy, finally block, Stack unwinding, Chained exceptions, Declaring new exception types, Assertions, try with resources. Simple I/O with GUI, Basic GUI Components, GUI Event handling, Adapter classes, Layout managers, Using panels.

(8L)

Module V
Strings, characters & Files

Working with the String and StringBuilder class, Character class, Tokenizing strings, Regular Expressions, Files and Streams, Using NIO classes, Sequential file handling, Object serialization, JFileChooser, Introduction to threading, Introduction to Generics and lambda expressions.

(8L)

Text book:

Deitel P., Deitel H., Java How to Program, 10th Edition, Pearson Publications, 2016.(T1)

Reference book:

Wu C. T., Object Oriented Programming in Java, 5th Edition, McGrawHill Publications, 2010.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment tool	**% contribution during co assessment**
Mid semester examination	25
End semester examination	50
Quiz (s)	10+10
Assignment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments

CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	2	1	3	3	3	3	2	1	1	1	1	2	3	2	3
CO4	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

Semester V(Laboratories)

COURSE INFORMATION SHEET

Course code: IT302
Course title: DCCN Lab
Pre-requisite(s):
Co- requisite(s): None
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B.Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To familiarize the student in introducing and exploring various Network topologies and networking protocols
2.	To understand the use of client/server architecture in application
3.	To enable the student on how to approach for networking problems using networking simulation tools.
4.	To Design reliable servers using both TCP and UDP sockets
5.	Familiarwithnetworktoolsandnetworkprogramming.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Express programming & simulation for networking problems.
CO2	Understand of various aspects of networking devices
CO3	Design and implement simulation of a simple LAN and a WAN that meet a specific set of criteria
CO4	Identify the elements of a communication network
CO5	Simulate various OSI layer protocols using C/C++/ Java

Syllabus
List of Programs as Assignments:

1. **Lab Assignment No: 1**

Q1. To familiarize with the Lab Network Topology, Locating different interfaces, routers and switches. Studying different pools of IP addresses.
Q2. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.
Q3. To learn and observe the usage of different networking commands e.g.PING, TRACEROUTE. Learning remote login using telnet session. Measuringtypical average delays between different locations of the network.

2. **<u>Lab Assignment No: 2</u>**

Q1. What is the IP of the machine you are using? Compare it with the IP of your neighbors.Are the IPs of your neighbors same? Why or Why not?

Q2. Ping" is a tool used to determine if a server is responding and to estimate the round triptime of a message sent to that server. Use the ping command for the following URLs andrecord the success or failure statistics along with the average round trip time.

a) google.com
b) facebook.com
c) bitmesra.ac.in

Q3. Trace the route that is taken when you try to access:
a) google.com
b) facebook.com
c) bitmesra.ac.in

Q4. Network Commands on Linux / Unix

3. **<u>Lab Assignment No: 3</u>**

Q1. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC 32.

Q2. Implementation of Sub-netting and Super-netting.

Q3. To study different types of transmission media, various topologies, and configure modem of computer HUB and Switches.

4. **<u>Lab Assignment No: 4</u>**

Q1. Write a C/C++ program to determine if the IP address is in Class A, B, C, D, or E.

Q2. Write a C/C++ program to determine if the IP address is in Class A, B, or C.

Q3. Write a C/C++ program to translate dotted decimal IP address into 32 bit address.

Q4. To implement a routing protocol and check its connectivity in a variable length subnet masked network

Q5. Write a C/C++ program to perform bit stuffing and de-stuffing.

5. **Lab Assignment No: 5**

   Q1. Implement Dijkstra's algorithm to compute the Shortest path through a graph.

   Q2. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm

   Q3. Take an example subnet of hosts. Obtain broadcast tree for it.

6. **Lab Assignment No: 6**

   Q1. Build implementations of the Internet protocols
   Q2. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
   Q3. Write a code simulating ARP /RARP protocols.

7. **Lab Assignment No: 7**

   Q1. Create a socket for HTTP for web page upload and download
   Q2. Write a code simulating PING and TRACEROUTE commands.

8. **Lab Assignment No: 8**

   Q1. Study and implement model for Socket Programming and Client – Server model.
   Q2. Experiments with NS2(or any other simulator) to study behavior (especially performance of) link layer protocols such as Ethernet and802.11 wireless LAN..

9. **Lab Assignment No: 9**

   Q1. Experimental study of applicationprotocolssuch as HTTP, FTP,SMTP, using network packetsniffersandanalyzerssuchas**Wireshark**. Small exercisesinsocketprogramming in C/C++/Java..

10. **Lab Assignment No: 10**

    Q1. Take a 64 bit playing text and encrypt the same using DES algorithm.

    Q2. Write a program to break the above DES coding

    Q3. Using RSA algorithm encrypts a text data and Decrypt the samebjective: To Understand and Implement Data Interpolation

11. **Lab Assignment No: 11**

    Q1. Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer
    Q2.Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
    Q3.Echo client and echo server b. Chat c. File Transfer

Books recommended:

Text books

1. William Stallings, Data and Computer Communication, Prentice Hall of India. (T1)

2. Behrouz A. Forouzan, Data Communication and Networking, McGraw-Hill. (T2)
3. Andrew S. Tanenbaum, Computer Networks, Prentice Hall.(T3)

Reference books

1. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley.(R1)
2. Douglas Comer, Internetworking with TCP/IP, Volume 1, Prentice Hall of India.(R2)

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

<u>Mapping between Objectives and Outcomes</u>

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	2	1	1			2	2	3	3	3	3
CO2	3	2	2	2	2	1	1		2	2	2	3	3	3	3
CO3	3	3	2	2	2	2	1		2	3	2	3	3	3	3
CO4	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3
CO5	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CS302
Course title: **Database Management system Lab**
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L:3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: V/III
Branch: CSE/IT

Course Objective

This course enables the students:

1.	Learn and practice data modeling using the entity-relationship and developing database designs.
2.	Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3.	Understanding the basic principles of modeling of database using UML and apply normalization techniques to normalize the database system.
4.	Learn Multidimensional schemas suitable for data warehousing. And learn the Difference between OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing).
5.	To demonstrate the principles behind the logical database design and Data Warehouse Modeling.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Describe the fundamental elements of relational database management systems.
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	Design ER-models to represent simple database application scenarios.
CO4	Convert the ER-model to relational tables, populate relational database and formulate SQL.
CO5	Improve the database design by normalization.

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1

Objective: Implementation of DDL commands of SQL with suitable examples

- Create table
- Alter table

- Drop Table

Lab Assignment No: 2

Objective: Implementation of DML commands of SQL with suitable examples

- Insert
- Update
- Delete

Lab Assignment No: 3

Objective: Implementation of different types of function with suitable examples

- Number function
- Aggregate Function
- Character Function
- Conversion Function
- Date Function

Lab Assignment No: 4

Objective: Study & Implementation of PL/SQL.

Lab Assignment No: 5

Objective Implementation of different types of operators in SQL

- Arithmetic Operators
- Logical Operators
- Comparison Operator
- Special Operator
- Set Operation

Lab Assignment No: 6

Objective: Implementation of different types of Joins

- Inner Join
- Outer Join
- Natural Join etc..

Lab Assignment No: 7

Objective: Study & Implementation of SQL Triggers.

Lab Assignment No: 8

Objective:

- Creating Database /Table Space
- Managing Users: Create User, Delete User
- Managing roles:-Grant, Revoke.

Lab Assignment No: 9

Objective: Study and Implementation of

- Group By & having clause
- Order by clause
- Indexing

Lab Assignment No: 10

Objective: Study & Implementation of

- Sub queries
- Views

Lab Assignment No: 11

Objective: Study & Implementation of different types of constraints.

Books recommended:

TEXT BOOKS

1. A.Silberschatz et.al - Database System Concepts, 5thEdn, Tata Mc-Graw Hill, New Delhi – 2000.

REFERENCE BOOKS

1. Date C.J. - An Introduction to Database System, Pearson Education, New Delhi, 2005.
2. R.Elmasri, Fundamentals of Database Systems, Pearson Education, New Delhi, 2005.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce
Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	3	3	1	1	2	2	1	3	3	3	3
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	3	3
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	3	3
CO4	3	2	3	2	3	3	1	2	2	3	3	1	3	3	3
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	1	2

COURSE INFORMATION SHEET

Course code: IT310
Course title: **Shell and Kernel Programming Lab**
Pre-requisite(s): Operating System, UNIX Programming
Co- requisite(s): NIL
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: V/III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic concepts of UNIX & shell programming.
2.	Understand the basic operations of an operating system.
3.	To explore the function of a kernel.
4.	To understand the basic function of a device driver.
5.	To understand the structure of a file system.

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain the design of Linux kernel components
2.	Experiencing the kernel by passive/active observation
3.	Extend the Linux kernel for understanding, self-satisfaction/falsification.
4.	Identify the current research trends in OS, Linux being the reference OS
5.	Illustrate the design of Linux kernel components

Syllabus
Module I
Introduction to UNIX, file system, system calls, AWK script, Bourne shell programming. (8L)
Module II
Korn Shell Programming, C Shell Programming, Different tools & Debuggers. (8L)
Module III
Introduction: OS concepts catch-up, Linux kernel overview, Extending the kernel: building a modified kernel, writing simple kernel modules, User-kernel interfacing: system calls, proc/sys, character devices, device memory maps, Kernel execution contexts: processes, threads, kernel threads, interrupts, bottom halves/soft IRQs. (8L)
Module IV
Process management: Linux kernel scheduler, context switching, kernel synchronization
Memory management: Virtual memory, page cache, File systems: The VFS layer, Kernel-File system interfacing. (8L)

Module V
Generic block layer: Block I/O interfacing, kernel block I/O scheduler
Device drivers: Device probe and software / hardware configurations, event registration, communication. (8L)

Text Books:

HARWANI B.M., UNIX and Shell Programming, First Publication,Oxford University Press, 2013. (T1)

Love Robert, Linux Kernel Development, 3rd Edition.(T2)

Corbet Jonathan, Kroah-Hartman Greg, Rubini Alessandro, Linux Device Drivers, 3rd Edition. (T3)

Bovet Daniel P. , CesatiMarco,Understanding the Linux Kernel, Publisher: O'Reilly.(T4)

Nutt Gary, Kernel Projects for Linux, Addison Wesley, ISBN: 0-201-61243-7, July 2000.(T5)

References Books:

Sarwar Syed Mansoor, Koretsky Robert, & Sarwar Syed Aqeel ,Linux: The Textbook Addison Wesley, ISBN: 0-201-72595-9. (R1)

Gagné Marcel, Linux System Administration: A User's Guide, Addison Wesley, ISBN: 0-201-71934-7 Paperback, September 2001. (R2)

Rubini Alessandro & Corbet Jonathan ,Linux Device Drivers, O'Reilly & Associates, ISBN 0-596-00008-1Paperback, June 2001.(R3)

Bar Moshe, Linux File Systems, McGraw-Hill; ISBN: 0-07-212955-7 Paperback.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	2	3	2	3	1				1		1	3	2	3
CO2	3	2	3	2	3	3	1	3		2	1	1	3	2	3
CO3	2	2	3	2	3	1						1	3	2	3
CO4	3	2	3	2	3	2	1	3		2	1	1	3	2	3
CO5	3	2	3	2	3	3	1	2		2	1	2	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7

CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT306
Course title: **Software Engineering Lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T:0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Familiarize the students with the fundamental concepts of Software Engineering
2.	Impart state-of-the-art knowledge on SRSand UML
3.	Explore case studies to demonstrate practical applications of different concepts
4.	Provide a platform where they can solve real life problems

Course Outcomes
After the completion of this course, students will be able to:

CO1	Prepare efficient models for development of software for various projects
CO2	Collect the requirements the client wants for the software being produced
CO3	Design the UML diagrams necessary for the software being developed
CO4	Create and specify feasible software designs based on the requirements/specifications
CO5	Assess the extent and costs of a project with the help of several different assessment methods

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**

Objective: To Understand and Implement Identification of Requirements from Problem Statements

Q1. To consider the problem statement for a project to be developed and list out the ambiguities, inconsistencies and incompleteness of the problem statement.

Q2. To identify different functionaries to be obtained from a system and characteristics that a system should have, but not possessed by the system itself

2. **Lab Assignment No: 2**

Objective: To Understand and Implement Estimation ofProject Metrics

Q1. To estimate the minimum size of the team one would require to develop a project through application of intermediate COCOMO.

Q2. To use Halstead's metrics to estimate the effort required to recreate a program in JAVA from C.

3. **Lab Assignment No: 3**

Objective: To Understand and Implement Modeling UML Use Case Diagrams and Capturing Use Case Scenarios

Q1. To draw a use case diagram for the given case study.

Q2. To identify the primary and secondary actors for the system and generalization of use cases and «include» stereotypes to prevent redundancy in the coding phase.

4. **Lab Assignment No: 4**

Objective: To Understand and Implement E-R Modeling from the Problem Statements

Q1. To identify the possible entity sets, their attributes, and relationships for the given case study.

Q2. To draw an ER diagram for the given case study.

5. **Lab Assignment No: 5**

Objective: To Understand and Implement Identification of Domain Classes from the Problem Statements

Q1. To identify potential classes and their attributes for the given case study.

Q2. To utilize expert knowledge on the subject matter to identify other relevant classes.

6. **Lab Assignment No: 6**

Objective: To Understand and Implement Identification of Components from the Problem Statements

Q1. To identify potential components for the given case study.

Q2. To draw component diagram for the given case study

7. **Lab Assignment No: 7**

Objective: To Understand and Implement State Chart and Activity Modeling

Q1. To draw a statechart diagram to graphically represent the given case study.

Q2. To draw an activity diagram to graphically represent the workflow of the given case study.

8. **Lab Assignment No: 8**

Objective: To Understand and Implement Modeling UML Class Diagrams and Sequence diagrams

Q1. To draw class diagram for the given case study.

Q2. To draw sequence diagram for the given case study.

9. **Lab Assignment No: 9**

Objective: To Understand and Implement Modeling Data Flow Diagrams

Q1. To draw data flow diagram (Level 0, 1 and 2) for the given case study.

10. **Lab Assignment No: 10**

Objective: To Understand and Implement Estimation of Test Coverage Metrics and Structural Complexity

Q1. To identify the basic blocks for a given program

Q2. To draw a CFG using the basic blocks

Q3. To determine McCabe's complexity from a CFG.

11. **Lab Assignment No: 11**

Objective: To Understand and Implement Designing Test Suites

Q1. To design a test suite for the given case study.

Q2. To verify implementation of functional requirements by writing test cases.

Q3. To analyze results of testing to ascertain the current state of the project.

12. **Lab Assignment No: 12**

Objective: To Understand and Implement Forward and Reverse Engineering

Q1. To obtain programs from UML diagrams.

Q2. To obtain UML diagrams from programs.

Books recommended:

TEXT BOOKS

1. Software Engineering, Ian Sommerville, Pearson, 10th Edition, 2016.**(T1)**
2. Software Engineering: A Practioner's Approach, Roger S. Pressman, McGraw Hills, 7th Edition, 2009.**(T2)**

REFERENCE BOOKS

1. Fundamentals of Software Engineering, Rajib Mall, Prentice-Hall of India, 3rd Edition, 2009.**(R1)**

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO2, 5 & 6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	1	3	2	2	1	1	1	1	3	1	3	3
CO2	3	2	1	1	2	1	1	1	2	1	3	3	3	2	3
CO3	3	3	2	1	3	2	2	1	3	3	1	3	3	3	3
CO4	2	3	2	2	3	3	2	3	3	2	3	3	3	3	2
CO5	3	1	1	3	2	2	3	1	2	1	2	2	1	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2, CD3, CD6, CD7
CO2	CD1, CD2, CD3, CD7
CO3	CD1, CD2, CD3, CD6, CD7
CO4	CD1, CD2, CD3,CD6
CO5	CD1,CD2, CD3, CD6, CD7

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

(Semester VI)

COURSE INFORMATION SHEET

Course code: CS305
Course title: **Compiler Design**
Pre-requisite(s): Formal Language and Automata Theory
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI/III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Understand the need of compiler in Computer Engineering
2.	Provide a thorough understanding of design, working, and implementation of programming languages
3.	Trace the major concept areas of language translation and compiler design
4.	Create an awareness of the functioning and complexity of modern compilers

Course Outcomes
After the completion of this course, students will be:

1.	Analyze the need of compiler for interfacing between user and machine
2.	Explain the role of several phases of compilation process
3.	Create an awareness of the function and complexity of modern compilers
4.	Outline the major concept areas of languages translation and Compiler design
5.	Develop a comprehensive Compiler for a given language
6.	Apply knowledge for developing tool for natural language processing

Syllabus
Module I
Introduction to Compilers and its Cousins, Structure of a Compiler, Science of building Compiler and its Application, Lexical Analyzer, Input Buffering, Specification and Recognition of Tokens, Introduction to Lex. (5L)

Module II
Introduction to Syntax Analysis, Elimination of Ambiguity, Left Recursion and Left Factoring, Recursive and Non-Recursive Top-Down Parsers, Bottom-up Parsers: Shift Reduce Parser techniques and conflicts, all variants of LR Parsers, Handling Ambiguous grammar in Bottom-Up Parsing, Error handling while parsing, The Parser generator YAAC. (15L)

Module III
Syntax-Directed Definition(SDD), Evaluation Order of SDD’s and its application, Syntax-Directed Translation Schemes and their Implementation. (7L)

Module IV
Intermediate code Generation: Variants of Syntax Tree, Three Address Code, Translation of Expressions, Control flow, Back Patching , Run Time Environment: Storage Organization. (8L)

Module V
Code Generation: Issues in its Design, Target Language, Addresses in Target Code, Basic Blocks and Flow Graphs, Optimization of Basic BlocksMachine Independent Optimization: Sources of Optimization, Data Flow analysis. (5L)

Text book:

Aho A. V., Lam M. S., Sethi R., Ullman J. D., Compilers, Principles, Techniques, and Tool, 2nd Edition, Pearson Education Asia.(T1)

Reference books:

Fischer C. N., LeBlanc R. J., Crafting a Compiler with C, Pearson Education Asia. (R1)

Louden K. C., Compiler Construction, Principles and Practice, Thomson, Brooks/Cole. (R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	3	3	1	1	2	1	2	3	3	1	1	1	3	1
2	2	3	1	2	2	2	2	2	2	3	2	1	1	2	1
3	2	3	3	3	3	1	1	1	2	3	1	2	2	3	1
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	2
5	2	2	1	2	3	1	3	3	1	3	2	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7

CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS307
Course title: **Graph Theory**
Pre-requisite(s): Discrete Mathematics
Co- requisite(s): None
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Learn and become comfortable with graphs and its terminologies
2.	Understand applications of graph theory to practical problems and other branches of mathematics
3.	Understand various graphs algorithms along with its analysis.
4.	Practice creative problem solving and improve skills in this area

Course Outcomes
After the completion of this course, students will be able to:

1.	Analyze different types of graphs and their applications in real world.
2.	Perceive the role of cut-set, cut-vertex and fundamental circuits in network flows.
3.	Create an awareness of planar and dual graph.
4.	Explain how to represent graphs in a computer system
5.	Apply the concept of graph coloring and partitioning techniques in NP-problems

Syllabus
Module I
Introduction: Graphs and its applications, Finite and infinite graphs, incidence and degree, isolated Vertex, pendant Vertex, and Null graph, paths and circuits, isomorphism, sub graphs, walks, paths, and circuits, connected graphs, disconnected graphs and components, Connectivity checking algorithm, Euler graphs, Operations on graphs, more on Euler graphs, Hamiltonian paths and circuits, Travelling Salesman problem. (8L)

Module II

Trees and Fundamental circuits: Trees and its properties, Distance and centres in a tree, Algorithm for checking if a graph is Tree, Partial k-trees, Dynamic Programming in partial k-trees, Spanning trees, Spanning trees in a Weighted graph, Prim's and Kruskal's algorithms

Cut set and cut vertices: Properties of a cut set, Fundamental circuits and cut sets, connectivity and separability, Computing connected components, Menger's theorem, Network flows, 1-Isomorphism, 2-Isomorphism. (8L)

Module III

Planar and Dual Graphs: Planar graph, Kuratowski's Graphs, Representations of a planar graph, Detection of planarity, Planar Separator Theorem, Geometric Dual, Combinatorial, Duel, Thickness and crossings, Algorithms for finding Clique and maximum clique**.** (8L)

Module IV

Matrix Representation of Graphs: Incidence matrix, Adjacency matrix, Adjacency list, Circuits Matrix, Fundamental Circuit Matrix and RankofB, Cut-set Matrix, Relationships among A*f*, B*f* and C*f*, path Matrix**.** (8L)

Module V

Coloring, Covering and partitioning: Chromatic number, Chromatic partitioning, Chromatics polynomial, Coverings, Four colour problem, Algorithm for graph colouring.

Directed Graphs: Digraphs and its types, Digraphs and binary Relations, Directed paths and connectedness, Euler Digraphs, Trees with Directed Edges, Fundamental Circuitsin Digraphs, Matrices A,B and C of Digraphs, Adjacency Matrix of a Digraph, Paired Comparisons and Tournaments, Acyclic Digraphsand De-cyclization**.** (8L)

Text Books:

Deo Narasingh, Graph Theory with Applications to engineering and Computer Science, Prentice Hall of India, 2001.(T1)

Raman Tulasi and Swamy M.N.S., Graph, Networks and Algorithms, John Wiley, 1981.(T2)

Reference Books:

West Douglas B., Introduction to Graph theory, Pearson Education, 2002.(R1)

Harary F., Graph Theory, Addison Wesley/ Narosa, 1998. (R2)

Reingold E. M., Nievergelt J., Deo N., Combinatorial Algorithms: Theory and Practice, R.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment

Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1
2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1

3	3	2	2	1	1	1	1	3	3	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1
5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: MT123
Course title: **Business Communications**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: VI/I
Branch: CSE/IT

Course Objectives

This course enables the students:

A.	To analyze and demonstrate writing and speaking processes through invention, organization, drafting, revision, editing, and presentation.
B.	To understand the importance of specifying audience and purpose and to select appropriate communication choices.
C.	To interpret and appropriately apply modes of expression, i.e., descriptive, expositive, Narrative, scientific, and self-expressive, in written, visual, and oral communication
D.	To participate effectively in groups with emphasis on listening, critical and reflective thinking, and responding.
.E	To develop the ability to research and write a documented paper and/or to give an oral presentation.

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.
2.	Utilize analytical and problem-solving skills appropriate to business communication.
3.	Participate in team activities that lead to the development of collaborative work skills.
4.	Select appropriate organizational formats and channels used in developing and presenting business messages
5.	Communicate via electronic mail, Internet, and other technologies and deliver an effective oral business presentation.

Syllabus

MT123: Business Communication

Module I(4 lectures)

Introduction to Business Communication:
Importance and Objectives of Business communication, Process of communication, Barriers to effective communication, Techniques of effective communication. Forms of communication (Written, Oral, audio-visual communication).

Module II(5 lectures)

Managing Business Communication:
Formal and Informal communication, Non- verbal communication (Body language, Gestures, Postures, Facial expressions). The cross cultural dimensions of business communication. Techniques to effective listening, methods and styles of reading.

Module III (5 lectures)

Other aspects of communication:
Vocabulary:
Single word substitution, Idioms and phrases, Precis writing, Comprehension.

Group Discussions, Extempore, Principles of effective speech and presentations, Role playing.

Module IV: (6 lectures)

Introduction to managerial writing:

Business letters: Inquiries, Circulars, Quotations, Orders, Acknowledgement, Claims & adjustments, Collection letters, Sales letters, Drafting of different resumes, Covering letters Applying for a job, Social correspondence, Invitation to speak.

Official Correspondence: Memorandum, Notice, Agenda, Minutes, Circular letters.

Module V: (3 lectures)

Report writing and Technical Proposals:

Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, check lists for reports.

Technical proposals, Definitions, types and format.

Text Books:

T1. Communication Skills, Sanjay Kumar &PushpLata, Oxford University Press
T2. Business Correspondence and Report Writing,R.C.Sharma, Krishna Mohan.Mcgraw Hill
T3. Communication for Business,Shirley Taylor, V.Chandra, Pearson

Reference Books:

R1. Business Communication- HorySankar Mukherjee, Oxford University Press
R2. Basic Business Communication- .Lesikar I Flatley, McGraw Hill.
R3. Business Communication Today ,Bovee, Thill and Chaterjee, Pearson

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Quiz(I,II)	20
Mid Term Examination Marks	25
Attendance	5
End Term Examination Marks	50

AssessmentComponents	CO1	CO2	CO3	CO4	CO5
Quiz(I,II)	√	√	√		
End Sem Examination Marks	√	√	√	√	√
Mid Term Examination Marks			√	√	√

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	1	1	1	1	2	3	3	3	3	3	3	2	2	1	1
CO2	1	2	1	1	1	3	3	2	3	3	2	2	1	1	2
CO3	1	2	2	1	1	1	3	3	3	3	2	2	1	1	3
CO4	1	2	2	1	3	3	2	2	3	3	1	2	1	1	2
CO5	2	1	1	2	2	3	3	3	3	3	2	1	1	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1,CD2,CD3
CD2	Tutorials/Assignments		CO2	CD1,CD2,CD3
CD3	Seminars		CO3	CD1,CD2,CD3
CD4	Mini projects/Projects		CO4	CD1,CD2,CD3,CO4 CD5
CD5	Laboratory experiments/teaching aids		CO5	CD1,CD2,CO5
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: MT204
Course title: **Constitution of India**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 2 T: 0 P: 0
Class schedule per week: 2
Class: B. Tech

Semester / Level: VI/II
Branch: CSE/IT

Course Objectives:
This course enables the students:

A.	To describe the importance and role of Constitution of India
B.	To resolve the social problems and issues.
C.	To maintain and bolster the unity and integrity in the society.
D.	To formulate and design policies in accordance with the constitutional provisions.

Course Outcomes

After the completion of this course, students will be:

1.	Outlinethe need and importance of the Indian constitution.
2.	Explain the fundamental rights and duties of the citizens of India.
3.	Relate appropriate constitutional provisions with relevant social issues
4.	Describe the role of different departments of government.
5.	Crique the Government policies and programmes designed for the society at large.

Syllabus

Module 1: Introduction to the Constitution of India, Salient Features of the Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Module 2: Union and State Executives: President and Prime Minister, Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.Governor: Role and Position, Chief Ministers and Council of ministers.

Module 3: The Indian Judicial System – The Supreme Court and The High Court's – composition, Jurisdiction and functions, The Role of the Judiciary.

Module 4: Local Government- District's Administration: Role and Importance, The Panchayatas – Gram Sabha, Constitution and Composition of Panchayatas ,Constitution and Composition of Municipalities

Module 5: Miscellaneous- Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Readings

1. The Constitution of India by " Ministry of Law India" Kindle Edition
2. Constitutional History of India by Prof.M.V.PYLEE-S.Chand Publishing
3. Indian Administration by Avasti and Avasti-Lakshmi Narain Agarwal Educational Publishers.2017 edition.
4. Introduction to the Constitution of India by D DBasu by Lexis Nexis : 20th edition.
5. Constitution of India V.N.Shukla's EBC Explorer Edition 13th ,2017

Gaps in the syllabus (to meet Industry/Profession requirements)

POs met through Gaps in the Syllabus

Topics beyond syllabus/Advanced topics/Design

POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
1.Lecture by use of boards/LCD projectors/OHP projectors
2. Tutorials/Assignments
3. Seminars
4. Mini projects/Projects
5.Laboratory experiments/teaching aids
6.Industrial/guest lectures
7.Industrial visits/in-plant training
8.Self- learning such as use of NPTEL materials and internets
9.Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Mid Sem Examination Marks	25
End SemExamination Marks	60
Assignment / Quiz (s)	15

AssessmentCompoents	CO1	CO2	CO3	CO4	CO5
Mid Sem Examination Marks	√	√			
End Sem Examination Marks	√	√	√	√	√
Assignment	√	√	√		

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1						3	3	3	3	3		2	1	1	1
CO2						3	3	2	3	3		2	1	1	2
CO3						1	3	3	3	3		2	1	1	1

CO4						3	2	2	3	3		2	1	1	1
CO5						3	3	3	3	3		1	1	1	1

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Mapping Between COs and Course Delivery (CD) methods

CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1
CD2	Tutorials/Assignments		CO2	CD1
CD3	Seminars		CO3	CD1, CD2
CD4	Mini projects/Projects		CO4,	CD1, CD2
CD5	Laboratory experiments/teaching aids		CO5	CD1, CD3, CD6
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

PROGRAM ELECTIVE -II

COURSE INFORMATION SHEET

Course code: IT326
Course title: **Wireless Sensor Networks**
Pre-requisite(s): IT301 Data Communication and Computer Networks
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Familiarize with the principles of sensor nodes, network deployment and architectures.
2.	Know the data transmission and routing protocols. Know the differences among different networks.
3.	Analyze or compare the performance of different routing and MAC protocol
4.	Evaluate the performance of different MAC protocols and clustering algorithm
5.	Compute the throughput and channel utilization for different network scenarios.

Course Outcomes
After the completion of this course, students will be:

1.	Obtain a broad understanding about the network architecture of wireless sensor network.
2.	Understand all basic characteristics of wireless sensor networks and sensor nodes.
3.	Understand the principles of data transmission, clustering algorithm and routing protocols.
4.	Analyse and evaluate different constraint of wireless sensor network, e.g., coverage, powermanagement, security and data collisions.
5.	Design and development of new sensor network architecture.

Syllabus
Module I

Introduction: Wireless channel and communication fundamentals, Features of Wireless sensor network, Design principles for WSNs, Service interfaces of WSNs and Gateways, Applications, Hardware components, Sensor deployment mechanism. (6L)

Module II

Network and Component Technologies: Topologies and characteristics, Sensor network characteristics, energy consumption model, Power management, Localization, hierarchical and cluster based topology control. (10L)

Module III

Data Transmission and Routing: Data processing and aggregation, Data storage, Network clustering protocols, Multi-hop communication protocols, Energy efficient routing, Data aggregation and data centric routing. (8L)

Module IV

Protocols: MAC Protocols, Framing and error control in WSNs, Medium access control protocols, Congestion control and rate control protocols. (8L)

Module V

QOS Issues:

Coverage and deployment, Reliable data transport, Single packet and block delivery, Congestion control and rate control, Collisions, Collision avoidance mechanism. (8L)

Text books:

Karl Holger and Willig Andreas, "Protocols and Architectures for Wireless Sensor Networks".(T1)

Callaway Jr. Edgar H. and Callaway Edgar H., "Wireless Sensor Networks: Architectures and Protocols".(T2)

Reference books:

Zhang Yan, Jejunum, Hu Honglin, "Wireless Mesh Networking, Architecture, Protocols and Standards".(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**

Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	3	3	3	1	2	3	1	2	2	3	3	3
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	3	2	3	3	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	3

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT327
Course title: Wireless Sensor Networks Lab
Pre-requisite(s): IT326 Wireless Sensor Networks
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B.Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	In-depth understanding of specialist bodies of knowledge within the engineering discipline.
2.	Application of established engineering methods to complex engineering problem solving.
3.	Fluent application of engineering techniques, tools and resources
4.	High levels of technical competence in the field
5.	Be able to apply problem solving approaches to work challenges and make decisions using sound engineering methodologies

Course Outcomes

After the completion of this course, students will be able to:

CO1	Apply knowledge of wireless sensor networks(WSN) to various application areas.
CO2	Design and implement WSN and IoT.
CO3	Conduct performance analysis of WSN.

Syllabus
List of Programs as Assignments:

1. Wireless technology for distributed sensor networks in perspective of deployment mechanisms
2. Clustering techniques in WSN; multi-hop to single hop communication analysis
3. Analyzing Routing in WSN: AODV, DSR
4. Industrial WSN protocols: ZigBee, Bluetooth applications
5. WSN network design and implementation; in perspective of gateway-based communications
6. Employing of wireless technologies in IoT.
7. IoT Structure and Framework

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training
CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Assessment Components	CO1	CO2	CO3	CO4	CO5
Progressive Evaluation	√	√	√	√	√
End SEM Evaluation	√	√	√	√	√

If satisfying < 34% = 1, 34-66% = 2, > 66% = 3

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	3	3	3	1	2	3	1	2	2	3	3	3
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	3	2	3	3	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	3

COURSE INFORMATION SHEET

Course code: CS322
Course title: **Simulation and Modelling**
Pre-requisite(s): CS201 Data Structure
Co- requisite(s):
Credits: L: 3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To Characterise engineering systems in terms of their essential elements, purpose, parameters, constraints, performance requirements, sub-systems, interconnections and environmental context.
2.	To understand Engineering problem modelling and solving through the relationship between theoretical and mathematical
3.	To provide Mathematical modelling real world situations related to engineering systems development.
4.	To able Generate random numbers and random varieties using different techniques.
5.	To provide the knowledge of queuing theory to solve real life problem

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Define basic concepts in modeling and simulation (M&S)
2.	Classify various simulation models and give practical examples for each category
3.	Analyze the behavior of a dynamic system and create an analogous model for a dynamic system.
4.	Analyze and test random number variates and apply them to develop simulation models
5.	Develop a real-life model using queuing system

Syllabus
Module I

The concepts of a system, System Environment, Stochastic Activities, continuous and discrete systems, System Modeling, Types of models.System Studies: Subsystem, A Corporate Model, Environment segment, Production Segment, Management Segment, full Corporate Model, Types of System study, System Analysis, System Design, System Postulation. (7L)

Module II

The technique of simulation, the Monte Carlo method, comparison of simulation and analytical methods, experimental nature of simulation, types of system simulation, numerical computation technique for continuous & discrete models, distributed lag models, cobweb models. Continuous system models, differential equations, analog computers & methods, hybrid computers, CSSLs, CSMP-III, Feedback Systems, Simulation of an Autopilot. (8L)

Module III

Exponential Growth & decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamics diagrams, Simple system dynamics diagrams, multi–segment models, representation of time delays. (8L)

Module IV

Evaluation of continuous probability functions, continuous uniformly distributed random numbers, a uniform random number numbers, generating discrete distributions, non-uniform continuously distributed random numbers, the rejection method. Random numbers Generators: Techniques for generating random numbers. Test for random numbers. Random vitiate Generation: Inverse transform technique, exponential distribution, uniform distribution. (8L)

Module V

Queuing disciplines, measures of queues. Discrete events, representation of time, generation of arrival patterns, simulation of a telephone system, delayed calls, Simulation programming tasks, measuring utilization and occupancy. (9L)

Text books:

Gordon Geoffrey, System Simulation, 2nd Edition, Pearson Education, 2007. (T1)
Banks J., Carson J. S. , Nelson B.L., Nicol D.M., Discrete-Event System Simulation, 4thEdn, Pearson Education, 2007. (T2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	2	2	2	2	1	1	1	2	1	2	2	2	2
CO2	3	3	3	2	3	2	2	1	1	2	1	2	3	2	2
CO3	3	3	3	3	3	2	2	1	1	2	1	2	3	3	2
CO4	3	3	3	3	3	2	2	1	1	2	1	2	3	3	3
CO5	3	3	3	2	3	2	2	1	1	2	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS323
Course title: **Simulation and Modelling Lab**
Pre-requisite(s): CS322 Simulation Modelling
Co- requisite(s):NIL
Credits: L: 0 T:0 P:3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To Characterise engineering systems in terms of their essential elements, purpose, parameters, constraints, performance requirements, sub-systems, interconnections and environmental context.
2.	To understand Engineering problem modelling and solving through the relationship between theoretical and mathematical
3.	To provide Mathematical modelling real world situations related to engineering systems development.
4.	To able Generate random numbers and random varieties using different techniques.
5.	To provide the knowledge of queuing theory to solve real life problem

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Define basic concepts in modeling and simulation (M&S)
2.	Classify various simulation models and give practical examples for each category
3.	Analyze the behavior of a dynamic system and create an analogous model for a dynamic system.
4.	Analyze and test random number variates and apply them to develop simulation models
5.	Develop a real life model using queuing system

Syllabus

1. Computer Generation of Random Numbers.

2. Chi-square goodness-of-fit test.

3. One-sample Kolmogorov-Smirnov test

4. Test for Standard Normal Distribution

5. Testing Random Number Generators.

6. Monte-Carlo Simulation.

7. Simulation of Single Server Queuing System.

8. Simulation of Two-Server Queuing System.

9. Simulate and control a conveyor belt system

10. Two-sample Kolmogorov-Smirnov test.

Text books:

Gordon Geoffrey, System Simulation, 2nd Edition, Pearson Education, 2007. (T1)
Banks J., Carson J. S. , Nelson B.L., Nicol D.M., Discrete-Event System Simulation, 4thEdn, Pearson Education, 2007. (T2)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

<u>POs met through Gaps in the Syllabus:</u>

<u>Topics beyond syllabus/Advanced topics/Design:</u>

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√

Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	2	2	2	2	1	1	1	2	1	2	2	2	2
CO2	3	3	3	2	3	2	2	1	1	2	1	2	3	2	2
CO3	3	3	3	3	3	2	2	1	1	2	1	2	3	3	2
CO4	3	3	3	3	3	2	2	1	1	2	1	2	3	3	3
CO5	3	3	3	2	3	2	2	1	1	2	1	2	3	3	3

COURSE INFORMATION SHEET

Course code: IT328
Course title: **Pattern Recognition**
Pre-requisite(s):
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	Be familiar with both the theoretical and practical aspects Pattern Recognition.

2.	Have described the foundation of pattern formation, measurement, and analysis.
3.	Understand the mathematical and computer aspects of while extracting features of an object.
4.	Learn the techniques of clustering and classification for various applications.

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply their knowledge on Real World Problems while converting these problems to computer compatible problems for Pattern Recognition.
2.	Solve Decision making model using Statistical and Mathematical Decision Theory.
3.	Design clusters for various Pattern using classical and Modern clustering techniques.
4.	Analyzing various Techniques for Pattern Classification and Clustering.
5.	Develop Model for Pattern classification through Probabilistic or fuzzy.

Syllabus

Module I

Introduction: Feature Vectors, Classifiers, Supervised, Unsupervised, MATLAB Tools. Classifiers Based on Bayesian Theory, Linear Classifiers, Nonlinear Classifiers. (10L)

Module II

Feature Selection, Feature Generation I: Data Transformation and Dimensionality Reduction, Feature Generation II. (10L)

Module III

Template Matching, Context Dependent Classification, Supervised Learning. (10L)

Module IV

Clustering: Basic Concepts, sequential Algorithms. (5L)

Module V

Hierarchical algorithms, Fuzzy clustering, probabilistic clustering, Hard Clustering, Optimization. (5L)

Text Books:

Theodoridis S., Koutroumbas K., Elsevier, "Pattern Recognition", 5th Edition 2015.(T1)

Murty N. Narshima "Pattern Recognition", Springer, University Press2nd edition,2015.(T2)

Reference Book:

DudaR.O.,Hart E. Peter,Stork G. David," Pattern Classification" 2nd Edition, John Wiley, New York, 2002.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	3	2	1	1	2	1	2	2	3	2	3
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	2	2	3	2	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT329
Course title: **Pattern Recognition Lab**
Pre-requisite(s): IT328 Pattern Recognition
Co- requisite(s): NIL
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Apply their knowledge on Real World Problems while converting these problems to computer compatible problems for Pattern Recognition.
2.	Solve Decision making model using Statistical and Mathematical Decision Theory.
3.	Design clusters for various Pattern using classical and Modern clustering techniques.
4.	Analyzing various Techniques for Pattern Classification and Clustering.
5.	Develop Model for Pattern classification through Probabilistic or fuzzy.

Course Outcomes
After the completion of this course, students will be able to:

1.	formulate and describe various applications in pattern recognition
2.	understand the Bayesian approach to pattern recognition
3.	Be able to mathematically derive, construct, and utilize various classifiers both

	theoretically and practically.
4.	be able to identify the strengths and weaknesses of different types of classifiers
5.	validate and assess different clustering techniques

Syllabus

1. Implement a function for extracting the colour histogram of an image.
2. Read all the images from the training set. For each image compute the colour histogram with general bin size *m* and save it as a row in the feature matrix ***X***. Save the corresponding class label in the label vector ***y.***
3. Implement the k-NN classifier for an unknown image and for a general *K* value.
4. Evaluate the classifier on the test set by calculating the confusion matrix and the overall accuracy.
5. Try out different values for the number of bins for the histogram and the parameter *K* to see which feature attains the best performance.
6. Convert the input image into Luv or HSV colour-space before histogram calculation.

Text books:

4. Pattern Recognition and Machine Learning, Christopher Bishop, Springer 2006.

Reference books:

5. Introduction to Statistical Learning, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 2013.
6. Pattern Classification, 2nd Ed., Richard Duda, Peter Hart, David Stork, John Wiley & Sons, 2001.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution

Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	3	1	3	2	2	2	1	2	3	3	2
CO2	3	2	3	1	2	1	2	3	2	1	1	2	2	3	2
CO3	3	3	3	1	2	1	2	3	1	2	1	2	3	2	2
CO4	3	3	3	1	2	2	2	2	1	2	3	2	3	1	2
CO5	3	2	3	1	2	2	1	3	2	2	3	2	3	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CS327
Course title: **Computer Graphics**
Pre-requisite(s): CS206 Design and Analysis of Algorithm
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To understand different hardware used for graphical requirement
2.	To perform visual computations for geometrical drawings.
3.	To display 3D objects in a 2D display devices using projection techniques
4.	To model 3D
5.	To create realistic images using color and shading techniques

Course Outcomes
After the completion of this course, students will be:

1.	Able to understand different hardware used for graphical requirement.
2.	Able to perform visual computations for geometrical drawings.
3.	Able to display 3D objects in a 2D display devices using projection techniques
4.	Able to model 3D objects
5.	Able to create realistic images using color and shading techniques

Syllabus
Module I
Introduction and Overview of Graphics Systems
Use of Computer graphics, Video Display Devices, Raster and Random Scan Displays, Colour CRT Monitors, Flat Panel Displays, Three-Dimensional Viewing Devices, Stereoscopic & Virtual Reality, Graphics system architecture, Input Devices, Graphics Software.

Output Primitives

Points and Lines, Line Drawing Algorithms (DDA &Bresenham's), Circle and Ellipse Generating Algorithms, Conic Sections.Filling Polygons, Pattern Filling, Thick Primitives, Line Style and PenStyle, Generating Characters, Aliasing and Antialiasing. (7L)

Module II

Geometric Transformations

Two dimensional transformations and their matrix representations, Translation, Rotation, Scaling, Reflection, Shears, Homogeneous Coordinates, Composite Transformations, transformations between Coordinate Systems, Affine transformations, 2-Dimensional viewing pipeline, Window-to-Viewport Coordinate transformation, Clipping-Point, Line clipping-Cohen Sutherland, Liang Bursky, Polygon clipping – Sutherland Hodgeman, weilerArtherton, Curve and Text Clipping, Three Dimensional Transformations, Translation, Rotation, Scaling, Reflection, Shears. (8L)

Module III

Three Dimensional Concepts and Object Representation

Three Dimensional Display Methods, Polygon Surfaces, Curved Lines & Surfaces, Quadric Surfaces, Spline Representations, Cubic Spline interpolation methods, Hermite Interpolation, Bezier Curves and Surfaces, Properties of B-splines, Fractal.

Three Dimensional Transformations and Viewing

Three dimensional viewing pipe line, Projections- Parallel and Perspective, Projection Transformations, Clipping. (7L)

Module IV

Color Model and Color application

Properties of light, Standard primaries and chromaticity diagram, XYZ Color model, RGB color model. YIQ color model, HSV color model, HLS color model

Illumination Model and Surface Rendering

Light sources, Basic Illumination Models, Ambient light, Defuse and specular reflection. Shadows, Transparency, Assigning intensity levels, Polygon Rendering Methods, Constant intensity shading, Gourad shading, Phong shading, Detail. (7L)

Module V

Visible Surface Detection Methods

Classification of Visible Surface Detection Algorithms, Back Face Detection, Depth Buffer Method, A-Buffer Method, Scan-Line Method, Depth Sorting Method, BSP-Tree Method & Area Subdivision Method. Octrees, Ray castiny method.

Graphical User Interfaces and Interactive Input Methods

The User Dialogues, Input of graphical data.

Computer Animation

Design of animation sequences, General computer animation functions, Raster animation, Computer animation languages, Key frame systems. (7L)

Text books:

Hearn D. & Baker M.P. , Computer Graphics, 2/e , Pearson Education, New Delhi, 2005.(T1)

Reference books:

Foley J.D. et. Al, A Fundamental of Computer Graphics, Addition Wesley, London, 1993.(R1)

Krishnamurthy N, Introduction to Computer Graphics, 1stEdn., TMH, 2002.(R2)

Rogers B., Mathematical elements of Computer Graphics, McGraw Hill, 1989.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	2	1	1	2	3	2	2
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	2	2	3	2	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS328
Course title: **Computer graphics lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

A.	Able to understand different hardware used for graphical requirement.
B.	Able to perform visual computations for geometrical drawings.
C.	Able to display 3D objects in a 2D display devices using projection techniques
D.	Able to create realistic images using color and shading techniques
E.	Able to model 3D objects

Course Outcomes
After the completion of this course, students will be able to:

1.	To list the basic concept used in Computer Graphics
2.	To describe the importance of viewing and projections.
3.	To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
4.	To design an application with the principles of Computer Graphics
5.	To define the fundamentals of animation, virtual reality and its related technologies.

Syllabus

1. Study of basic graphics functions defined in “graphics.h”.
2. Write a program to draw a line using Bresenham’s Algorithm
3. Write a program to draw a line using DDA Algorithm.
4. Write a program to draw a line using Mid-Point Algorithm.
5. Write a program to draw a Circle using Mid-Point Algorithm.
6. Write a program to draw a Ellipse using Mid-Point Algorithm.
7. Programs using 2-D transformations in C.
8. Implement Polygon filling algorithms [Flood-Fill Algorithm] in C.
9. Program for Cohen Sutherland Line clipping algorithm in C.
10. Write a program to implement reflection of a point, Line.
11. Write a program to rotate a circle around any arbitrary point or around the boundary of another circle.
12. Write a program to implement polygon filling.
13. Programs to study 3-D transformations in C.

Text books:

1. D. Hearn & M.P. Baker - Computer Graphics, 2/e , Pearson Education, New Delhi, 2005.

2. Prabat K Andleigh and KiranThakrar, “Multimedia Systems and Design”, PHI, 2005.

Reference books:

1. W.M. Newman. et. al.- Principle of Interactive Computer Graphics, McGraw Hill Publication, New Delhi, 1995.
2. S. Harrington -Computer Graphics- A Programming Approach, McGraw Hill Publication, New Delhi, 1994.
3. J.D. Foley et. al- A Fundamental of Computer Graphics Addition Wesley, London, 1993.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	3	2	1	2	1	2	2	1	2	3	3	2
CO2	3	3	3	2	2	1	2	1	1	1	2	2	2	3	3
CO3	3	2	2	2	3	2	2	2	2	2	3	2	3	3	3
CO4	3	3	3	2	3	2	2	1	2	1	1	1	2	2	1
CO5	2	3	3	2	3	3	3	3	3	2	3	3	3	3	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT340
Course title: **Machine Learning**
Pre-requisite(s): CS206 Design and Analysis of Algorithm
Co- requisite(s):NIL
Credits: L: 3 T: 1 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To understand the basic concept of machine learning.
2.	To explore the application of machine learning.
3.	To understand the concept of supervised learning.
4.	To learn the advantage of neural network.
5.	To learn the utility of clustering techniques.

Course Outcomes

After the completion of this course, students will be able to:

1.	Formulate machine learning problems corresponding to different applications: data, model selection, model complexity
2.	Demonstrate understanding of a range of machine learning algorithms along with their strengths and weaknesses
3.	Implement machine learning solutions to classification, regression, and clustering problems
4.	Design and implement various machine learning algorithms in a range of real-world applications
5.	Evaluate and analyse the performance of machine learning algorithm or a system based on machine learning algorithm.

Syllabus

Module I

Introduction to Machine learning

Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression. (8L)

Module II

Supervised Learning

Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts. (10L)

Module III
Neural Networks
Perceptions: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.
(8L)

Module IV
Unsupervised and Semi Supervised Learning
Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabeled data.
(8L)

Module V
Ensemble
Committees of multiple hypotheses, bagging, boosting, active learning with ensembles, (6L)

Text book:

1. Mitchell Tom, Machine Learning, Latest Edition, Mc-Graw Hill.(T1)

Reference books:

1. Shalev-Shwartz Shai and Ben-David Shai, Understanding Machine Learning, Cambridge University Press. 2017.(R1)
2. Bishop Christopher, Pattern Recognition and Machine Learning, Springer, 2006.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution

Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	1	2	1	1	1	1	1	1	1	2	3	1	1
CO2	3	3	2	2	1	1	1	1	1	1	1	2	3	3	1
CO3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	3	2
CO5	2	3	2	3	3	2	1	1	2	2	1	2	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT341
Course title: **Machine Learning Lab**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: 4
Branch: CSE/IT

Course Objectives:

This course enables the students:

A.	Make use of Data sets in implementing the machine learning algorithms
B.	To choose the appropriate machine learning design method for a specified application.
C.	Implement the machine learning concepts and algorithms in any suitable language of choice.
D.	Analyze and compare the different algorithms

Course Outcomes:

After the completion of this course, students will be able to:

1.	Gain knowledge about basic concepts of Machine Learning
2.	Identify machine learning techniques suitable for a given problem
3.	Solve the problems using various machine learning techniques
4.	Apply Dimensionality reduction techniques
5	Design application using machine learning techniques.

Syllabus:

1. Implement and demonstrate the FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct aBayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

Text Books:

Floreano, D. and Mattiussi, C., "Bio-Inspired Artificial Intelligence", MIT Press, 2008. (T1)

Neumann, F. and Witt, C., “Bioinspired Computation in combinatorial optimization: Algorithms and their computational complexity”, Springer, 2010. (T2)

Elben, A. E. and Smith, J. E., “Introduction to Evolutionary Computing”, Springer, 2010.(T3)

Goldberg, D. E., “Genetic algorithms in search, optimization, and machine learning”, Addison- Wesley, 1989.(T4)

Haykin, Simon O., “Neural Networks and Learning Machines”, Third Edition, Prentice Hall, 2008.(T5)

Reference Books:

Dorigo, M. and Stutzle, T., “Ant Colony Optimization”, A Bradford Book, 2004.(R1)
Ebelhart, R. C. et al., “Swarm Intelligence”, Morgan Kaufmann, 2001.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars

CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	2	3	2	1	1	2	1	2	3	3	2
CO2	3	3	2	3	3	3	2	1	1	1	1	2	3	2	2
CO3	3	3	3	3	3	2	1	1	1	2	1	2	3	3	2
CO4	3	3	3	3	2	2	1	1	1	2	1	2	3	3	3
CO5	3	3	3	3	3	3	3	1	1	2	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

OPEN ELECTIVES-II

COURSE INFORMATION SHEET

Course code: CS206
Course title: **Design and Analysis of Algorithm**
Pre-requisite(s): Data Structure
Co- requisite(s): Algorithms Lab
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II/2
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To analyze the performance of recursive and nor-recursive algorithms.
2.	To understand various algorithm design techniques.
3.	To use of different paradigms of problem solving.
4.	To find efficient ways to solve a given problem.
5.	To compare various algorithms of a given problem.

Course Outcomes
After the completion of this course, students will be able to:

1.	Define the concepts and mathematical foundation for analysis of algorithms.
2.	Explain different standard algorithm design techniques, namely, divide & conquer, greedy, dynamic programming, backtracking and branch & bound.
3.	Demonstrate standard algorithms for fundamental problems in Computer Science.
4.	Design algorithms for a given problem using standard algorithm design techniques.
5.	Analyze and compare the efficiency of various algorithms of a given problem.

SYLLABUS

Module I
Algorithms and Complexity
Introduction, Algorithm Complexity and various cases using Insertion Sort, Asymptotic Notations, Time complexity of Recursive Algorithm, Solving Recurrences using Iterative, Recursion Tree and Master Theorem. (8L)

Module II
Divide and Conquer
Discussion of basic approach using Binary Search, Merge Sort , Quick Sort , Selection in Expected linear time, Maximum Subarray , Matrix Multiplication , Introduction of Transform and Conquer and AVL Tree . (8L)

Module III
Dynamic Programming
Introduction and Approach, Rod Cutting, LCS, Optimal BST, Transitive closure and All-pair Shortest Path, Travelling Salesperson Problem. (8L)

Module IV
Greedy and other Design Approaches
Introduction to greedy using fractional knapsack, Huffman Code, Minimum Spanning Tree – Prim and Kruskal, Single Source Shortest Path Dijkstra's and Bellman-Ford, Introduction to Backtracking using N-Queens problem, Introduction to Branch and Bound using Assignment Problem or TSP. (8L)

Module V
NP Completeness and Other Advanced Topics
Non-deterministic algorithms – searching and sorting, Class P and NP, Decision and Optimization problem, Reduction and NPC and NPH, NP Completeness proof for: SAT, Max-Clique, Vertex Cover, Introduction to Randomized Algorithms, Introduction to Approximation Algorithms. (8L)

Text Book:

2. Cormen Thomas H. et al., Introduction to Algorithms. 3rd Edition, PHI Learning, latest edition.(T1)

Reference Books:

4 Horowitz E., Sahani, Fundamentals of Computer Algorithms, Galgotia Publication Pvt. Ltd. (R1)
5 Dave and Dave, Design and Analysis of Algorithms, 2nd Edition, Pearson. (R2)
6 Goodrich, Tamassia. Algorithm Design. Wiley. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: P10 will be met though report-writing/presentation-based assignment

Topics beyond syllabus/Advanced topics/Design: Teaching through paper

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through paper

CD #	Course Delivery methods
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars/ Quiz (s)
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids
CD6	Industrial/guest lectures
CD7	Industrial visits/in-plant training

CD8	Self- learning such as use of NPTEL materials and internets
CD9	Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	3	2	1	1	1	1	1	2	1	2	3	3	2
CO2	2	2	3	2	1	1	1	1	1	2	1	2	3	3	2
CO3	2	2	3	2	1	1	1	1	1	2	2	2	3	3	3
CO4	3	3	3	3	2	1	1	1	1	2	2	3	3	3	3
CO5	3	3	3	3	2	1	1	1	1	2	2	3	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS 275
Course title: Foundations of Data Structures
Pre-requisite(s):
Co- requisite(s):
Credits:3 L:3 T:0 P:0
Class schedule per week: 03
Class: B.Tech
Semester / Level: IV/2
Branch:

Course Objectives
This course enables the students:

1.	To Understand the necessity of Data Structures while solving the problem through Computer
2.	To Understand the limitations of Computer Program

3.	To acquire the knowledge of Abstract Data types and Representation in Computer Memory.
4.	To differentiate Array and Link list Implementation
5.	To Convert Practical Problems into Computer Compatible problems

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply in the Respective field of Different Discipline.
2.	Visualize the use of Linear and Non-Linear Data Structures
3.	Handle operations like searching, Sorting, insertion, deletion, traversing mechanism.
4.	Apply Concepts Learned to tackle the issue on Programming
5.	Choose/Select appropriate/suitable Data Structure for the given Problem.

Syllabus

Module I **[8 L]**

Introduction to Data Structures, Abstract data types, Time and space complexity,
Asymptotic Notations, Array Operations, Memory Representations of Multi-Dimensional Array.

Module II **[8 L]**

Stacks and Queue Operations, Applications of Stack and Queue,
Types of Queues and their Operations, Limitations, and applications

Module III **[8 L]**

Linear list – singly linked list implementation and its operations,
circular linked list implementation, Double linked list implementation,
insertion, deletion and searching operations on the types of Lists. Applications of linked lists.

Module IV **[8 L]**

Trees – Definitions, tree representation, properties of trees,
Types of Trees and their applications, tree traversals, tree implementation.
Graph, representations of graph, Types of Graphs, Operations and applications of Graph.

Module V **[8 L]**

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort,
quick sort, merge sort. Searching-linear and binary search,
comparison among sorting and searching methods.

Text Books:

1. Sahni Horwitz,, Freed Anderson, Fundamentals of Data Structures in C, 2nd Edition (or latest) , University Press.(T1)

Reference Books:

1. Thareja Reema, Data Structures Using C, 2nd Edition, Oxford University Press.(R1)
2. Tanenbaum, Langsam, Augenstein, Data Structures using C, Pearson. (R2)

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS &EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
✓ Continuous Internal Assessment	✓	✓	✓	✓	✓
✓ Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes**							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	1	3	2	3	1
CO2	3	1	3	3	2	2	2	1
CO3	2	2	1	1	2	2	3	1
CO4	3	2	1	3	3	1	2	1
CO5	2	3	2	3	3	2	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD3,CD6
CO3	CD1, CD3,CD6
CO4	CD1, CD3,CD6
CO5	CD2, CD3, CD6

COURSE INFORMATION SHEET

Course code:IT270
Course title**: Introduction to R**
Pre-
requisite(s): Nil
Co-
requisite(s):
Credits: L: 3
T:0 P:0
Class schedule per
week: 3Class: B.
Tech

Semester / Level: II
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To develop problem solving skills
2.	To learn programming and to solve problems using computers
3.	To learn Data Manipulation, Analysis and Visualization using Computers
4.	To introduce students to the key concepts and ideas of a statistical computing environment
	To introduce students to fundamental concepts in (scientific) programming in general.

Course Outcomes

After the completion of this course, students will be to do the following:

1.	Design programs with Interactive Input and Output, utilizing arithmetic expression, repetitions and decision making
2.	Design programs using the fundamental data structures in R
3.	Develop programs in R interfacing files and URLs
4.	Solve Mathematical problems using R
5.	Design graphs and simulations in R

Syllabus

Module I

Introduction- R reserved words, Variables and Constants, Operators, Operator Precedence

Getting Data In and Out of R –Accessing the Keyboard and Monitor, Reading in Larger Datasets. (6L)

Module II

Control Statements- if ..else, for loop, while loop, repeat loop, break and next

Data Structures- Vectors, Arrays, Matrices, Lists, Data Frames, Factors, Operations on Dates and Times. (7L)

Module III

Strings: Overview of String Manipulation Functions

Functions: Function Syntax, Environment and Scope, Recursive Function

Interfaces to the Outside World: File Connections, Reading Lines of a Text File Reading From a URL Connection. (7L)

Module IV

Maths in R- Math Functions, Functions for Statistical Distributions, Sorting, Linear Algebra Operations, Set Operations.

Simulation -Generating Random Numbers, Simulating a Linear Model, Random Sampling. (8L)

Module V

Graphics-Creating Graphs, Customising Graphs

Introduction to Object Oriented Features- Concept of Class and Object, S3 Classes, S4

Classes. (7L)

Text books:

Peng Roger D., R Programming for Data Science.(T1)
Matloff Norman, The Art of R Programming – A Tour of Statistical Software Design. (T2)

Reference books:

Grolemund Garret, Hands-On Programming with R. (R1)
Gardener Mark, Beginning R: The Statistical Programming Language.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	1	3	1	1	1				1	3	2	1
CO2	3	3	3	2	3	1	1	1				1	3	2	1
CO3	3	3	3	2	3	1	1	1		1	1	1	3	2	1
CO4	3	3	3	2	3		1	1		1	1	1	3	2	1
CO5	3	3	3	2	3	1	1	1	1	1	1		3	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT271

Course title: **Introduction to Python**

Pre-requisite(s):

Co- requisite(s):NIL

Credits: L: 3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To facilitate skills required to Install and run the Python interpreter
2.	To facilitate skills required to Create and execute Python programs
3.	To introduce the Understanding the concepts of file I/O
4.	To provide skills to read data from a text file using Python
5.	To discover the interesting patterns using appropriate Python visualization libraries

Course Outcomes
After the completion of this course, students will be able to do the following:

1.	Show how to convert the problems into algorithms
2.	Analyze and develop the algorithms to Python programs.
3.	Design programs with Interactive Input and Output, utilizing arithmetic expression repetitions, decision making, arrays.
4.	Develop modular Python programs using functions.
5.	Design programs using file Input and Output.

Syllabus
Module I **[6 L]**
Problem Analysis-Formal Definition of a Problem, Algorithms, Flowcharts, Examples for Algorithms and Flowcharts
Introduction to Python- Variables, Operators, Expressions, Evaluation of Expressions, String Operations, Input and Output functions
Module II **[7 L]**
Control Statements- Decision making statements, Iterative Statements, Loop Control Statements
Strings and Lists- String Operations, Tuples and Dictionaries-Operations and Examples
Module III **[7 L]**
Functions- Function Definition and Call, Mathematical functions, User defined Functions, Parameters and Arguments, Type Conversion and Coercion
Module IV **[8 L]**

Files – Different File Operations, File Object Attributes, Directories

Exceptions- Except clause, Exception with arguments, Raising an Exception, User Defined Exceptions

Module V **[7 L]**

Introduction to Classes and Objects- Object Oriented Features, Attributes, Instances, Garbage Collection

Text book:

1. Downey A., How to think like a computer scientist: Learning with Python.

Reference books:

1. Jose Jeeva, Taming Python by Programming, Khanna Publishing House.
2. Jose J. Introduction to Computing and Problem Solving with Python, (ISBN: 978-93-82609-810).

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty

2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	**Program Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	1	3	1	1	1				1	2	2	1
CO2	3	3	3	1	3	1	1	1				1	2	2	1
CO3	3	3	3	1	3	1	1	1		1	1	1	2	2	1
CO4	3	3	3	1	3		1	1		1	1	1	2	2	1
CO5	3	3	3	1	3	1	1	1	1	1	1		2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS271
Course title: **Cyber Law and Security**
Pre-requisite(s): Nil
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: II
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the necessity of cyber laws.
2.	To explore the Constitutional & Human Rights Issues in Cyberspace
3.	To understand the criteria for Cyber Stalking/Harassment
4.	To understand the different aspects of cyber crimes

Course Outcomes
After the completion of this course, students will be able to:

1.	Construct a strategy to Safeguard the society from cybercrime.
2.	Organize the evidence in terms of court terminology.
3.	Define the legal issues and its applications.
4.	Apply Computer forensics and digital detective and various processes, policies and procedures.
5.	Compose the techniques to produce data from computer and hand held devices.

Syllabus
Module I
Introduction
Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level.
Cyber Law - International Perspectives
UN & International Telecommunication Union (ITU) Initiatives, Council of Europe - Budapest Convention on Cybercrime, Asia-Pacific Economic Cooperation (APEC), Organization for Economic Co-operation and Development (OECD), World Bank, Commonwealth of Nations, Indian Context of Jurisdiction and IT Act, 2000, International Law and Jurisdictional Issues in Cyberspace. (8L)

Module II
Constitutional & Human Rights Issues in Cyberspace
Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace – Access to Internet, Right to Privacy, Right to Data Protection
Cyber Crimes & Legal Framework

Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under Indian IT Act, 2000. (8L)

Module III

Cyber Torts

Cyber Defamation, Different Types of Civil Wrongs under the IT Act, 2000

Intellectual Property Issues in Cyber Space

Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues. (8L)

Module IV

Introduction to Cybercrime, Classifications of Cyber Crimes, Local and Global perspectives on Cybercrime, Cyber offences, Cyberstalking, Cybercrime and cloud computing, cybercrimes through hand held devices., Tools and Methods used in Cybercrime, phishing, steganography, attacks on wireless network. (8L)

Module V

Understanding Digital forensic, Forensics science, computer forensics, and digital forensics. Criminalistics, Analysis of cyber-criminalistics area, Holistic approach to cyber-forensics, Computer forensic tools, Forensics of Hand held devices, tools for hand held device forensics., intellectual property in the cyberspace, The ethical dimension of Cybercrimes. (8L)

Text Books:

1. Reed Chris & Angel John, *Computer Law*, OUP, New York, 2007. (T1)
2. Singh Justice Yatindra, *Cyber Laws*, Universal Law Publishing Co, New Delhi, 2012. (T2)
3. Verma S, K, Mittal Raman, *Legal Dimensions of Cyber Space*, Indian Law Institute, New Delhi, 2004. (T3)
4. JonthanRosenoer, *Cyber Law*, Springer, New York, 1997. (T4)
5. Naib Sudhir, The Information Technology Act, 2005: A Handbook, OUP, New York, 2011.(T5)
6. Godbole Nina, BelapureSunit, Cyber Security, Wiley Indian Print, 2014.(T6)
7. Sammons John, The Basics of Digital Forensics, Elsevier.(T7)
8. Hyaes D.R., A Practical Guide to Computer Forensics Investigations , Person IT education 2014.(T8)

Reference Books:

1. Bhansali S. R., *Information Technology Act, 2000*, University Book House Pvt. Ltd.,Jaipur, 2003. (R1)
2. Deva Vasu, *Cyber Crimes and Law Enforcement*, Commonwealth Publishers, New Delhi, 2003. (R2)
3. Nelson Bil, Philips A, Stuarts Christopher, Guide to Computer Forensics and Investigations: Processing Digital evidence , Cengage Learning, 5th Edition 2015.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**	**Program Specific**

													Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	2	2	2	2				2	2	2	1
CO2	3	3	3	3	2	2	2	2				2	2	2	1
CO3	3	3	3	3	2	1	2	2		1	1	2	2	2	1
CO4	3	3	3	3	3	1	2	2		1	1	2	2	2	1
CO5	3	3	3	3	3	1	2	2	1	1	1	2	2	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

(SEMESTER VI-LABORATORIES)

COURSE INFORMATION SHEET

Course code: CS306
Course title: COMPILER DESIGN LAB
Pre-requisite(s):
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic component of Natural Language Processing.
2.	To explore the application areas of Natural Language Processing.
3.	To understand the idea of Language Modelling.
4.	To explore the basic concepts of Parts-of-speech Tagging.
5.	To understand the concepts of language modelling.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Apply different compiler writing tools to implement the different Phases.
CO2	Analyze the data flow and control flow.
CO3	Construct the intermediate representation.
CO4	Design and develop various modules of a compiler.
CO5	Develop modules of compiler using Lex and Yacc tools.

Syllabus

List of Programs as Assignments:

1. **Lab Assignment No: 1**

Objective: To Understand the concept of tokens.

Q1. C program to count white spaces, numbers, words in a file./

2. **Lab Assignment No: 2**

Objective: To Understand the process of identification of tokens.

Q1. C program to design Finite automata to identify different tokens(identifiers, constants, operators, etc.).

3. **Lab Assignment No: 3**

Objective: To have a brief Understanding to lex programming.

Q1. Count number of a's in given string.

Q2. Identify different patterns like aa, ab, not containing a, etc. in given string .

4. **Lab Assignment No: 4**

Objective: To Understand lex programming tool.

Q1. Lex program to Identify all tokens of C programs.

5. **Lab Assignment No: 5**

Objective: To Understand and Implement structure of any programming language.

Q1.Design and Code individual programming code with all possible tokens in programming language.

6. **Lab Assignment No: 6**

Objective: To Understand lex programming tool in depth.

Q1. Starting and ending with 'a'.

Q2. # a's divisible by 2 or b's divisble by 3.

Q3. 4th Symbol 'a' from RHS.

Q4. Output code after removing white spaces and comment.

7. **Lab Assignment No: 7**

Objective: To Understand and Implement Parser using yacc.

Q1. Build parsers using yacc for L(G)={$a^n b^n \mid n >= 1$} over {a,b}

8. **Lab Assignment No: 8**

Objective: To Understand and Implement parser for different grammars.

Q1.Build Parser using yacc for L(G) where rule set of G is { S ->aSb, S->bSa, S->c} over {a,b,c}.

9. **Lab Assignment No: 9**

Objective: To Understand and Implement parser coding.

Q1. Build parser using yacc to convert the infix expression to postfix expression.

10. **Lab Assignment No: 10**

Objective: To Understand and Implement parser coding.

Q1. Build a calculator in yacc which takes expression in postfix notation.

Q2. Build parsers using yacc to convert the prefix expression into the postfix expression.

11. **Lab Assignment No: 11**

Objective: To Understand and Implement parser for validation and operations.

Q1. Build parsers using yacc to validate the C statements. E.g int a,b,c;(valid)

Q2. Build calculator in yacc.

Books recommended:

Text books

lex&yacc (2nd ed.) :O'Reilly & Associates, Inc. Sebastopol, CA, USA ©1992 . **(T1)**

Reference books

Lex &Yacc:O'Reilly & Associates, Inc. Sebastopol, CA, USA ©1992. **(R1)**

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	1	3	3	2	2	1	1	1	1	2	3	2	2
CO2	2	2	1	2	2	1	1	1	1	1	1	1	2	2	2
CO3	2	3	2	3	3	1	1	1	1	1	2	2	3	3	3
CO4	3	2	2	1	3	1	1	1	1	1	1	2	2	2	1
CO5	3	3	3	3	2	1	1	1	1	1	1	2	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD2,CD3
CO2	CD1, CD2,CD3
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD5
CO5	CD1,CD2,CD4

COURSE INFORMATION SHEET

Course code: CS308
Course title: **Mobile Interface Lab**
Pre-requisite(s):
Co- requisite(s): NIL
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To introduce Android platform and its Architecture.
2.	To learn activity creation and Android UI designing.
3.	To be familiarized with Intent, Broadcast receivers and Internet services.
4.	To integrate multimedia, camera and Location based services in Android Application.
5.	To explore Mobile security issues.

Course Outcomes
After the completion of this course, students will be able to:

1.	Describe Android platform, Architecture and features.
2.	Design User Interface and develop activity for Android App.
3.	Design and implement Database Application and Content providers.
4.	Use multimedia, camera and Location based services in Android App.
5.	Discuss various security issues in Android platform.

Syllabus

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of database.
5. Develop a native calculator application.
6. Implement an application that implements Multi-threading.
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock.

Text books:

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer 2006.

Reference books:

4. Introduction to Statistical Learning, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 2013.
5. Pattern Classification, 2nd Ed., Richard Duda, Peter Hart, David Stork, John Wiley & Sons, 2001.

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**

Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	3	3	2	3	1	2	1	2	1	1	2	1	2
CO2	3	2	3	3	2	1	2	3	2	1	3	2	2	3	2
CO3	3	3	1	3	2	1	3	3	3	2	1	2	3	2	2
CO4	2	3	3	2	2	2	2	2	2	2	2	1	3	2	2
CO5	3	3	3	1	2	3	1	1	2	3	2	2	3	2	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method

CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT404
Course title: **Intellectual Property Rights and Cyber Laws**
Pre-requisite(s):
Co- requisite(s):
Credits: L: 2 T:0 P: 0
Class schedule per week: 2
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Outcomes
After the completion of this course, students will be:

1.	Understand the importance of Intellectual property, their implications and their types.
2.	Identify the process for registration and use of copyrights and patents and the rights involved with them.
3.	Discover the functioning of trademarks and domain names, the rights of the holders and process of dispute resolution.
4.	Assess the importance and procedure for registration of Designs and Geographical Indications, the rights of the owner and arbitration process.
5.	Develop an understanding of the Cyber Laws, trends in Cyber crimes and procedures to tackle them.

Syllabus
Module I

Introduction to Intellectual Property, Justifications for protection of IP, Major forms of IP- Copyright; Patent; Trade Marks; Designs; Geographic indication; Semi conductors; Plant varieties, Berne Convention, Paris Convention, TRIPS

Module II

Copyrights- Historical development of copyright, Original literary, dramatic, musical, artistic works, Cinematograph films, Sound recordings, Ownership of copyright, Term of copyright, Infringement of copyright, Exceptions of infringement, Remedies, Registration

Patents- Historical development of patents, Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Revocation, Infringement of patents, Remedies

Module III

Trade Marks and Domain Names - Historical development of trademarks, Functions of marks, Concept of distinctiveness, Absolute grounds of refusal, Procedure for registration, Term of mark, Rights of holder, Assignment and licensing of marks, Infringement, Passing Off, Domain Name Protection, Domain Name Disputes, Cyber squatting, Arbitration

Module IV

Designs- meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.

Geographical Indications- meaning and its evolution, Difference between GI and Trade Marks, Registration, Rights, Authorised user

Module V

Cyber Law- Need for Cyber Law, Cyber Jurisprudence at International and Indian Level, Cyber Crime and IT Act 2000, Nature of cyber criminality, Strategies to tackle cyber crime and Trends, Defamation, Harassment and Email abuse, Law of Digital Contracts, The System of Digital Signatures

Text books:

1. Deborah E. Bouchoux, Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, Delmar Cengage Learning, 4th Edition, 2013.
2. Vivek Sood, Cyber Law Simplified, Tata McGraw-Hill Publishing, Fourth Reprint, 2008.

Reference books:

1. Miller and Davis' Intellectual Property, Patents, Trademarks, and Copyright in a nutshell, West Publishing, 5th edition, 2012.
2. William Rodolph Cornish, David Llewelyn, Tanya Frances Aplin, Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights, Sweet & Maxwell, 7th Edition, 2010.
3. Henri J. A. Charmasson, John Buchaca, Patents, Copyrights and Trademarks For Dummies, Wiley, 2nd Edition, 2008.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

<u>Topics beyond syllabus/Advanced topics/Design:</u>N/A

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course	**Program Outcomes (POs)**	**Program**

Outcome													Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1			1	1	1	3	3	3	1	3	2	2	1	1	2
CO2				1	1	3	3	2	1	3	2	2	1	1	2
CO3				1	1	1	3	3	1	3	2	2	1	1	2
CO4		2	2	1	1	3	2	2	1	3	2	2	1	1	2
CO5		2	2	1	1	3	3	3	1	3	2	1	1	1	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

PROGRAM ELECTIVE –III

COURSE INFORMATION SHEET

Course code: IT420
Course title: **Artificial Intelligence**
Pre-requisite(s): IT201 Basics of Intelligent Computing
Credits: L:3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/ IT

Program Outcome

This course enables the students to:

1.	An ability to apply knowledge of mathematics, science and engineering to both software and hardware design problems.
2.	An ability to design and conduct experiments and to analyze and interpret data related to software and hardware design solutions.
3.	An ability to design a system, component or process to meet desired needs within realistic constraints.
4.	An ability to function on multidisciplinary teams using current computer engineering tools and technologies.

5.	An ability to identify, formulate and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics.

Course Outcomes

After the completion of this course, students will be to:

1.	Analyze the principles and approaches of artificial intelligence and understand different aspects of Intelligent agent.
2.	Apply different search techniques for solving real world problems and select the most appropriate solution by comparative evaluation.
3.	Analyze the various concepts of knowledge representations and demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
4.	Develop a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, Robotics etc.
5.	Explain various types of LISP and PROLOG programs and explore more sophisticated LISP and PROLOG code.

Syllabus

Module I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem.

Intelligent Agents: Agents & Environment, Nature Of Environment, Structure Of Agents, Goal Based Agents, Utility Based Agents, Learning Agents.

Problem Solving: Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs. (9L)

Module II

Search Techniques: Solving Problems By Searching, Problem Solving Agents, Searching For Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.

Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems.

Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Mini Max Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening. (9L)

Module III

Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation.

Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction.

Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge. (7L)

Module IV

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory.
Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning.
Learning: Forms Of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning. (8L)

Module V
Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.
Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains. (6L)

Text Books:

Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3rd edition, Pearson Education.(T1)
Rich E. & Knight K., Artificial Intelligence, 3rd edition, TMH, New Delhi.(T2)

Reference books:

Patterson Dan W., Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.(R1)
Rolston D.W., Principles of AI & Expert System Development, TMH, New Delhi.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	1	2	1	3	2	3	2
CO2	3	2	2	3	3	2	1	1	3	3	2	3	2	2	1
CO3	3	2	2	2	3	2	2	2	3	3	1	3	2	3	2
CO4	2	3	2	2	2	3	2	1	3	3	1	3	2	2	3
CO5	3	3	2	3	2	3	2	2	2	1	2	2	2	2	3

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT421
Course title: **Artificial Intelligence Lab**
Pre-requisite(s): IT420 Artificial Intelligence, Data Structure And Database Management System
Credits: L:0 T: 0 P: 1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV

Course Objectives
This course enables the students to:

1.	To familiarize the student in introducing AI Problems
2.	Develop mathematical thinking and problem-solving skill using AI
3.	To enable the student on how to approach for solving Engineering problems using simulation tools.
4.	To provide a foundation so as to use AI techniques in real world puzzle solving

Course Outcomes
After the completion of this course, students will be able to:

CO1	Apply AI techniques to different complex problems using programs.
CO2	Create knowledge base and serve their applications in different fields.
CO3	Implement perfect and better heuristics for different applications.
CO4	Analyze and Implement real world complex problems.
CO5	Create Expert systems

SYLLABUS

List of Programs as Assignments:

PUZZLE SOLVING:

12. **Lab Assignment No: 1**
   Objective: To understand and solve simple AI problems.

To solve Tic-Tac-Toe problem such that computer always win.
(Min-Max Search)

13. **Lab Assignment No: 2**
    Objective: To understand and solve simple AI problems.
    To solve Monkey-Banana Problem

14. **Lab Assignment No: 3**
    Objective: To understand and solve simple AI problems.
    To solve Missionaries and Cannabal Problem.

15. **Lab Assignment No: 4**
    Objective: To understand and solve simple AI problems.
    To solve Water-Jug problem.

SEARCHING PROBLEM: 8-PUZZLE OR 8-QUEEN

16. **Lab Assignment No: 5**
    Objective: To Understand blind search algorithms.
    Q1.Toimplement Depth First Search (DFS)
    Q2. To implement Breadth First Search (BFS)
17. **Lab Assignment No: 6**
    Objective: To apply DFS in problems.
    To solve Hill Climbing
18. **Lab Assignment No: 7**
    Objective: To apply BFS in problems.
    To solve Best First Search
19. **Lab Assignment No: 8**
    Objective: To understand and implement informed search algorithms.
    To solve A*.
20. **Lab Assignment No: 9**
    Objective: To understand and implement informed search algorithms.
    To solve AO*.

OTHER PROBLEMS:

21. **Lab Assignment No: 10**
    Objective: To implement real world Games.
    Chess Playing (Computer vs Human)
22. **Lab Assignment No: 11**
    Objective: To implement real-world Games.
    Sudoku Puzzle

Books recommended:

TEXT BOOKS

2. Prolog Programming by Bratko, PHI publishing.
3. Dan W. Patterson - Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	1	2	1	3	2	3	2
CO2	3	2	2	3	3	2	1	1	3	3	2	3	2	2	1
CO3	3	2	2	2	3	2	2	2	3	3	1	3	2	3	2
CO4	2	3	2	2	2	3	2	1	3	3	1	3	2	2	3
CO5	3	3	2	3	2	3	2	2	2	1	2	2	2	2	3

COURSE INFORMATION SHEET

Course code: IT423
Course title: **Internet of Things(IoT)**
Pre-requisite(s): IT201 Basics of Intelligent Computing
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the IoT Components and its capabilities
2.	Explain the architectural view of IoT under real world constraints

3.	Analyse the different Network and link layer protocols
4.	Evaluate and choose among the transport layer protocols
5.	Design an IoT application

Syllabus

Module I

Introduction to IOT

The definition of the Internet of Things, main assumptions and perspectives. Platform for IoT devices Device architectures. Conventional and renewable power sources for resource-constrained devices. Operating systems for resource-constrained devices. (8L)

Module II

Architecture of IOT

Node structure: Sensing, Processing, Communication, Powering IOT networking: Topologies, Layer/Stack architecture, The data link layer for IoT- Wireless communication technologies. Wire communication technologies. Manet Networks.

(8L)

Module III

Communication Technologies

Introduction to ZigBee, BLE, WiFi, LTE, IEEE 802.11ah, Discuss data rate, range, power, computations/bandwidth, QoS, Service oriented protocols (COAP). Communication protocols based on the exchange of messages (MQTT). Service discovery protocols. (8L)

Module IV

M2M and IoT Technology Fundamentals

Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management. (8L)

Module V

The data processing for IoT

Organization of data processing for the Internet of things. Cloud computing. Fog computing. Application case studies: Smart Grid. Home Automation. Smart City. (8L)

Text books:

Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.(T1)

Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.(T2)

Reference books:

Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.(R1)

Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.(R2)

<u>**Gaps in the syllabus (to meet Industry/Profession requirements):**N/A</u>

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	2	3	1	2	1	2	1	1	2	2	2	2
CO2	2	3	3	3	2	2	1	1	1	1	1	2	2	3	2
CO3	2	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO4	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2
CO5	2	3	3	3	2	1	1	2	1	1	1	3	3	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT424
Course title: **Internet of Things(IoT) Lab**
Pre-requisite(s): IT423 Internet of Things(IoT)
Co-requisite(s):
Credits: L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes

After the completion of this course, students will be:

1.	Identify the IoT Components and its capabilities
2.	Explain the architectural view of IoT under real world constraints
3.	Analyse the different Network and link layer protocols
4.	Evaluate and choose among the transport layer protocols
5.	Design an IoT application

List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Glowing LEDs.
   Toggling LED's.
2. **Lab Assignment No: 2**
   Transmitting a string through UART
   Controlling LEDs blinking pattern through UART.
3. **Lab Assignment No: 3**
   Echo each character typed on HyperTerminal
   Digital IO configuration.
   Timer based LED Toggle.
4. **Lab Assignment No: 4**
   Scanning the available SSID's in the range of Wi-FI Mote.
   Connect to the SSID of choice
5. **Lab Assignment No: 5**
   Demonstration of a peer to peer network topology.
   check the connectivity to any device in the same network.
6. **Lab Assignment No: 6**
   Send hello world to TCP server existing in the same network
   Reading of atmospheric pressure value from pressure sensor.
7. **Lab Assignment No: 7**
   I2C protocol study
   Reading Temperature and Relative Humidity value from the sensor.
   Reading Light intensity value from light sensor.
8. **Lab Assignment No: 8**
   Proximity detection with IR LED.
   Generation of alarm through Buzzer.
9. **Lab Assignment No: 9**
   Timestamp with RTC
   IO Expander.
   Relay control.
10. **Lab Assignment No: 10**
    I2C based 12-channel ADC
    EEPROM read and write
11. **Lab Assignment No: 11**

Transmitting the measured physical value from the UbiSense Over the Air.

Text books:

Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.(T1)

Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.(T2)

Reference books:

Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.(R1)

Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	2	3	1	2	1	2	1	1	2	2	2	2
CO2	2	3	3	3	2	2	1	1	1	1	1	2	2	3	2
CO3	2	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO4	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2
CO5	2	3	3	3	2	1	1	2	1	1	1	3	3	2	2

COURSE INFORMATION SHEET

Course code: IT307
Course title: **Image Processing**
Pre-requisite(s): Discrete Mathematics,
Co- requisite(s): Data Structures
Credits: L: 3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level:
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept of Digital Image Processing
2.	To Learn the Fourier Transform& its application
3.	Understand the basic components of filters
4.	Understand the basic concept of Image Compression Fundamentals

5.	Understand the basic concept of Image Segmentation.

Course Outcomes

After the completion of this course, students will be:

1.	Understand the concept of image formation, digitization, and role human visual system plays in perception of image data and spatial filtering techniques for enhancing the appearance of an image.
2.	Acquire an appreciation for various frequency based filtering techniques for enhancing the appearance of an image, duly applying them in different applications.
3.	Discern the difference between noise models, gain an insight into assessing the degradation function and realize different spatial and frequency based filtering techniques for reduction and removal of noise.
4.	Synthesize a solution to image compression using the concept of information theory and lossless and lossy compression techniques.
5.	Design and create practical solutions using morphological and image segmentation operators for common image processing problems and assess the results.

Syllabus

Module I **[8 L]**

Introduction to Digital Image Processing, Elements of Visual Perception, Image Sensing & Acquisition, Sampling and Quantization, Basic Relationships between Pixels, Intensity Transformations, Histogram Processing, Spatial Convolution & Correlation, Smoothing Spatial Filters, Sharpening Spatial Filters.

Module II **8 L]**

Introduction to the Fourier Transform, Discrete Fourier Transform, Properties of the Two-Dimensional Fourier Transform, Image Smoothing using Frequency Domain filters, Image Sharpening using Frequency Domain filters, Selective Filtering, Basics of Fast Fourier Transform, Basics of: Walsh- Hadamard Transform; K-L Transform; Discrete Cosine Transform.

Module III **[8 L]**

Model of Image Degradation/Restoration Process, Noise Probability Density Functions, Restoration in presence of Noise only, Periodic Noise Reduction using Frequency Domain filtering, Circulant Matrices, Block Circulant Matrices, Unconstrained Restoration, Constrained Restoration, Basics of Inverse Filtering

Module IV **[8 L]**

Image Compression Fundamentals – Coding Redundancy, Interpixel Redundancy, Psychovisual Redundancy, Fidelity Criteria, Image Compression Models– Source Encoder and Decoder, Channel Encoder and Decoder, Elements of Information Theory, Error-Free Compression – Variable-Length Coding, Bit-Plane Coding, Lossless Predictive Coding. Lossy Compression – Lossy Predictive Coding, Transform Coding.Color Fundamentals, Color Models, Basics of Full Color Image Processing

Module V **[8 L]**

Morphological Image Processing-Preliminaries, Dilation and Erosion, Opening and Closing, Hit-or-Miss Transformation, Boundary Extraction, Hole Filling, Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning

Image Segmentation- Fundamentals,Point, Line and Edge Detection, Thresholding, Region Based Segmentation, Segmentation based on color.

Text books:

1. Rafael. C. Gonzalez & Richard E. Woods- Digital Image Processing, 3/e Pearson Education, New Delhi - 2009

Reference books:

1. W.K.Pratt-Digital Image Processing, 4/e, John Wiley & sons, Inc. 2006.
2. M. Sonka et al. Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
3. Jayaraman, Digital Image Processing, Tata McGraw-Hill Education, 2011

ii.

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty

2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	2		1					2	3	3	2
CO2	3	3	3	2	2	1	1					2	3	3	2
CO3	3	3	3	3	2	1	1					2	3	3	2
CO4	3	3	3	3	2	1	1					2	3	3	2
CO5	3	3	3	3	3	2	1	1	1	1		2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: IT309
Course title: **Image Processing Lab**
Pre-requisite(s): Discrete Mathematics,
Co- requisite(s): Data Structures
Credits: L: 3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level:
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept of Digital Image Processing
2.	To Learn the Fourier Transform& its application
3.	Understand the basic components of filters
4.	Understand the basic concept of Image Compression Fundamentals
5.	Understand the basic concept of Image Segmentation.

Course Outcomes
After the completion of this course, students will be:

1.	Understand the concept of image formation, digitization, and role human visual system plays in perception of image data and spatial filtering techniques for enhancing the appearance of an image.
2.	Acquire an appreciation for various frequency based filtering techniques for enhancing the appearance of an image, duly applying them in different applications.
3.	Discern the difference between noise models, gain an insight into assessing the degradation function and realize different spatial and frequency based filtering techniques for reduction and removal of noise.
4.	Synthesize a solution to image compression using the concept of information theory

	and lossless and lossy compression techniques.
5.	Design and create practical solutions using morphological and image segmentation operators for common image processing problems and assess the results.

Syllabus

1. Write a C Program to display header information of 16 color .bmp image.
2. Program to enhance image using image arithmetic and logical operations.
3. Program for an image enhancement using pixel operation.
4. Program for gray level slicing with and without background.
5. Program for image enhancement using histogram equalization.
6. Program to filter an image using averaging low pass filter in spatial domain.
7. And median filter.
8. Program to sharpen an image using 2-D laplacian high pass filter in spatial
9. domain.
10. Program for detecting edges in an image using Roberts cross gradient
11. operator and sobel operator.
12. Program for smooth an image using low pass filter in frequency domain . (Butterworth lpf)
13. Program for smooth an image using high pass filter in frequency domain . (Butterworth hpf)
14. Program for morphological image operations-erosion, dilation, opening & closing.
15. Program for illustrating color image processing.
16. Program for image Watermarking.

Text books:

2. Rafael. C. Gonzalez & Richard E. Woods- Digital Image Processing, 3/e Pearson Education, New Delhi - 2009

Reference books:

1. W.K.Pratt-Digital Image Processing, 4/e, John Wiley & sons, Inc. 2006.
2. M. Sonka et al. Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition, 2007.
3. Jayaraman, Digital Image Processing, Tata McGraw-Hill Education, 2011

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	3	2	2	2			2	1	2	2	3	3	2
CO2	3	3	3	2	2	1			2	1	2	2	3	3	2

CO3	3	3	3	3	2	1			2	1	2	2	3	3	2
CO4	3	3	3	3	2	1			2	1	2	2	3	3	2
CO5	3	3	3	3	3	2	1	1	2	1	2	2	3	3	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CS494
Course title: Big Data Analytics
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To provide an overview of approaches facilitating data analytics on huge datasets in different domain.
2.	To provide the knowledge on NoSQL and different partitioning method to handle large datasets.
3.	To provide an overview of Apache Hadoop and HDFS Concepts and Interfacing with HDFS
4.	To understand Map Reduce Jobs in Hadoop framework
5.	To provide the knowledge of various Hadoop based tool for processing large datasets.

Course Outcomes

After the completion of this course, students will be able to:

1.	Describe big data and use cases from selected business domains
2.	Explain NoSQL big data management
3.	Install, configure, and run Hadoop and HDFS
4.	Perform map-reduce analytics using Hadoop
5.	Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics

Syllabus

Module I

Introduction

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics. (8L)

Module II

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations. (8L)

Module III

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures. (8L)

Module IV

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats. (8L)

Module V

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries. (8L)

Text Books:

Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.(T1)
P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.(T2)
Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.(3)

Reference Books:

Sammer ,E., "Hadoop Operations," O'Reilley, 2012.(R1)
Capriolo ,E., Wampler ,D., and Rutherglen ,J., "Programming Hive," O'Reilley, 2012.(R2)
George ,L., "HBase: The Definitive Guide," O'Reilley, 2011.(R3)
Gates ,A., "Programming Pig," O'Reilley, 2011.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√

Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	1	1	1	1	1	1	1	1	2	3	1	1
CO2	2	2	2	2	3	1	1	1	2	2	2	2	2	2	3
CO3	2	2	2	1	3	2	2	2	3	2	1	2	3	2	3
CO4	3	2	3	2	3	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	2	2	2	2	2	3	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7

CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS495
Course title: Big Data Analytics Lab
Pre-requisite(s): CS494 Big Data Analytics
Co- requisite(s):
Credits: L:0 T: 0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	To implement MapReduce programs for processing big data
2.	To realize storage of big data using H base, Mongo DB
3.	To analyze big data using linear models
4.	To analyze big data using machine learning techniques such as SVM Decision tree classification and clustering

Course Outcomes

After the completion of this course, students will be able to:

CO1	Process big data using Hadoop framework
CO2	Build and apply linear and logistic regression models
CO3	Perform data analysis with machine learning methods
CO4	Perform graphical data analysis
CO5	Simulate basic Engineering problems

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1
Objective:
Q1. To draw and explain Hadoop Architecture and Ecosystem with the help of a case study using WorkCount example. To define and install Hadoop.
Lab Assignment No: 2
Objective:
Q1. To implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, Retrieving files, Deleting files
Lab Assignment No: 3
Objective:
Q1.To run a basic Word Count MapReduce program to understand MapReduce Paradigm: To count words in a given file, to view the output file, and to calculate execution time.
Lab Assignment No: 4
Objective:
Q1. Implement word count / frequency programs using MapReduce
Lab Assignment No: 5
Objective:
Q1.To study and implement basic functions and commands in R Programming.
Lab Assignment No: 6
Objective:
Q1. To implement Bloom Filters for filter on Stream Data in C++/java.
Lab Assignment No: 7
Objective:
Q1.To implement Bloom Filters for filter on Stream Data in C++/java.
Lab Assignment No: 8
Objective:
Q1.To implement clustering program using R programming.
Lab Assignment No: 9
Objective:
Q1. Visualize data using any plotting framework
Lab Assignment No: 10
Objective:
Q1.Implement an application that stores big data in Hbase / MongoDB / Pig using Hadoop / R.

Books recommended:

TEXT BOOKS
VigneshPrajapati, “Big Data Analytics with R and Hadoop”, Packet Publishing

REFERENCE BOOKS
1. Tom White, “Hadoop: The Definitive Guide”, Second Edition, O’Reilly Yahoo Press

2. Robert D. Schneider, “Hadoop for Dummies”, Wiley.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	1	1	1	1	1	1	1	1	2	3	1	1
CO2	2	2	2	2	3	1	1	1	2	2	2	2	2	2	3
CO3	2	2	2	1	3	2	2	2	3	2	1	2	3	2	3
CO4	3	2	3	2	3	2	2	2	2	2	2	2	3	3	3
CO5	3	3	3	3	3	2	2	2	2	2	3	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

COURSE INFORMATION SHEET

Course code: IT426
Course title: **Data Mining Concepts and Technique**
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Examine the types of the data to be mined and apply pre-processing methods on raw data.
2.	To introduce the basic concepts of Data Warehouse and Data Mining techniques
3.	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data
4.	Prepare students for research in the area of data mining and related applications and Enhance students communication and problem solving skills
5.	Provide the students with practice on applying data mining solutions using common data mining software tool /programming languages.

Course Outcomes
After the completion of this course, students will be able to:

1.	Illustrate the fundamentals of data mining systems as well as issues related to access and retrieval of data at scale.
2.	Explain the various data mining functionalities and data warehousing techniques.
3.	Apply the various data mining techniques to solve classification, clustering and association rule mining problems.
4.	Analyze and choose among different approaches of a data mining task.
5.	Design and evaluate data mining models to be used in solving real life problems, keeping in view social impacts of data mining.

Syllabus
Module I
Data Mining: Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation. (6L)

ModuleII

Data Warehouse: Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining.Data Cube Computation and Data Generalization. (8L)

Module III

Mining Association Rules in Large Databases: Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining. (10L)

Module IV

Classification and Prediction: Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule Analysis, Other Classification Methods, Prediction, Classification Accuracy. (8L)

Module V

Cluster Analysis: Introduction , Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Method - k- Medoids Algorithm, CLARANS, Hierarchical Methods - BIRCH, ROCK Density-Based Methods - DBSCAN, Grid-Based Methods – STING, WaveCluster. Outlier Analysis. (8L)

Text book:

Han Jiawei &Kamber Micheline - Data Mining Concepts & Techniques, 2^{nd} Edition, Publisher Harcout India. Private Limited.(T1)

Reference books:

Gupta G.K., Introduction to Data Mining with case Studies, PHI, New Delhi, 2006.(R1)
Berson A. & Smith S. J., Data Warehousing Data Mining, COLAP, TMH, New Delhi, 2004.(R2)
Dunham H.M. & Sridhar S., Data Mining, Pearson Education, New Delhi, 2006.(R3)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>N/A

<u>POs met through Gaps in the Syllabus:</u>N/A

<u>Topics beyond syllabus/Advanced topics/Design:</u>N/A

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
<u>Direct Assessment</u>

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	2	2	2	1	2	2	1	1	3	3	1
CO2	2	3	2	3	2	2	1	2	2	2	2	1	2	2	2
CO3	2	3	3	3	3	3	3	2	3	2	3	1	2	2	3
CO4	3	2	2	3	3	2	2	1	3	2	2	2	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT427
Course title: **Data Mining Concepts and Technique Lab**
Pre-requisite(s): IT426 Data Mining Concepts and technique
Co- requisite(s):
Credits: L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Explain about the necessity of preprocessing and its procedure.
2.	Generate and evaluate Association patterns
3.	Solve problems using various Classifiers
4.	Learn the principles of Data mining techniques and various mining algorithms.
5.	Learn about traditional and modern data driven approach and problem solving techniques for various datasets

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand Data Warehousing and Data Mining and its applications and challenges and Create mini data warehouse.
CO2	Apply the association rules for mining applications .
CO3	Identify appropriate Classification techniques for various problems with high dimensional data.
CO4	Implement appropriate Clustering techniques for various problems with high dimensional data sets.
CO5	Implement various mining techniques on complex data objects.

SYLLABUS

List of Programs as Assignments:

Q1. Build a Data Warehouse and Explore WEKA tool.

Q2. Demonstration of preprocessingon various datasets.

Q3.Demonstration of Association rule process on dataset using apriori algorithm.

Q4.Demonstrate performance of classification on various data sets.

Q5. Demonstrate performance of clustering on various data sets.

Q6. Demonstrate performance of Regression on various data sets

Q7. Implement following algorithms for various datasets

A. Apriori Algorithm.
B. FP-Growth Algorithm.
C. K-means clustering.

Q8. Implement Bayesian Classification for various datasets

Q9 Implement Decision Tree for various datasets.

Q10. Implement Support Vector Machines.

Q11 Applications of classification for web mining.

Q12. Case Study on Text Mining or any commercial application

Books recommended:

Text Books :

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcout India. Private Limited.

Reference Books :

1. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
2. A. Berson& S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004.
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3	1
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2	2

CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	3
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

PROGRAM ELECTIVES-IV

COURSE INFORMATION SHEET

Course code: IT428
Course title: **Information Retrieval**
Pre-requisite(s): Design of Algorithms
Co- requisite(s): NIL
Credits: L: 3 T: 1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	To understand the basic component of data retrieval.
2.	To explore the application areas of information retrieval.
3.	To understand the idea of indexing and pre-processing of data.
4.	To explore the different IR evolution techniques.
5.	To understand the concepts of Query Expansion techniques.

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain the working of a search engine and details of the individual components.
2.	Apply efficient techniques for the indexing of documents
3.	Implement various indexing, scoring, ranking and relevance feedback models and techniques for information retrieval
4.	Develop a complete IR system from scratch
5.	Evaluate and analyse the performance of a retrieval systems using a suitable test collection

Syllabus
Module I
Introduction
Introduction; Search Engine Architecture; An overview of crawling, text transformation, index creation, user interaction, ranking, link analysis, evaluation and deep web. (8L)
Module II
Pre-processing and Indexing
Pre-processing: tokenization, stop word, normalization, stemming, wildcard queries, spelling correction – edit distance and k-gram; Indexing: Index construction; Index compression. (12L)
Module III
Scoring
Parametric and zone indexes; term frequency and weighting; vector space model; efficient scoring and ranking; vector space scoring. (8L)
Module IV
IR Evaluation
Evaluation; Standard test collection; Evaluation of unranked and ranked retrieval; Assessing relevance; System quality and user utility. (6L)
Module V
Relevance Feedback and Query Expansion
Relevance feedback and pseudo relevance feedback; query reformulation. (6L)

Text book:

Manning, Christopher D., Raghavan Prabhakar, and SchützeHinrich, “Introduction to Information Retrieval”, Cambridge: Cambridge University Press, 2008.(T1)

Reference books:

Grossman David A., Frieder Ophir “Information Retrieval: Algorithms and Heuristics”, Springer.(R1)

Croft Bruce, Metzler Donald, and Strohman Trevor “Search Engines: Information Retrieval in Practice”, Pearson Education, 2009.(R2)

Ricardo Baeza-Yates and Neto Berthier Ribeiro “Modern Information Retrieval”, 2nd Edition, Addison-Wesley, 2011.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	3	2	2	1	1	2	2	1	1	3	3	2
CO2	3	3	2	3	3	2	2	1	3	2	1	1	2	3	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3
CO4	3	3	3	2	2	3	3	1	2	2	2	2	3	3	2
CO5	2	3	3	3	3	3	2	1	2	2	2	1	2	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT438
Course title: **Information Retrieval Lab**
Pre-requisite(s): NIL
Co- requisite(s): Information Retrieval
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	To understand the basic component of data retrieval.
2.	To explore the application areas of information retrieval.

3.	To understand the idea of indexing and pre-processing of data.
4.	To explore the different IR evolution techniques.
5.	To be familiar with current R&D scenario in information retrieval.

Course Outcomes

After the completion of this course, students will be able to:

1.	Explain the working of a search engine and details of the individual components.
2.	Apply efficient techniques for the indexing of documents
3.	Implement various indexing, scoring, ranking and relevance feedback models and techniques for information retrieval
4.	Develop a complete IR system from scratch
5.	Evaluate and analyse the performance of a retrieval systems using a suitable test collection

Syllabus

List of Assignments

1. Assignment on making a corpus and preprocessing: (a) search the web using a recent event and collect 50 news articles from various sources – this collection is 'myCorpus', (b) perform stop word removal and stemming of the documents.
2. Assignments on term-document matrix: Build term-document matrix using 'myCorpus' and top N frequent terms. Now find similarity between the documents using any distance metric.
3. Vary N and choose other distance matrices and perform experiments. Find two documents that have the highest similarity and two documents having the lowest similarity. Manually verify the documents and comment on the value of N and performance of the similarity metrices.
4. Experiments with TfIdf and applications of TfIdf using a given dataset.
5. Experiments with Zips law on Reuters21578 corpus and another Indian language corpus.
6. Assignments on construction of an Inverted Index using a given corpus.
7. Form 3 suitable queries manually and retrieve documents from 'myCorpus'. Perform experiments on various retrieval models.
8. Implement and evaluate algorithms for index compression.
9. Experiments on studying an available crawler and building own toy crawler for performing specific task.
10. Experiments on Unranked Evaluation Measures: Manually label the set of documents corresponding to each query. Now compare the system-retrieved documents with manually labelled set of documents and compute Precision,

Recall, F-measure.

11. Experiments on Ranked Retrieval and Evaluation: Select a task from Forum for Information Retrieval Evaluation(FIRE) resources, use the available dataset(http://fire.irsi.res.in/fire/static/resources) to design a IR system. Then evaluate your system using the given procedure.

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	3	2	2	1	1	2	2	1	1	3	3	2
CO2	3	3	2	3	3	2	2	1	3	2	1	1	2	3	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	3
CO4	3	3	3	2	2	3	3	1	2	2	2	2	3	3	2
CO5	2	3	3	3	3	3	2	1	2	2	2	1	2	2	2

COURSE INFORMATION SHEET

Course code: CS429
Course title: **Information and Coding Theory**
Pre-requisite(s): MA303 Discrete Mathematics
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students:

1.	To understand the role of information theory for an efficient, error-free and secure delivery of information using binary data streams.
2.	To have a complete understanding of error-control coding.
3.	To understand encoding and decoding of digital data streams.
4.	To introduce methods for the generation of these codes and their decoding techniques.
5.	To have a detailed knowledge of compression and decompression techniques.
6	To evaluate the performance of various coding techniques over noisy communication

	channels

Course Outcomes

After the completion of this course, students will be:

1.	To be able to understand the principles behind an efficient, correct and secure transmission of digital data stream.
2.	To be familiar with the basics of error-coding techniques.
3.	To have knowledge about the encoding and decoding of digital data streams.
4.	Generation of codes and knowledge about compression and decompression techniques.
5.	To be able to understand the performance requirements of various coding techniques.
6	To produce professionals who will be able to conduct research in information theory.

Syllabus

Module I

Source Coding-Introduction to Information Theory, Uncertainty and Information, Average Mutual Information and Entropy, Information Measure for Continuous Random Variables, Source coding theorem, Huffman Coding, Shannon- Fano -Elias Coding, Arithmetic Coding , The Lempel-Ziv ,Algorithm , Run Length Encoding.

And the PCX Format, Rate Distribution Function, Optimum Quantizer Design, Entropy Rate of a Stochastic Process, Introduction to Image Compression, The JPEG Standard for Lossless Compression, The JPEG Standard for Lossy Compression. (8L)

Module II

Channel Capacity and Coding- Introduction, Channel Model, Channel Capacity, Channel Coding, Information Capacity Theorem, the Shannon Limit, Channel Capacity for MIMO System, Random Selection of Code. Error Control Coding (Channel Coding). (8L)

Module III

Linear Block Codes for Error Correction- Introduction to Error Correction Codes, Basic Definitions, Matrix Description of Linear Block Codes , Equivalent Codes , Parity Check Matrix, Decoding of Linear Block Code ,Syndrome Decoding, Error Probability after Coding (Probability of Error Correction), Perfect Codes, Hamming Codes, Low Density Parity Check (LDPC) Codes , Optimal Linear Codes, Maximum Distance Separable (MDS) Codes, Bound on Minimum Distance, Space Time Block Codes.

(10L)

Module IV

Cyclic Codes- Introduction to the Cyclic Codes, Polynomials, The Division Algorithm for Polynomials ,A Method for Generating Cyclic Codes, Matrix Description of Cyclic Codes, Burst Error Correction , Fire Codes, Golay Codes, Cyclic Redundancy Check(CRC) Codes, Circuit Implementation of Cyclic Codes. (6L)

Module V

Bose –Chaudhuri Hocquenghem(BCH)Codes- introduction to the Codes , Primitive Elements, Minimal Polynomials, Generator Polynomials , in Terms of Minimal Polynomials, Some

Examples if BCH Codes, Reed –Solomon Codes, Implementation of Reed –Solomon Encoders and Decoders, Performance of RS Codes Over Real Channels, Nested Codes.

Module VI

Convolution Codes-Introduction to the Convolution Codes, Tree Codes and Trellis Codes, Polynomial Description of Convolution Codes(Analytical Representation), Distance Notions for Convolution Codes, The Generating Function, Matrix Description of Convolution Codes, Viterbi Decoding and Convolution Codes , Distance Bounds for Convolution Codes , Turbo Codes.

Trellis Coded ModulatioN- Introduction to TCM , The concept of Coded Modulation , Mapping by Set partitioning.

(8L)

Text book:

Bose R., “Information theory Coding and Cryptography”, 2nd Edition, McGraw-Hill, 2008. (T1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1
2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1
3	3	2	2	1	1	1	1	1	1	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1
5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS430
Course title: **Information and Coding Theory Lab**
Pre-requisite(s): MA303 Discrete Mathematics
Co- requisite(s):
Credits: L: 0 T: 0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives:

This course enables the students:

1.	To understand the role of information theory for an efficient, error-free and secure delivery of information using binary data streams.
2.	To have a complete understanding of error-control coding.
3.	To understand encoding and decoding of digital data streams.
4.	To introduce methods for the generation of these codes and their decoding techniques.
5.	To have a detailed knowledge of compression and decompression techniques.
6	To evaluate the performance of various coding techniques over noisy communication channels

Course Outcomes:

After the completion of this course, students will be:

1.	To be able to understand the principles behind an efficient, correct and secure transmission of digital data stream.
2.	To be familiar with the basics of error-coding techniques.
3.	To have knowledge about the encoding and decoding of digital data streams.
4.	Generation of codes and knowledge about compression and decompression techniques.
5.	To be able to understand the performance requirements of various coding techniques.
6	To produce professionals who will be able to conduct research in information theory.

Syllabus:

1. Write a program for determination of various entropies and mutual information of a given channel.
Test various types of channel such as
a) Noise free channel.
b) Error free channel
c) Binary symmetric channel
d) Noisy channel Compare channel capacity of above channels.

2. Write a program for generation and evaluation of variable length source coding using C/MATLAB (Any 2) a) Shannon – Fano coding and decoding b) Huffman Coding and decoding c) Lempel Ziv Coding and decoding
3. Write a Program for coding & decoding of linear block codes.
4. Write a Program for coding & decoding of cyclic codes.
5. Write a program for coding and decoding of convolutional codes.
6. Write a program for coding and decoding of BCH and RS codes.
7. Write a program to study performance of a coded and encoded communication system (Calculate the error probability).
8. Write a simulation program to implement source coding and channel coding for transmitting a text file.
9. Write a program to implement of any compression algorithm for either audio, image or video data

TextBook:

1. Ranjan Bose, "Information Theory coding and Cryptography", McGraw-Hill Publication, 2ndEdition
2. J C Moreira, P G Farrell, "Essentials of Error-Control Coding", Wiley Student Edition

References:

1. BernadSklar, "Digital Communication Fundamentals & applications", 2ndEd. Pearson Education.
2. Shulin and Daniel j, Cistellojr., "Error control Coding" Pearson, 2nd Edition.
3. Todd Moon, "Error Correction Coding: Mathematical Methods and Algorithms", Wiley Publication
4. Khalid Sayood, "Introduction to data compression", Morgan Kaufmann Publishers International Institute of Information Technology, Hinjawadi, Pune.Page 3

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	2	2	1	1	2	2	2	2	3	3	2
CO2	3	3	3	1	2	1	2	1	2	1	2	2	3	3	2
CO3	3	3	3	3	3	1	2	1	2	1	1	2	3	3	2
CO4	3	3	3	2	3	1	1	1	2	2	1	2	3	3	2
CO5	3	3	3	2	3	1	2	1	2	2	1	2	3	3	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT402
Course title: **. NET Programming**
Pre-requisite(s): Nil
Co- requisite(s):
Credits:L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To study basic and advanced features of the C# language
2.	To create form based and web based applications
3.	To study the internals of the .NET framework
4.	To know and study about the Common Language Runtime (CLR) and Common Language Infrastructure (CLI)

Course Outcomes
After the completion of this course, students will be able to:

1.	Install and configure Dot Net application development tools.
2.	develop, implement and creating Applications with C#
3	develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services, web
4.	explain Security in the .NET framework and Deployment in the .NET.
5.	develop Assemblies and Deployment in .NET, Mobile Application Development.

Syllabus
Module I
C# basics
C# and the .NET framework – C# basics – Objects and types – Inheritance –Arrays – Operators and casts – Indexers. (8L)

Module II
Advanced C# features
Delegates and events – Strings and regular expressions – Generics – Collections–Memory management and pointers – Errors and exceptions. (8L)

Module III
I/O and network programming
Tracing and events - threading and synchronization - .Net security – localization –Manipulating XML - Managing the file system – basic network programming. (8L)

Module IV
Window and web applications
Window based applications – Data access with .NET – basics of ASP .NET -Introduction to web services. (8L)

Module V
.NET Features
Architecture – Assemblies – shared assemblies – CLR hosting – Appdomains –Reflection. (8L)

Text Books:

Nagel,C. , Evjen,B. , Glynn,J. , Watson,K. , and Skinner,M.,"Professional C# 4 with .NET 4," Wiley India, 2010.(T1)

Liberty ,J., and MacDonald ,B., "Learning C# 3.0," First Edition ,O'Reilly, 2008.(T2)

References Book:

Troelson ,A., "Pro C# 5.0 and the.NET 4.5 Framework," Sixth Edition, Apress,2012.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

CO1	2	2	1	1	3	1	2	2	1	1	1	2	2	1	2
CO2	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO4	2	3	3	1	3	2	2	2	3	3	3	3	2	2	3
CO5	3	3	3	3	3	1	1	2	2	2	3	3	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT402
Course title: **. NET Programming**
Pre-requisite(s): Nil
Co- requisite(s):
Credits:L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To study basic and advanced features of the C# language
2.	To create form based and web based applications
3.	To study the internals of the .NET framework
4.	To know and study about the Common Language Runtime (CLR) and Common Language Infrastructure (CLI)

Course Outcomes
After the completion of this course, students will be able to:

1.	Create Simple application using web controls

2.	Work with States of ASP. NET Pages & Adrotator Control
3	Use of calendar control, Treeview control & Validation controls
4.	Query textbox and Displaying records & Display records by using database
5.	implement the algorithms in C#.net, VB.net and ASP.net

Syllabus:

List of experiments:

1. Simple application using web controls

    a) Finding factorial Value

    b) Money Conversion

    c) Quadratic Equation

    d) Temperature Conversion

    e) Login control

2. States of ASP.NET Pages

3. Adrotator Control

4. Calendar control

    a) Display messages in a calendar control

    b) Display vacation in a calendar control

    c) Selected day in a calendar control using style

    d) Difference between two calendar dates

5. Treeview control

    a) Treeview control and datalist

    b) Treeview operations

6. Validation controls

7. Query textbox and Displaying records

8. Display records by using database

Text Books:

Nagel,C. , Evjen,B. , Glynn,J. , Watson,K. , and Skinner,M.,"Professional C# 4 with .NET 4," Wiley India, 2010.(T1)

Liberty ,J., and MacDonald ,B., “Learning C# 3.0,” First Edition ,O’Reilly, 2008.(T2)

References Book:

Troelson ,A., “Pro C# 5.0 and the.NET 4.5 Framework,” Sixth Edition, Apress,2012.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	2	1	1	3	1	2	2	1	1	1	2	2	1	2
CO2	3	3	3	3	3	2	2	2	2	2	2	2	3	2	3
CO3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3
CO4	2	3	3	1	3	2	2	2	3	3	3	3	2	2	3
CO5	3	3	3	3	3	1	1	2	2	2	3	3	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT436
Course title: **Software Testing**
Pre-requisite(s): IT305 Software Engineering
Co- requisite(s):
Credits: L: 3 T:1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Objectives

1.	To understand the fundamental concepts of software testing
2.	To understand about product risks and risk based testing
3.	To learn the details about test planning, test case writing and defect management
4.	To identify various types of system and testing methodologies
5.	To describe about test metrics, test reports and qualitative and quantitative analysis

Outcomes
After the completion of this course, students will be able to:

1.	Comprehend the quality concepts that serve as the foundation for software testing
2.	Understand about the various risks related to product
3.	Conduct test planning, test case writing and defect management
4.	Enforce various techniques related to system and testing
5.	Elucidate about test metrics, test reports and qualitative and quantitative analysis

Syllabus
Module I
Introduction to Software Quality - Fundamentals of quality, financial aspect of quality, Total Quality Management, basic premises of quality management, quality approaches, quality and productivity relationship, variation in quality expectations, software quality management, processes related to software quality, quality management system structure. (8L)

Module II

Fundamentals of Software Testing - Basic concepts of software testing, Comparison between TQM testing and Big Bang approaches, testing methodologies such as Black Box testing, White Box testing and Gray Box testing, test processes including test policy defining process, test strategy and test plan, overview of configuration management, SDLC work products, product risk management, potential risks of replacement of manual operation with automated systems, risk management processes, risk control mechanisms, software verification and validation during SDLC, V-Test model, defect management and life cycle. (8L)

Module III

Testing Techniques and Tools- Levels of testing during SDLC, integration testing techniques, acceptance test plan and criteria, acceptance test process, acceptance testing methods such as alpha, beta and gamma testing, testing of specialised systems such as UI testing, compatibility testing, internationalisation testing, security testing, performance testing, recovery testing and installation testing, special testing such as OO testing, mobile testing, e-Commerce and e-Business testing, control testing, client testing, client server testing, web application testing and agile testing, testing tools and their procurement, advantages and disadvantages of tool usage in SDLC. (8L)

Module IV

Testing Process - Test policy, test strategy, test planning, test scenario definition, test case definition, test data definition, test estimation techniques, variation in standards used at organisation level, national level, customer level and international level, roles and responsibilities of test team members, test metrics, test reports, quantitative and qualitative data collection and uses of qualitative and quantitative tools required for data analysis and decision making during and post testing. (8L)

Module V

Test Process Improvement - Introduction to test process improvement,Alteration in perception about testing, issues related to testing process, importance of test process improvement, test process maturity, test process improvement model, stages of test process improvement model, graphical representation of improvements. (8L)

Text book:

Limaye M. G., “Software Testing: Principles, Techniques and Tools”, Tata McGraw-Hill Education Pvt Ltd, 2009.(T1)

Reference books:

Chauhan Naresh, “Software Testing: Principles and Practices”, Oxford University Press, 2012.(R1)

Sommerville, “Software Engineering’, 8th Edition, Pearson Education Ltd, 2009.(R2)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>N/A

<u>POs met through Gaps in the Syllabus:</u>N/A

<u>Topics beyond syllabus/Advanced topics/Design:</u>N/A

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

<u>Direct Assessment</u>

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	3	1	2	3	1	2	2	3	3	3
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	2	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT437
Course title: **Software Testing Lab**
Pre-requisite(s): IT324 Software Testing
Co- requisite(s):
Credits: L: 0 T:0 P: 3
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Familiarize the students with the fundamental concepts of Software Engineering
2.	Impart state-of-the-art knowledge on SRSand UML
3.	Explore case studies to demonstrate practical applications of different concepts
4.	Provide a platform where they can solve real life problems

Course Outcomes

After the completion of this course, students will be able to:

CO1	Comprehend the quality concepts that serve as the foundation for software testing
CO2	Understand about the various risks related to product
CO3	Conduct test planning, test case writing and defect management
CO4	Enforce various techniques related to system and testing
CO5	Elucidate about test metrics, test reports and qualitative and quantitative analysis

SYLLABUS

List of Programs as Assignments:

13. **Lab Assignment No: 1**

Objective: To Understand and Implement Identification of Requirements from Problem Statements

Q1. To consider the problem statement for a project to be developed and list out the ambiguities, inconsistencies and incompleteness of the problem statement.

Q2. To identify different functionaries to be obtained from a system and characteristics that a system should have, but not possessed by the system itself

14. **Lab Assignment No: 2**

Objective: To Understand and Implement Estimation ofProject Metrics

Q1. To estimate the minimum size of the team one would require to develop a project through application of intermediate COCOMO.

Q2. To use Halstead's metrics to estimate the effort required to recreate a program in JAVA from C.

15. **Lab Assignment No: 3**

Objective: To Understand and Implement Modeling UML Use Case Diagrams and Capturing Use Case Scenarios

Q1. To draw a use case diagram for the given case study.

Q2. To identify the primary and secondary actors for the system and generalization of use cases and «include» stereotypes to prevent redundancy in the coding phase.

16. **Lab Assignment No: 4**

Objective: To Understand and Implement E-R Modeling from the Problem Statements

Q1. To identify the possible entity sets, their attributes, and relationships for the given case study.

Q2. To draw an ER diagram for the given case study.

17. **Lab Assignment No: 5**

Objective: To Understand and Implement Identification of Domain Classes from the Problem Statements

Q1. To identify potential classes and their attributes for the given case study.

Q2. To utilize expert knowledge on the subject matter to identify other relevant classes.

18. **Lab Assignment No: 6**

Objective: To Understand and Implement Identification of Components from the Problem Statements

Q1. To identify potential components for the given case study.

Q2. To draw component diagram for the given case study

19. **Lab Assignment No: 7**

Objective: To Understand and Implement State Chart and Activity Modeling

Q1. To draw a statechart diagram to graphically represent the given case study.

Q2. To draw an activity diagram to graphically represent the workflow of the given case study.

20. **Lab Assignment No: 8**

Objective: To Understand and Implement Modeling UML Class Diagrams and Sequence diagrams

Q1. To draw class diagram for the given case study.

Q2. To draw sequence diagram for the given case study.

21. **Lab Assignment No: 9**

Objective: To Understand and Implement Modeling Data Flow Diagrams

Q1. To draw data flow diagram (Level 0, 1 and 2) for the given case study.

22. **Lab Assignment No: 10**

Objective: To Understand and Implement Estimation of Test Coverage Metrics and Structural Complexity

Q1. To identify the basic blocks for a given program

Q2. To draw a CFG using the basic blocks

Q3. To determine McCabe's complexity from a CFG.

23. **Lab Assignment No: 11**

Objective: To Understand and Implement Designing Test Suites

Q1. To design a test suite for the given case study.

Q2. To verify implementation of functional requirements by writing test cases.

Q3. To analyze results of testing to ascertain the current state of the project.

24. **Lab Assignment No: 12**

Objective: To Understand and Implement Forward and Reverse Engineering

Q1. To obtain programs from UML diagrams.

Q2. To obtain UML diagrams from programs.

Books recommended:

TEXT BOOKS

3. Software Engineering, Ian Sommerville, Pearson, 10th Edition, 2016.**(T1)**
4. Software Engineering: A Practioner's Approach, Roger S. Pressman, McGraw Hills, 7th Edition, 2009.**(T2)**

REFERENCE BOOKS

2. Fundamentals of Software Engineering, Rajib Mall, Prentice-Hall of India, 3rd Edition, 2009.**(R1)**

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce
Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO2, 5 & 6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment

Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	3	1	2	3	1	2	2	3	3	3
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	2	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

OPEN ELECTIVES-III

COURSE INFORMATION SHEET

Course code: CS301
Course title: **Database Management System (DBMS)**
Pre-requisite(s): Data Structures.
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of databases.
2.	Recognize the importance of database analysis and design in the implementation of any database application.
3.	Describe the role of transaction processing in a database system.
4.	Understand various concurrency control mechanisms for a database system.
5.	Describe the roles of recovery and security in a database system.

Course Outcomes

After the completion of this course, students will be able to:

1.	Analyze data organization requirements and their inter relationships.
2.	Illustrate the features of data models and their application for storing data.
3.	Design queries to maintain and retrieve useful information from the databases created.
4.	Analyze the physical database design with respect to their expected performance using normalization and query processing.
5.	Examine the best practices according to concepts of indexing, transaction control and concurrency maintenance

Syllabus

Module I

Database Design and Entity - Relational Model

Purpose of Database System; View of Data, Database Languages, Transaction Management, Database architecture, Database Users and Administrator, Types of database System, Overview of design process, E-R model, Constraints, E–R Diagram, E-R Diagram issues, Weak Entity Sets, Extended E – R Features, Reduction to E–R Schemas. (8L)

Module II

Relational Model

Structure of Relational Database, Codd's Rules, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Data definition, Basic structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub Queries, complex queries, views, modification of database, Joined relations, SQL data types & schemas, Integrity constraints, authorization, Embedded SQL, Triggers. (8L)

Module III

Relational Database Design

Functional dependency, Decomposition, Normalization, First normal form, Second normal form, Third normal form, BCNF, Multivalued dependencies and Fourth normal form, Join dependencies and Fifth normal form, DKNF. (8L)

Module IV

Indexing & Hashing

Ordered Indices, B+ Tree index files, B-Tree index files, Multiple key access Static hashing, Dynamic Hashing, Comparison of ordered indexing and hashing, Index definition in SQL.

Query Processing

Measure of Query Cost, Selection Operation, Evaluation of Expressions. (8L)

Module V

Transaction & Concurrency Control

Transaction Concepts & ACID Properties, Transaction States, Implementation of Atomicity & Durability, Concurrent Executions, Serializability& Its Testing, Recoverability, Lock-Based protocols, Validation based protocol, Multiple Granularity, Multiversion Schemes, Deadlock Handling. (8L)

Text Book:

Silberschatz A. et.al, Database System Concepts, 6th Edition, Tata Mc-Graw Hill, New Delhi, 2011. (T1)

Reference Books:

Elmasri R., Fundamentals of Database Systems, 7thEdition, Pearson Education, New Delhi, 2016. (R1)

Ullman Jeffrey D et.al., A First course in Database Systems, 3rd Edition, Pearson Education, New Delhi- 2014.(R2)

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u><u>N/A</u>

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training

CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	2	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO2	3	1	2	2	3	3	2	1	1	1	1	2	3	2	2
CO3	3	1	3	3	3	3	2	1	1	2	1	2	3	2	3
CO4	3	1	3	3	3	3	2	1	1	2	2	3	3	2	3
CO5	2	1	3	3	3	3	2	1	1	1	2	3	3	2	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS302
Course title: **Database Management system Lab**
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L:3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: V/III
Branch: CSE/IT

Course Objective

This course enables the students:

1.	Learn and practice data modeling using the entity-relationship and developing database designs.
2.	Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3.	Understanding the basic principles of modeling of database using UML and apply normalization techniques to normalize the database system.
4.	Learn Multidimensional schemas suitable for data warehousing. And learn the Difference between OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing).
5.	To demonstrate the principles behind the logical database design and Data Warehouse Modeling.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Describe the fundamental elements of relational database management systems.
CO2	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO3	Design ER-models to represent simple database application scenarios.
CO4	Convert the ER-model to relational tables, populate relational database and formulate SQL.
CO5	Improve the database design by normalization.

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1

Objective: Implementation of DDL commands of SQL with suitable examples

- Create table
- Alter table
- Drop Table

Lab Assignment No: 2

Objective: Implementation of DML commands of SQL with suitable examples

- Insert
- Update
- Delete

Lab Assignment No: 3

Objective: Implementation of different types of function with suitable examples

- Number function
- Aggregate Function
- Character Function
- Conversion Function
- Date Function

Lab Assignment No: 4

Objective: Study & Implementation of PL/SQL.

Lab Assignment No: 5

Objective Implementation of different types of operators in SQL

- Arithmetic Operators
- Logical Operators
- Comparison Operator
- Special Operator
- Set Operation

Lab Assignment No: 6

Objective: Implementation of different types of Joins

- Inner Join
- Outer Join
- Natural Join etc..

Lab Assignment No: 7

Objective: Study & Implementation of SQL Triggers.

Lab Assignment No: 8

Objective:

- Creating Database /Table Space
- Managing Users: Create User, Delete User
- Managing roles:-Grant, Revoke.

Lab Assignment No: 9

Objective: Study and Implementation of

- Group By & having clause
- Order by clause
- Indexing

Lab Assignment No: 10

Objective: Study & Implementation of

- Sub queries
- Views

Lab Assignment No: 11

Objective: Study & Implementation of different types of constraints.

Books recommended:

TEXT BOOKS

4. A.Silberschatz et.al - Database System Concepts, 5thEd^{n}, Tata Mc-Graw Hill, New Delhi – 2000.

REFERENCE BOOKS

3. Date C.J. - An Introduction to Database System, Pearson Education, New Delhi, 2005.
4. R.Elmasri, Fundamentals of Database Systems, Pearson Education, New Delhi, 2005.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	3	3	1	1	2	2	1	3	3	3	3
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	3	3
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	3	3
CO4	3	2	3	2	3	3	1	2	2	3	3	1	3	3	3
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	1	2

Course code: IT305
Course title: **Software Engineering**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Students are effective team members, aware of cultural diversity, who conduct themselves ethically and professionally
2.	Students use effective communication skills and technical skills to assure production of quality software, on time and within budget.
3.	Students build upon and adapt knowledge of science, mathematics, and engineering to take on more expansive tasks.
4.	Able to increase level of self-reliance, technical expertise, and leadership.

Course Outcomes

After the completion of this course, students will be:

1.	Explain the software engineering principles and techniques
2.	Apply Software Project Management Practices
3.	Apply the knowledge gained for their project work as well as to develop software following software engineering standards
4.	Develop self-reliance, technical expertise, and leadership.

Syllabus

Module I

Introduction

Some Definitions, FAQs about software engineering, the evolving role of software, Software process models, Waterfall model, the prototyping model, spiral model, RAD and Incremental model, Management activities, Project planning and Project Scheduling. (8L)

Module II

Software Requirements

Functional and non-functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS.

Requirement Engineering Process: Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management. (8L)

Module III

Design Engineering

Design Process and Design Quality, Design Concepts, Design Models, Object oriented Design, UML: Class diagram, Sequence diagram, Collaboration diagram. (8L)

Module IV

Verification and Validation

Verification and Validation Planning, S/W inspection, static analysis.

Software Testing

Testing functions, Test care design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability. (8L)

Module V

Process metrics, Software Measurement, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Quality assurance and standards, Quality planning, Quality control, **S**/W Maintenance in detail. (8L)

Text Book:

Sommerville, Software Engineering, 7th Edition, Pearson Education Publication. (T1)

Reference Books:

Pressman R. S.,Software Engineering: A Practiioners Approach, 5th Edition., TMA, New Delhi.(R1)

Mall Rajib, Fundamental of Software Engineering, 4th Edition, PHI Learning Private Limited.(R2)

Peters J. F. &Pedrycz W., Software Engineering, John Wiley & Sons, Inc. 2000.(R3)

Behforooz A. & Hudson F.J., Software Engineering Fundamentals, Oxford Univ. Press, New York, 2000.(R4)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments

CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	3	1	1	2	1	2	3	3	1	1	1	3	2
2	2	3	1	2	2	2	2	2	2	3	2	1	1	2	3
3	2	3	3	3	3	1	1	1	2	3	1	2	2	3	3
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	2
5	2	2	1	2	3	1	1	1	1	3	2	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS325
Course title: **Database Modeling**
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L:3 T:0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objective

This course enables the students:

1.	Learn and practice data modeling using the entity-relationship and developing database designs.
2.	Understand the use of Structured Query Language (SQL) and learn SQL syntax.
3.	Understanding the basic principles of modeling of database using UML and apply normalization techniques to normalize the database system.
4.	Learn Multidimensional schemas suitable for data warehousing. And learn the Difference between OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing).
5.	To demonstrate the principles behind the logical database design and Data Warehouse Modeling.

Course Outcomes

After the completion of this course, students will be to:

1.	Explain the features of database management systems and Relational database and design the ER-models to represent simple database application scenarios.
2.	ApplytheSQL-the standard language to relational tables, populate relational database and formulate SQL queries on data.
3.	Applying UML, it collects the requirements and prepare their scenarios and design. And understand the functional dependencies and design of the database.
4.	Design a data mart or data warehouse for any organization. And Develop a skill to write queries using DMQL.
5.	Analyze the existing design of a database and data warehouse and apply concepts of normalization to design an optimal database.

Syllabus

Module I

Database Design and Entity- Relational Model

Introduction to Data and Database Management, The Database Life Cycle, Conceptual Data Modeling, Fundamental ER Constructs, Mapping Cardinalities and Constraints, Relational Data model (Relational Algebra, Tuple and Domain Relational Calculus), Network Model, Hierarchical Model, Alternative Conceptual Data Modeling Notations, Advanced ER Construct, Summary. (8L)

Module II

Requirement Analysis and Conceptual Data Modeling

Introduction, Requirements Analysis, Conceptual Data Modeling, View Integration, Entity Clustering for ER Models, Transforming Rules and SQL Constructs, Transformation Steps, Summary. (8L)

Module III

The Unified Modeling Language (UML) and Normalization

Class Diagrams, Activity Diagrams, Rules of Thumb for UML Usage, Functional Dependencies, Fundamentals of Normalization, Design of Normalized Tables, Normalization of Candidate Tables Derived from ER Diagrams, 1NF, 2NF, 3NF, BCNF, Fourth and Fifth Normal Forms. Determining the Minimum set of 3NF Tables, Summary. (8L)

Module IV

Business Intelligence

Overview of Data Warehousing, Logical Design, The Exponential Explosion of views, Decision Support system. Overview of Online Analytical Processing (OLAP), View Size Estimation, Selection of Materialized Views, View Maintenance, Query Optimization, Forecasting, Overview of Data mining and Text Mining, Summary. (8L)

Module V

Logical Database Design

Requirements Specification, Logical Design, CASE Tools for Logical Database Design, generating a Database from a Design, Database Support, Collaborative Support, Distributed Development, Application Life Cycle tooling Integration, Design Compliance Checking, Reporting, Modeling a Data Warehouse, Semi-Structured Data, XML, Summary. (8L)

Textbooks:

Teorey ,T. J., Lightstone,S., and Nadeau ,T.,"Database Modeling and Design: Logical Design", Fourth Edition, Morgan Kaufmann Publishers, 2006.(T1)

Reference books:

Elmasri,R., and Navathe ,S.B.,"Fundamentals of Database Systems,"Sixth Edition,Pearson,2015.(R1)

Silberschatz ,A., Korth ,H. F., and Sudarshan ,S.,"Database System Concepts," Sixth Edition,Mc Graw Hill Education,2010.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment					

Semester End Examination					

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	3	3	1	1	2	2	1	3	3	3	3
CO2	3	3	2	3	3	2	1	1	2	2	2	1	3	3	3
CO3	3	3	2	3	2	3	1	2	2	2	2	1	3	3	3
CO4	3	2	3	2	3	3	1	2	2	3	3	1	3	3	3
CO5	3	3	3	3	2	2	2	2	2	1	2	1	3	1	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT330
Course title: **Cryptography and Network Security**
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

1.	To Learn Basic Concepts of Cryptography and Network Security and Apply them in various Real life Application.
2.	To understand the basic concepts of Network Security
3.	To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
4.	To understand how to deploy encryption techniques to secure data in transit across data networks
5.	To design security applications in the field of Information technology

Course Outcomes
After the completion of this course, students will be:

1.	Understand the basic concept of Cryptography and Network Security and their mathematical models, and to be familiar with different types of threats
2.	Learning and applying various Ciphering Techniques.
3.	Apply Symmetric and Asymmetric Cryptographic Algorithms and Standards in Networks.
4.	Examine the issues and structure of Authentication Service and Electronic Mail Security
5.	To explain and classify different malicious programs, worms and viruses, and to learn the working and design principles of Firewalls

Syllabus
Module I
Introduction to Cryptography: ComputerSecurity concepts, The OSI Security Architecture, Security Attacks, Security Services, A model for Network Security, Classical Encryption Techniques. (8L)
Module II
Mathematical Foundations of Cryptography: Modular Arithmetic, Euclidean Algorithm, Groups, Rings, Fields, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2^n), Prime Numbers, Fermat's and Euler's Theorem, The Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithms. (8L)
Module III
Symmetric and Asymmetric Cryptography: Difference Between Symmetric and Asymmetric Cryptography, DES, Triple DES, AES, RSA Cryptosystem, Symmetric and Asymmetric Key Cryptography Together, Elgamal Cryptosystem, Elliptic Curve Cryptosystems, , Diffie-Hellman

Key Exchange , Cryptographic Hash Functions, Message Authentication Codes, Digital Signature. (8L)

Module IV

Internet Security Protocols : Basic Concepts, Security Socket Layer (SSL), Secure Hyper Text Transfer Protocol (SHTTP), Time stamping Protocol(TSP), Secure Electronic Transaction(SET), SSL Versus SET, 3-D Secure Protocol, Electronic Money, Email Security, Wireless Application Protocol(WAP) Security, Security in GSM. (8L)

Module V

Network Security: Users, Trusts and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, Worms, Viruses, Intrusion Detection Systems (IDS), Firewalls: Definitions, Constructions and Working Principles. (8L)

Text Book:

Forouzan B. A., Mukhopadhyay D., "Cryptography and Network Security", 3rd Edition, Mcgraw Higher Education, 2016. (T1)

Reference Books:

Stallings W., "Cryptography and Network Security: Principles and Practice", 7th Edition, Pearson, 2017.(R1)

Kahate A., "Crptography and Network Security", 3rd Edition, McGraw Hill Education, New Delhi, 2013.(R2)

Schneier B., "Applied Cryptogaphy: Protocols, Algorithms And Source Code In C", 2nd Edition, Wiley, 2007. (R3)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)

Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	3	3	3	3	2	2	1	2	2	2	3	1
CO2	3	3	3	3	3	3	3	2	2	2	1	2	1	2	3
CO3	3	2	3	3	3	2	2	2	2	2	2	2	2	3	3
CO4	3	2	3	3	2	2	1	2	2	2	2	2	1	2	3
CO5	3	2	3	3	1	2	2	2	2	1	1	2	2	1	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS371
Course title: **Genetic Algorithm**
Pre-requisite(s): CS206 Design and Analysis of Algorithm
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Able to understand the basic concepts of GA
2.	Able to find the application areas of GA
3.	Able to understand the importance of optimization using GA
4.	Able to know about the traditional GA model

Course Outcomes
After the completion of this course, students will be able to:

1.	Define Traditional GA model.
2.	Build code for GA.
3.	Apply different techniques of GA.
4.	Design schema for various problems of optimization using GA.
5.	Develop Classifier system using GA.

Syllabus
Module I
Introduction to Genetic Algorithm, Genetic Algorithms, Traditional and Search Methods and their Differences, A Simple Genetic Algorithm. The Fundamental Theorem, Schema Processing.
(8L)

Module II
Two & k-Armed Bandit Problem, Hypothesis, Schemata and Revisited., Computer Implementation of A Genetic Algorithm**:** Data Structures, Reproduction, Crossover and Mutation, A Time to Reproduce, A Time to Cross, How Well Does It Work, Mapping Objective Functions to Fitness Form, Fitness Scaling. (8L)

Module IV

Coding, A Multiparameter Mapped, Fixed-Point Coding, Discretization, Constraints.Applications of Genetic Algorithms **:**The Rise of Genetic Algorithms, Genetic Algorithm Applications of Historical Interest, De Jong and Function Optimization. (8L)

Module V

Improvements in Basic Technique, Current Applications of Genetic Algorithms.Genetics-Based Machine Learning, Whence It Came, What is Classifier System, Rule and Message, Genetic Algorithm.
(8L)

Text Book :

Goldberg D. E., Genetic Algorithms in Search Optimization and Machine Learning, Pearson Education, New Delhi, 2005.(T1)

Reference Book :

Vose M. D., The Simple Genetic Algorithm, PHI, New Delhi, 2004.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√

Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	1	1	1	1	1				2	2	2	1
CO2	3	3	3	1	2	1	1	1				2	2	2	1
CO3	3	3	3	3	3	1	1	1		1	1	2	3	2	1
CO4	3	3	3	2	3	1	1	1		1	1	2	3	2	1
CO5	3	3	3	2	3	1	1	1	1	1	1	2	3	2	1

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT340
Course title: **Machine Learning**
Pre-requisite(s): CS206 Design and Analysis of Algorithm
Co- requisite(s):NIL
Credits: L: 3 T: 1 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic concept of machine learning.
2.	To explore the application of machine learning.
3.	To understand the concept of supervised learning.
4.	To learn the advantage of neural network.
5.	To learn the utility of clustering techniques.

Course Outcomes
After the completion of this course, students will be able to:

1.	Formulate machine learning problems corresponding to different applications: data, model selection, model complexity
2.	Demonstrate understanding of a range of machine learning algorithms along with their strengths and weaknesses
3.	Implement machine learning solutions to classification, regression, and clustering problems
4.	Design and implement various machine learning algorithms in a range of real-world applications
5.	Evaluate and analyse the performance of machine learning algorithm or a system based on machine learning algorithm.

Syllabus
Module I
Introduction to Machine learning

Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression. (8L)

Module II

Supervised Learning

Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts. (10L)

Module III

Neural Networks

Perceptions: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks. (8L)

Module IV

Unsupervised and Semi Supervised Learning

Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabeled data. (8L)

Module V

Ensemble

Committees of multiple hypotheses, bagging, boosting, active learning with ensembles, (6L)

Text book:

2. Mitchell Tom, Machine Learning, Latest Edition, Mc-Graw Hill.(T1)

Reference books:

3. Shalev-Shwartz Shai and Ben-David Shai, Understanding Machine Learning, Cambridge University Press. 2017.(R1)
4. Bishop Christopher, Pattern Recognition and Machine Learning, Springer, 2006.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	1	2	1	1	1	1	1	1	1	2	3	1	1
CO2	3	3	2	2	1	1	1	1	1	1	1	2	3	3	1
CO3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3
CO4	3	3	3	3	3	2	2	2	2	2	2	2	3	3	2

CO5	2	3	2	3	3	2	1	1	2	2	1	2	3	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

OPEN ELECTIVE IV

COURSE INFORMATION SHEET

Course code: IT490
Course title: **Natural Language Processing**
Pre-requisite(s): CS305 Compiler Design
Co- requisite(s): NIL
Credits: L: 3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic component of Natural Language Processing.
2.	To explore the application areas of Natural Language Processing.
3.	To understand the idea of Language Modelling.
4.	To explore the basic concepts of Parts-of-speech Tagging.
5.	To understand the concepts of language modelling.

Course Outcomes
After the completion of this course, students will be able to:

1.	Describe the typical NLP problem, their importance & difficulty; and concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.

2.	Demonstrate understanding of the relationship between NLP and statistics& machine learning.
3.	Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
4.	Analyse NLP problems to decompose them into appropriate components.
5.	Evaluate a NLP system, identify shortcomings and suggest solutions for these shortcomings.

Syllabus

Module I

Introduction to NLP :introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English. (8L)

Module II

Language Modelling: N-gram and NeuralLanguageModelsLanguage Modelling with N-gram, Simple N-gram models, Smoothing(basic techniques), Evaluating language models;Neural Network basics, Training;Neural Language Model, Case study: application of neural language model in NLP system development**.** (8L)

Module III

Parts-of-speech Tagging**: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, POS Tagging using Maximum Entropy Model.** (8L)

Module IV

ParsingBasic concepts: top down and bottom up parsing, Treebank; Syntactic parsing: CKY parsing; Statistical parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs. (8L)

Module V

Semantics: Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WorldNet. (8L)

Text books:

Jurafsky Dan and Martin James H., Speech and Language Processing **(3rd ed.)***To be published in 2018*. Available at: https://web.stanford.edu/~jurafsky/slp3/. (T1)

Reference books:

Jurafsky D. and Martin J. H., Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.(R1)

Goldberg Yoav, A Primer on Neural Network Models for Natural Language Processing.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	1	1	1	2	1	3	1	1	3	2	1
CO2	3	3	3	1	3	1	1	1	3	1	2	2	3	2	1
CO3	3	3	3	3	3	1	2	2	2	1	1	2	3	3	2
CO4	3	3	3	1	3	2	1	1	2	1	1	2	3	3	2
CO5	3	3	3	3	3	1	1	1	1	1	1	2	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT423
Course title: **Internet of Things (IoT)**
Pre-requisite(s): IT201 Basics of Intelligent Computing
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the IoT Components and its capabilities
2.	Explain the architectural view of IoT under real world constraints
3.	Analyse the different Network and link layer protocols
4.	Evaluate and choose among the transport layer protocols
5.	Design an IoT application

Syllabus

Module I

Introduction to IOT

The definition of the Internet of Things, main assumptions and perspectives. Platform for IoT devices Device architectures. Conventional and renewable power sources for resource-constrained devices. Operating systems for resource-constrained devices. (8L)

Module II

Architecture of IOT

Node structure: Sensing, Processing, Communication, Powering IOT networking: Topologies, Layer/Stack architecture, The data link layer for IoT- Wireless communication technologies. Wire communication technologies. Manet Networks.

(8L)

Module III

Communication Technologies

Introduction to ZigBee, BLE, WiFi, LTE, IEEE 802.11ah, Discuss data rate, range, power, computations/bandwidth, QoS, Service oriented protocols (COAP). Communication protocols based on the exchange of messages (MQTT). Service discovery protocols. (8L)

Module IV

M2M and IoT Technology Fundamentals

Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management. (8L)

Module V

The data processing for IoT

Organization of data processing for the Internet of things. Cloud computing. Fog computing. Application case studies: Smart Grid. Home Automation. Smart City. (8L)

Text books:

1. Madisetti Vijay and BahgaArshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.(T1)
2. Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.(T2)

Reference books:

1. Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.(R1)
2. Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training

CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	2	3	3	2	3	1	2	1	2	1	1	2	2	2	2
CO2	2	3	3	3	2	2	1	1	1	1	1	2	2	3	2
CO3	2	3	2	2	2	1	1	1	1	1	1	2	3	2	2
CO4	2	2	2	3	2	2	1	1	1	1	1	3	2	2	2
CO5	2	3	3	3	2	1	1	2	1	1	1	3	3	2	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT420
Course title: **Artificial Intelligence**
Pre-requisite(s): IT201 Basics of Intelligent Computing
Credits: L:3 T: 0 P: 0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/ IT
Program Outcome
This course enables the students to:

1.	An ability to apply knowledge of mathematics, science and engineering to both software and hardware design problems.
2.	An ability to design and conduct experiments and to analyze and interpret data related to software and hardware design solutions.
3.	An ability to design a system, component or process to meet desired needs within realistic constraints.
4.	An ability to function on multidisciplinary teams using current computer engineering tools and technologies.
5.	An ability to identify, formulate and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics.

Course Outcomes

After the completion of this course, students will be to:

1.	Analyze the principles and approaches of artificial intelligence and understand different aspects of Intelligent agent.
2.	Apply different search techniques for solving real world problems and select the most appropriate solution by comparative evaluation.
3.	Analyze the various concepts of knowledge representations and demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
4.	Develop a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, Robotics etc.
5.	Explain various types of LISP and PROLOG programs and explore more sophisticated LISP and PROLOG code.

Syllabus

Module I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem.

Intelligent Agents: Agents & Environment, Nature Of Environment, Structure Of Agents, Goal Based Agents, Utility Based Agents, Learning Agents.

Problem Solving: Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs.

(9L)

Module II

Search Techniques: Solving Problems By Searching, Problem Solving Agents, Searching For Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.

Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated

Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems.
Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Mini Max Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening. (9L)

Module III
Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation.
Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction.
Representing Knowledge Using Rules: Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge. (7L)

Module IV
Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory.
Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning.
Learning: Forms Of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning. (8L)

Module V
Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.
Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains. (6L)

Text Books:

Russel S. and Norvig P., Artificial Intelligence a Modern Approach, 3rd edition, Pearson Education.(T1)

Rich E. & Knight K., Artificial Intelligence, 3rd edition, TMH, New Delhi.(T2)

Reference books:

Patterson Dan W., Introduction to Artificial Intelligence and Expert Systems, PHI, New Delhi, 2006.(R1)

Rolston D.W., Principles of AI & Expert System Development, TMH, New Delhi.(R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment					
Semester End Examination					

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	1	2	1	3	2	3	2
CO2	3	2	2	3	3	2	1	1	3	3	2	3	2	2	1

CO3	3	2	2	2	3	2	2	2	3	3	1	3	2	3	2
CO4	2	3	2	2	2	3	2	1	3	3	1	3	2	2	3
CO5	3	3	2	3	2	3	2	2	2	1	2	2	2	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT426
Course title: **Data Mining Concepts and Technique**
Pre-requisite(s): CS301 Database Management System
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Examine the types of the data to be mined and apply pre-processing methods on raw data.
2.	To introduce the basic concepts of Data Warehouse and Data Mining techniques
3.	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data
4.	Prepare students for research in the area of data mining and related applications and Enhance students communication and problem solving skills
5.	Provide the students with practice on applying data mining solutions using common data mining software tool /programming languages.

Course Outcomes

After the completion of this course, students will be able to:

1.	Illustrate the fundamentals of data mining systems as well as issues related to access and retrieval of data at scale.
2.	Explain the various data mining functionalities and data warehousing techniques.
3.	Apply the various data mining techniques to solve classification, clustering and association rule mining problems.
4.	Analyze and choose among different approaches of a data mining task.
5.	Design and evaluate data mining models to be used in solving real life problems, keeping in view social impacts of data mining.

Syllabus

Module I

Data Mining: Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation. (6L)

ModuleII

Data Warehouse: Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining.Data Cube Computation and Data Generalization. (8L)

Module III

Mining Association Rules in Large Databases: Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining. (10L)

Module IV

Classification and Prediction: Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule Analysis, Other Classification Methods, Prediction, Classification Accuracy. (8L)

Module V

Cluster Analysis: Introduction , Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Method - k- Medoids Algorithm, CLARANS, Hierarchical Methods - BIRCH, ROCK Density-Based Methods - DBSCAN, Grid-Based Methods – STING, WaveCluster. Outlier Analysis. (8L)

Text book:

Han Jiawei &Kamber Micheline - Data Mining Concepts & Techniques, 2nd Edition, Publisher Harcout India. Private Limited.(T1)

Reference books:

Gupta G.K., Introduction to Data Mining with case Studies, PHI, New Delhi, 2006.(R1)
Berson A. & Smith S. J., Data Warehousing Data Mining, COLAP, TMH, New Delhi, 2004.(R2)
Dunham H.M. & Sridhar S., Data Mining, Pearson Education, New Delhi, 2006.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	2	2	2	1	2	2	1	1	3	3	1
CO2	2	3	2	3	2	2	1	2	2	2	2	1	2	2	2
CO3	2	3	3	3	3	3	3	2	3	2	3	1	2	2	3
CO4	3	2	2	3	3	2	2	1	3	2	2	2	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	2	3	3	3

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	**Course Delivery Method**
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT427
Course title: **Data Mining Concepts and Technique Lab**
Pre-requisite(s): IT426 Data Mining Concepts and technique

Co- requisite(s):
Credits: L:0 T:0 P:1.5
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Explain about the necessity of preprocessing and its procedure.
2.	Generate and evaluate Association patterns
3.	Solve problems using various Classifiers
4.	Learn the principles of Data mining techniques and various mining algorithms.
5.	Learn about traditional and modern data driven approach and problem solving techniques for various datasets

Course Outcomes

After the completion of this course, students will be able to:

CO1	Understand Data Warehousing and Data Mining and its applications and challenges and Create mini data warehouse.
CO2	Apply the association rules for mining applications .
CO3	Identify appropriate Classification techniques for various problems with high dimensional data.
CO4	Implement appropriate Clustering techniques for various problems with high dimensional data sets.
CO5	Implement various mining techniques on complex data objects.

SYLLABUS

List of Programs as Assignments:

Q1. Build a Data Warehouse and Explore WEKA tool.

Q2. Demonstration of preprocessingon various datasets.

Q3.Demonstration of Association rule process on dataset using apriori algorithm.

Q4.Demonstrate performance of classification on various data sets.

Q5. Demonstrate performance of clustering on various data sets.

Q6. Demonstrate performance of Regression on various data sets

Q7. Implement following algorithms for various datasets

D. Apriori Algorithm.
E. FP-Growth Algorithm.
F. K-means clustering.

Q8. Implement Bayesian Classification for various datasets

Q9 Implement Decision Tree for various datasets.

Q10. Implement Support Vector Machines.

Q11 Applications of classification for web mining.

Q12. Case Study on Text Mining or any commercial application

Books recommended:

Text Books :

2. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcout India. Private Limited.

Reference Books :

4. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi – 2006.
5. A. Berson& S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004.
6. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3	1
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2	2
CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	3
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING SPECIALIZATIONS

SPECIALIZATION I: COMPUTATIONAL INTELLIGENCE

Course code: CS360
Course title: Nature Inspired Computing
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students to:

1	Develop basic knowledge of Nature Inspired Computing Techniques and their working principle.
2	Identify the suitable Nature Inspired Computing Techniques to solve a problem.
3	Generate the possible ways of solution to a certain real world problem using Nature Inspired Computing Techniques
4	Analyze and modify the performance of the Nature Inspired Computing algorithms.

Course Outcomes:

After completion of this course the students will be able to:

1.	Identify the Nature Inspired Computing Techniques and their classifications.
2.	Explain the different Nature Inspired algorithms and other algorithms and their working principles.
3.	Design and modify different Nature Inspired algorithms in terms of Initialization, Processing and Stopping Criteria.
4.	Apply Nature Inspired algorithms to different set of practical problems.
5.	Justify the proper applicability of a Nature Inspired algorithm to a problem.

Syllabus:

Module I: Introduction to Nature Inspired Computing, Meta-Heuristic and Evolutionary Algorithms
Nature inspired Computing Concepts, Concepts of Optimization, Examples of the Formulation of Various Engineering Optimization Problems, Searching the Decision Space for Optimal Solutions, Definition of Terms of Meta-Heuristic and Evolutionary Algorithms, Principles of Meta-Heuristic and Evolutionary Algorithms, Classification of Meta-Heuristic and Evolutionary Algorithms.

(8L)

Module II:. Evolutionary Algorithms

Evolutionary Algorithms in Discrete or Continuous Domains, Generating Random Values of the Decision Variables, Dealing with Constraints, Fitness Function, Selection of Solutions in Each Iteration, Generating New Solutions, The Best Solution in Each Algorithmic Iteration, Termination Criteria, General Algorithm, Performance Evaluation of Meta-Heuristic and Evolutionary Algorithms, Search Strategies

Module III: Genetic Algorithm
Introduction, Mapping the Genetic Algorithm (GA) to Natural Evolution, Creating an Initial Population, Selection of Parents to Create a New Generation, Population Diversity and Selective Pressure, Reproduction, Termination Criteria, User-Defined Parameters of the GA, Pseudocode of the GA

(8L)

Module IV: Ant Colony Optimization& Particle Swarm Optimization

Ant Colony Optimization:
ACO Introduction, Mapping Ant Colony Optimization (ACO) to Ants' Foraging Behavior, Creating an Initial Population, Allocating Pheromone to the Decision Space, Generation of New SolutionsTermination Criteria, User-Defined Parameters of the ACO, Pseudocode of the ACO

Particle Swarm Optimization:
PSO Introduction, Mapping Particle Swarm Optimization (PSO) to the Social Behavior of Some Animals, Creating an Initial Population of Particles, The Individual and Global Best Positions Velocities of Particles, Updating the Positions of Particles, Termination Criteria, User-Defined Parameters of the PSO, Pseudocode of the PSO

(8L)

Module V: Other Nature Inspired Algorithms
Honey-Bee Mating Optimization:
Introduction of HBMO, Mapping Honey-Bee Mating Optimization (HBMO) to the Honey-Bee Colony Structure, Creating an Initial Population, Pseudocode of the HBMO

Bat Algorithm:
BA Introduction, Mapping the Bat Algorithm (BA) to the Behavior of Microbats, Creating an Initial Population, Pseudocode of the BA

Harmony Search:
Inspiration of the Harmony Search (HS), Initializing the Harmony Memory, Generating New, Harmonies (Solutions), Pseudocode of the HS

(8L)

Textbook:

1. Meta-heuristic and Evolutionary Algorithms for Engineering Optimization by Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loáiciga, Wiley, 2017, ISBN: 9781119386995

Ref Book:

1. Nature-Inspired Optimization Algorithms, by Xin-She Yang, Elsevier, 2014, ISBN 9780124167438.

2. Introduction to Nature-Inspired Optimization,Editor(s): George Lindfield, John Penny, Academic Press, 2017, ISBN 9780128036365.

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	**Program Outcomes (POs)**											**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	2	2	2				1		3	3	1
CO2	2	3	2	3	2	2	1				1	1	2	2	2
CO3	2	3	3	3	3	3	3				1		2	2	3
CO4	3	2	2	3	3	2	2				1		3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	1		3	3	3

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS473
Course title: Deep Learning
Pre-requisite(s):
Co- requisite(s):
Credits: L:3 T:1 P: 0
Class schedule per week: 4
Class: B. Tech

Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic component of Machine Learning.
2.	To explore the application areas of Neural Networks.
3.	To understand the idea of Recurrent Neural Networks.
4.	To explore the basic concepts of Feed forward Neural Networks.
5.	To understand the concepts of mathematical modelling.

Course Outcomes
After the completion of this course, students will be able to:

1.	Distinguish between machine learning and deep learning
2.	Identify problems suitable for application of deep learning.
3.	Explain the working of FF Neural Networks and their modifications.
4.	Apply Convolutional & Recurrent Neural Networks to solve problems
5.	Discuss the efficiency of deep learning systems.

Syllabus
Module I

Machine Learning Basics: Learning Algorithms, Capacity, Over Fitting and Under fitting, Hyperparameters and Validation sets, Estimators, Bias and variance, Maximum Likelihood Estimation, BayesianStatistics, Supervised and Unsupervised Learning algorithms, SGD, Building a ML algorithm,

(8L)

Module II
History of Deep Learning, Deep Learning Success Stories, McCulloch Pitts Neuron, Thresholding Logic, Perceptrons, Perceptron Learning Algorithm Deep feedforward Networks, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Gradient Descent, Representation Power of Feedforward Neural Networks, Backpropagation.

(8L)

Module III
Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Basis, Principal Component Analysis and its interpretations, Singular Value Decomposition. Autoencoders and relation to PCA, Regularization in autoencoders, Denoisingautoencoders, Sparseautoencoders,
Contractive autoencoders.

(8L)

Module IV
Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset Augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods,

Dropout. Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization. Learning Vectorial Representations Of Words.

(8L)

Module V

Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks,Recurrent Neural Networks, Backpropagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs.Encoder Decoder Models, Attention Mechanism, Attention over images,Introduction to GANs.

. (8L)

Text book:

1. Ian Goodfellow and YoshuaBengio and Aaron Courville,Deep Learning (2016) An MIT Press book, http://www.deeplearningbook.org.(T2)
2. Skansi S., Introduction to Deep Learning - From Logical Calculus to Artificial Intelligence, 1st Edition, Springer International Publishing, 2018.(T2)

Reference book:

Buduma N., Fundamentals of Deep Learning, 1st Edition, O Reilly Media, 2016.(R1)

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcome onto Program Outcome

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	2	3	2	1	2	2	1	2	2	2	3	1	1	1
2	2	3	2	1	1	1	1	1	1	1	1	2	1	2	1
3	3	3	1	3	3	3	2	1	1	1	1	2	2	2	2
4	3	1	2	1	2	2	1	2	1	1	2	1	1	2	1
5	2	2	1	2	3	1	1	1	2	3	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7

CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT401
Course title: Data Analysis and Interpretation
Pre-requisite(s): Nil
Co- requisite(s):
Credits: L:3 T:1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: 4
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Examine the different types of the data and its interpretation and analysis.
2.	To introduce the basic Statistics Probability Distributions.
3.	Apply the techniques of hypothesis tests, supervised and unsupervised learning, feature selection and visualization to real world data.
4.	Prepare students for latest research in the area of data analysis such as deep learning and related applications and Enhance student's communication and problem solving skills.
5.	Provide the students to practice on different datasets for data analysis and interpretation using common statistical software tool /programming languages.

Course Outcomes
After the completion of this course, students will be able to:

1.	Analyze data to convert information to useful knowledge.
2.	Develop an appreciation for what is involved in learning from data.
3.	Explain a wide variety of learning algorithms and also understand how to apply a variety of learning algorithms to data.
4.	Elaborate the fundamental principles, theory and approaches for Neural Networksand learning with deep neural networks.
5.	Interpret and Solve problems related to statistical analysis in Machine Learning

Syllabus:
Module I
Descriptive Statistics- Introduction to the course Descriptive Statistics Probability Distributions
Inferential Statistics-Inferential Statistics through hypothesis tests Permutation &Randomization Test. (6L)

Module II

Machine Learning: Introduction and Concepts Differentiating algorithmic and model based frameworks **Regression**: Regression & ANOVA Regression ANOVA (Analysis of Variance) Ordinary Least Squares, Ridge Regression, Lasso Regression, K Nearest Neighbours Regression & Classification. (10L)

Module III
Supervised Learning with Regression and Classification techniques - Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines (10L)

Module IV
Ensemble Methods- Random Forest, Neural Networks, Deep learning. (8L)

Module V
Unsupervised Learning and Challenges for Big Data Analytics- K-Means and Hierarchical Clustering, Associative Rule Mining, Challenges for big data analytics
Prescriptive analytics- Creating data for analytics through designed experiments, Creating data for analytics through Active learning, Creating data for analytics through Reinforcement learning. (6L)

Text books:

Hastie, Trevor,**Tibshirani,** Robert, **Friedman**, Jerome, "The Elements of Statistical Learning". Vol. 2. No. 1. Springer, New York, 2009.(T1)
Montgomery, Douglas C., and Runger George C., "Applied statistics and probability for Engineers" . John Wiley & Sons, 2010. (T2)

Reference Books:

DeGroot, Morris H., and Schervish Mark J., "Probability and Statistics", 3rd Edition, Boston, MA: Addison-Wesley., 2002. (R1)
Box, G.E.P., Hunter, J.S and Hunter, W.G, "Statistics for Experimenters - Design, Innovation and Discovery, 2nd Edition, Wiley, 2005. (R2)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1
2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1
3	3	2	2	1	1	1	1	1	1	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1

5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS361
Course title: Nature Inspired Computing Lab
Pre-requisite(s):
Co- requisite(s): CS360 Nature Inspired Computing
Credits: L: 0 T: 0 P:2
Class schedule per week: 4
Class: B. Tech
Semester / Level: 4
Branch: CSE/IT

Course Objectives:

This course enables the students to:

1.	Make use of Data sets in implementing nature inspired algorithms
2.	Select the appropriate nature inspired design method for a specified application.
3.	Implement nature inspired concepts and algorithms for a complex problem.
4.	Analyze and compare the different nature inspired algorithms

Course Outcomes:

After the completion of this course, students will be able to:

1.	Utilize the knowledge gained about basic concepts of nature inspired algorithms.
2.	Identify nature inspired techniques suitable for a given problem

3.	Solve the problems using various nature inspired techniques
4.	Apply nature inspired techniques to solve complex problems
5	Design application using nature inspired algorithms.

Syllabus:

1. Programs on Python Basics
2. Programs based on Concept of Optimization
3. Programs based on Concept of Meta heuristics
4. Programs showing Implementation of GA
5. Programs using Problem solving approach of GA
6. Programs showing Implementation of ACO algorithm
7. Programs using Problem solving approach of ACO algorithm
8. Programs showing Implementation of PSO algorithm
9. Programs using Problem solving approach of PSO algorithm
10. Programs showing Implementation of Honey-bee algorithm
11. Programs using Problem solving approach of Honey-bee algorithm
12. Programs showing Implementation of Bat algorithm
13. Programs using Problem solving approach of-Bat algorithm
14. Programs showing Implementation of Harmony Search
15. Programs using Problem solving approach of Harmony Search

Textbook:

1. Meta-heuristic and Evolutionary Algorithms for Engineering Optimization by Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loáiciga, Wiley, 2017, ISBN: 9781119386995

Ref Book:

1. Nature-Inspired Optimization Algorithms, by Xin-She Yang, Elsevier, 2014, ISBN 9780124167438.

2. Introduction to Nature-Inspired Optimization,Editor(s): George Lindfield, John Penny, Academic Press, 2017, ISBN 9780128036365.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3	1
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2	2
CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	3
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS460
Course title: Deep Learning Lab
Pre-requisite(s):
Co- requisite(s): CS473 Deep Learning
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B.Tech
Semester / Level: IV

Branch: B Tech/IT

Course Objectives

This course enables the students:

1.	To understand the basic component of Machine Learning.
2.	To explore the application areas of Neural Networks.
3.	To understand the idea of Recurrent Neural Networks.
4.	To explore the basic concepts of Feed forward Neural Networks.
5.	To understand the concepts of mathematical modelling.

Course Outcomes

After the completion of this course, students will be able to:

1.	Develop Neural network models to solve classification problems.
2.	Design decision trees to solve real world problems.
3.	Create Bayesian Networks for classification problems
4.	Design Convolutional & Recurrent Neural Networks to solve problems
5.	Interpret the training and testing results of deep learning systems.

Syllabus

1. Programs showing Implementation and demonstration of the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a.CSV file.
2. Write a Program for a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Write a program assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for a data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Write a program to Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same dataset for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.
9. Write a program showing implementation of k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Write a program showing implementation of the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3	1
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2	2
CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	3
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

SPECIALIZATION II: IoT AND CLOUD COMPUTING

COURSE INFORMATION SHEET

Course code: IT 360
Course title: Introduction to cyber physical systems
Pre-requisite(s): Internet of things
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B.Tech
Semester / Level: IV
Branch: B Tech/IT

Course Objectives

This course enables students:

1.	To understand different Cyber physical systems, its characteristics and components.
2.	To have a comprehensive view of storage and networking infrastructure for highly CPS deployments.
3.	To critically appraise the opportunities and challenges of IoT applications in complex business environments.
4.	To understand the concepts of Ubiquitous Computing
5.	To know about embedded systems a s a whole.

Course Outcomes

After the completion of this course, students will be able to:

1.	Explain the logical and physical components of a System
2.	Evaluate Embedded computing systems.
3.	Analyze the various types of CPS technologies.
4.	Apply IoT concepts to different technological applications
5.	Discuss case studies related to ubiquitous computing systems.

Syllabus

Module 1: Introduction to Systems

Study of Systems, Standard Forms of System Description, Input-Output Description,State-Variable Description, Controllability, Observability, and Identifiability, Analytical Solutions of Linear Systems Models, Solution of State Equations Using the Laplace Transform, Eigenvalues of the Linear Vector-Equation Systems,Steady-State Errors of Systems .

(8L)

Module II: Introduction to Embedded Computing Systems

Embedded Computing Systems, Hardware Architectures of Embedded Computing Systems, Programmable Logic Devices, Field-Programmable Gate Arrays, Design Metrics, Embedded Control

Systems, Control: Feedback Control, Feedback Components of Embedded Control Systems, Hardware-Software Codesign, Case Study: FPGA-Based CPU Core.

(8L)

Module III: Introduction to Cyber-Physical Systems

Cyber-Physical Systems, Cyber-Physical Systems Design Recommendations, Cyber-Physical System Requirements, Requirements Engineering, Interoperability, Real-Time Systems, GPU Computing, Cyber-Physical Systems Applications, Requirements Analysis.

(8L)

Module IV: Introduction to the Internet of Things

Internet of Things, Radio Frequency Identification Technology, Wireless Sensor Networks Technology , Sensor Technology, Sensor Networks, Wireless Sensor Networks, Powerline Communication: Internet of Things and Powerline Communication, Smart Grid, Smart Home Energy Management, RFID Applications.

(8L)

Module V: Ubiquitous Computing

Ubiquitous Computing Fundamentals, Learning in the Ubiquitous Space: Smart Home and Powerline Communication, Core Properties of Ubiquitous Computing, Ubiquitous Computing Formalisms for Use Cases, Smart Devices: Components and Services, Tagging, Sensing, and Controlling : Tagging, Sensing Controlling, Autonomous Systems in Ubiquitous Computing .

(8L)

TextBooks:

1. Guide to Computing Fundamentals in Cyber-Physical Systems, Concepts, Design Methods, and Applications, Authors: Möller, Dietmar P.F

Reference Books:

1. Introduction to Embedded Systems – A Cyber–Physical Systems Approach" - E. A. Lee, Sanjit Seshia
2. Principles of Cyber-Physical Systems" - Rajeev Alur

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment

Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1

2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1
3	3	2	2	1	1	1	1	1	1	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1
5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code:IT460
Course title: Cloud Storage and Security
Pre-requisite(s): Cloud Computing
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B.Tech
Semester / Level: IV
Branch: B Tech/IT

Course Objectives
This course enables students:

1.	To understand different cloud storage technologies, its characteristics and components.
2.	To have a comprehensive view of storage and networking infrastructure for highly virtualized cloud deployments.
3.	To critically appraise the opportunities and challenges of storage management in complex business environments.
4.	To acknowledge the concepts of security systems and cryptographic protocols, which are widely used in the design of cloud security.
5.	To appraise legal and compliance issues related to cloud computing

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain the logical and physical components of a Storage infrastructure.

2.	Evaluate storage architectures, including DAS, SAN, NAS, and CAS.
3.	Elaborate the various types of Storage networking technologies.
4.	Discuss the different forms of storage virtualization techniques.
5.	Evaluate security issues related to cloud storage.

Syllabus

Module 1: Introduction to Storage Technology:

Review of basic sources of data, understand the value of data to business, challenges in data storage and its management, Evolution of storage technology and architecture, Data center infrastructure, Storage system environment, Intelligent storage systems.

(8L)

Module 2: Storage System Architecture:

Components of a storage system environment: Host, Connectivity and storage, Data Protection: RAID, Implementation of RAID, RAID Array Components, Components of an intelligent storage system, Intelligent storage array.

(8L)

Module 3: Storage Networking Technologies: Evolution of networked storage, Direct-Attached Storage (DAS) Architecture, Types of DAS, Benefits and Limitations, Storage Area Network (SAN), Components of SAN, Fibre channel connectivity, Zoning, Networked Attached Storage (NAS), Components of NAS.

(8L)

Module 4: Advanced Storage Networking and Virtualization: IP Storage Area Network (IP SAN), iSCSI, Fiber channel over IP (FCIP), Content-Addressed Storage (CAS), Storage virtualization, Types of Storage virtualization

(8L)

Module 5: Cloud Security:

Storage security framework, Security implementations in SAN, NAS and IP SAN, Virtualization system security, Technologies for virtualization-based security enhancement, legal and compliance issues.

(8L)

Text Book:

1. G. Somasundaram, AlokShrivastava , "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley.
2. Tim Mather, SubraKumaraswamy, ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance" O'Reilly Media; 1 edition

Reference Book:

1. Richard Barker, Paul Massiglia, "*Storage area network essentials"*, Wiley New York
2. Greg Schulz, "*Cloud and Virtual Data Storage Networking"*, Auerbach Publications
3. Meeta Gupta, "*Storage Area Networks Fundamentals*", Pearson Education Limited, 2002.
4. Ronald L. Krutz, Russell Dean Vines, "*Cloud Security"*

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1
2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1
3	3	2	2	1	1	1	1	1	1	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1
5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code:IT462
Course title: SOFTWARE DEFINED NETWORKING
Pre-requisite(s): Data and Computer Communication
Co- requisite(s): NIL
Credits: L: 3 T: 1 P: 0
Class schedule per week: 04
Class: M. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Review the main features of SDN
2.	Discuss the timeline of SDN techniques in the past
3.	Gain awareness about the ideas and principles behind SDN
4.	Recognize architectural themes in computer networking where SDN originated
5.	Apply understanding of security and virtualization in SDN.

Course Outcomes

After the completion of this course, students will be able to:

1.	Identify challenges for widely deploying SDN in different contexts
2.	Discuss SDN controller scalability issues and possible solutions
3.	Analyze SDN Basics and Open Flow.
4.	Compare Abstraction methods used in SDN and their applicability
5.	Distinguish between scalability and virtualization in SDN

Syllabus

Module I **[8L]**

Introduction:

Software defined networking, SDN motivation, Conventional networking system today (before SDN), Ideal networking system for innovation, SDN now: separate forwarding hardware from controlling software

Module II **[8L]**

SDN evolution

Main features of SDN, Evolution of the SDN supporting technologies: centralized global view, Network Control Point, Evolution of SDN technologies: Programmability in Networks, Active networks SDN basics and OpenFlow,Control plane and data plane, Forwarding abstraction, State Distribution Abstraction, other Abstraction methods, Network Operating System(NOS), Openflow.

Module III **[8L]**

OpenFlow Controllers

SDN controllers, SDN controllers (NOS) .vs. OS, NOS functionality, Existing SDN controllers, NOX, Open Daylight, REST API.

Module IV **[8L]**

SDN challenges, SDN Network Updates

SDN challenges, Device heterogeneity, SDN scalability: distributed controller, distributed apps, NOS: Network abstraction, SDN controller scalability issue, Solutions.

Module V **[8L]**

SDN virtualization:

Flowvisor Overview, Network slice and flowspace, Slicing control & data planes, Network Slicing Architecture, Slicing Policies, FlowVisor Slicing, FlowVisor Message Handling.

SDN and Security

Problems of Legacy Network Devices, Security as an App, Framework for Enabling Security Controls in OpenFlow networks.

Text Books:

The Road to SDN: An Intellectual History of Programmable Networks by Nick Feamster, Jennifer Rexford and Ellen Zegura, ACM CCR April 2014

Gaps in the syllabus (to meet Industry/Profession requirements): N/A

POs met through Gaps in the Syllabus: N/A

Topics beyond syllabus/Advanced topics/Design: N/A

POs met through Topics beyond syllabus/Advanced topics/Design: N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	3	2	1	1	1	1	1	1	1	1	3	1	1	1
2	3	2	1	1	1	1	1	1	1	1	1	2	1	2	1
3	3	2	2	1	1	1	1	1	1	1	1	2	2	2	2
4	2	3	2	2	1	1	1	1	1	1	1	1	1	2	1
5	2	2	2	3	3	2	1	1	1	1	1	1	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT361
Course title: Programming for IoT Lab
Pre-requisite(s):
Co- requisite(s):
Credits: L:0 T:0 P:2
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	Understand the basic concept and the Iot Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT

4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes

After the completion of this course, students will be able to :

1.	Identify the IoT Components and its capabilities
2.	Design IoT System using Raspberry-Pi for reading data from various sensors and storing the data into cloud.
3.	Design the Networkfor communication between two devices using Zigbee.
4.	Develop socket programs for device communication
5.	Design and develop small IoT systems like simulated traffic signals, lift elevator etc.

Syllabus

1. Programs/ Script based on Raspberry-Pi, Arduino and other micro controllers.

2. Programs/ Script based on different operating systems for Raspberry-Pi. Understanding the process of OS installation on Raspberry-Pi

3. Programs/ Script based on Connectivity and configuration of Raspberry-Pi circuit with basic peripherals, LEDS for understanding GPIO and its use in programs.

4. Programs/ Script showing the connectivity of Raspberry-Pi circuit with temperature sensor. Write a program/script to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs

5. Programs/ Script showing the connectivity of Raspberry-Pi circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.

6. Programs/ Script showing connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.

7. Write a Program/script using Raspberry-Pi to control the operation of hardware simulated traffic signal.

8 Write a Program/script using Raspberry-Pi to control the operation of a hardware simulated lift elevator.

9. Write a Program/script showing server application to be deployed on Raspberry-Pi. Write client applications to get services from the server application.

10. Write a Program/script which will create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.

11. Write a Program/script which will create a simple web interface for Raspberry-Pi/Beagle board to control the connected LEDs remotely through the interface.

Text books:

3. Madisetti Vijay and Bahga Arshdeep, Internet of Things (A Hands-on-Approach), 1st Edition, VPT, 2014.(T1)
4. Raj Pethuru and Raman Anupama C., The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press.(T2)

Reference books:

3. Vermesan Dr. Ovidiu, Friess Dr. Peter, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers.(R1)
4. Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.(R2)

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3	1
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2	2
CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	3
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2

CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT461
Course title: Cloud Storage & Computing lab
Pre-requisite(s):
Co- requisite(s):
Credits: L:0 T:0 P:2
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives

1.	To learn the design and development process involved in creating a cloud based application
2.	Install and use a generic cloud environment that can be used as a private cloud.
3.	Learn how to simulate a cloud environment to implement new schedulers.
4.	To learn to implement and use parallel programming using Hadoop
5.	Learning about developing web applications in cloud

Course Outcomes

CO1	To develop web applications in cloud
CO2	Design and deploy a web application in a PaaS environment.
CO3	Construct various virtualization tools such as Virtual Box, VMware workstation.
CO4	Analyze large data sets in a parallel environment.
CO5	Apply basic security Algorithms on cloud based data and systems

Syllabus

1. Sign up for a free account at two or more cloud storage providers of your choice. Choose any ten of your files that are larger than 1 MB each. Store these files in both the providers above. Show a "directory listing" in each.
2. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
3. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
4. Install Google App Engine. Create hello world app and other simple web applications using python/java.
5. Use GAE launcher to launch the web applications.
6. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
7. Find a procedure to transfer the files from one virtual machine to another virtual machine.
8. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
9. Install Hadoop single node cluster and run simple applications like wordcount.

Text Book:

1. G. Somasundaram, AlokShrivastava , “Information Storage and Management: Storing, Managing, and Protecting Digital Information”, Wiley.
2. Tim Mather, SubraKumaraswamy, ShahedLatif, “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance” O'Reilly Media; 1 edition

Reference Book:

1. Richard Barker, Paul Massiglia, “*Storage area network essentials”*, Wiley New York
2. Greg Schulz, “*Cloud and Virtual Data Storage Networking”*, Auerbach Publications
3. Meeta Gupta, “*Storage Area Networks Fundamentals*”, Pearson Education Limited, 2002.
4. Ronald L. Krutz, Russell Dean Vines, “*Cloud Security”*

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CO1	3	3	2	3	2	2	2	1	2	3	3	3	3	3	1
CO2	2	3	2	3	2	2	1	2	2	3	3	3	2	2	2
CO3	2	3	3	3	3	3	3	2	3	3	3	3	2	2	3
CO4	3	2	2	3	3	2	2	1	3	3	3	3	3	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	3	3	3	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

SPECIALIZATION III: **Image Processing & Computer Vision**

COURSE INFORMATION SHEET

Course code: CS380
Course title: Modern Computer Graphics
Pre-requisite(s): CS206 Design and Analysis of Algorithm
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	To Apply Principles Rasterization
2.	To be able to use visual computations for geometrical drawings.
3.	To apply principles of Projection techniques
4.	To be able to use animation techniques
5.	To ConstructVirtual images using color and shading techniques

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply different rasterization concepts.
2.	Explain various projection techniques.
3.	Develop Object Representation using Curves and Surfaces
4.	Design Computer Animation
5.	Create Visual Effects

Syllabus

Module I

Graphics Pipeline **[10 Lectures]**

Graphics system introduction, Rasterization, Scan Conversions, Filled Area Algorithms, Antialiasing

Module II **[10 Lectures]**

2D Geometric Transformations and Viewing

Basic Transformations, Homogenous coordinates, Composite Transformations, Affine Transformations, 2D Viewing, Coordinate transformation, 2DClipping, 2D texture mapping

Module III

3D Geometric Transformations, Modeling and Viewing **[10 Lectures]**

3Dbasic Transformations, 3D Viewing and Clipping, Projections,3D display elements, Implicit Modeling

Module IV

Curves, Surface Design and Display **[10 Lectures]**

Curves, Curve Properties, Quadratic Curves, Cubic Curve, Splines, Surface Design, Fractals geometry, Hidden Surface Removal

Module V

Colorimetry and Computer Animation **[10 Lectures]**

Color Models, Illumination and shading model, Tone Reproduction, Principles of Animation, Keyframing, Deformations, Character Animations, Physics based Animations, Morphing and Motion Specifications

Text books:

1. Hearn D. & Baker M.P. , Computer Graphics, 2/e , Pearson Education, New Delhi, 2005.(T1)
2. Peter Shirley & Steve MarschnerComputer Graphics: CENEAGE Learning, Second Edition 2012

Reference books:

1. Foley J.D. et. Al, A Fundamental of Computer Graphics, Addition Wesley, London, 1993.(R1)
2. Krishnamurthy N, Introduction to Computer Graphics, 1stEdn., TMH, 2002.(R2)
3. Rogers B., Mathematical elements of Computer Graphics, McGraw Hill, 1989.(R3)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	2	2	3	2	1	1	2	1	1	2	3	2	2
CO2	3	2	2	3	3	2	1	1	2	2	2	1	3	2	2
CO3	3	2	2	3	2	3	3	2	2	2	2	1	3	1	2
CO4	3	2	3	2	3	2	1	2	2	3	3	1	3	3	2
CO5	3	3	3	3	2	2	2	2	2	1	2	1	2	2	2

Mapping of Course Outcomes onto Program Outcomes

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT480
Course title: Image Processing and Pattern Recognition
Pre-requisite(s): Design and Analysis of Computer Algorithm
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B.Tech

Semester / Level: IV
Branch: B Tech/CSE/IT

Course Objectives

This course enables the students:

1.	To understand the basic concepts for representation of an image mathematically.
2.	Use foundational techniques of image processing to solve image processing problems of real world application
3.	To understand the basic concepts of classification, clustering and its importance to image processing and pattern recognition.
4.	Use image processing and pattern recognition techniques to detect objects and activities in images.

Course Outcomes

After the completion of this course, students will be able to:

1.	Explain the process of digital representation of images and the principles of image enhancement and restoration.
2.	Discuss different techniques employed for the segmentation of images.
3.	Apply different feature extraction techniques for building pattern recognition applications.
4.	Explain the different pattern recognition strategies.
5.	Distinguish between different types of pattern classification techniques and Explain its applications to different real time problems.

Syllabus

Module I Overview of Image Processing [10 Lectures]

Fundamental Components of Image Processing, Digital Image Representation, Mathematical Preliminaries, Mathematical Morphology, Image Enhancement:Grayscale Transformation, Piecewise Linear Transformation, Bit Plane Slicing, Histogram Equalization, Histogram Specification, Enhancement by Arithmetic Operations, Smoothing Filter, Sharpening Filter, Image Blur Types and Quality Measures. Image Restoration: Image degradation model, Types of image degradation, Linear and non-linear image restoration techniques.

Module II Image Segmentation [10 Lectures]

Introduction, Classification of image segmentation algorithms, Principle of image thresholding, Region based segmentation, Clustering based Image segmentation, Contour based image segmentation.

Module III Image Feature Extraction and Representation[10 Lectures]

Necessity of image feature extraction, Types of image feature extraction methods, Feature representation: Chain code representation, Polygonal Approximation, Measuring moments, Principal components, Boundary thinning

Module IV Pattern Recognition **[10 Lectures]**

Recognition and Learning: Human Learning, Machine learning, Recognition by Machines, Overview of pattern recognition, Pattern recognition strategies: Acquisition and representation of patterns, Feature selection, Applications of Pattern recognition.

Module V: Pattern Classification and Applications **[10 Lectures]**

Decision making: Linear functions and Non-linear separability, Classification models: Distance based classifier, Naïve Bayesian Classifier, Decision Tree, Artificial Neural networks. Applications: Face Recognition, Character Recognition, Watermarking, Solar image Processing.

Text Book:

1. Image Processing and Pattern Recognition, Frank Y Shin, Wiley, 2nd Edition 2010.
2. Digital Image Processing, Gonzalez, R. and Woods, Prentice Hall, 2018.
3. Digital Image Processing and Pattern Recognition by Malay Kumar Pakhira, PHI, 2014.
4. Pattern Recognition, M NurshimhaMurty, University Press, 2019

Reference Book:

1. Image Processing, Analysis, and Machine Vision, Milan Sonka
2. Digital Image Processing, S.Sridhar, Oxford University Press, 2016
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill, 2015
4. Pattern Recognition SergoiTardos, Academic press, 4th Edition 2008.

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)											Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	2	2	2	1	3	2	1	2	3	3	2
CO2	2	2	3	3	2	3	2	2	3	2	1	2	2	2	3
CO3	3	2	2	2	3	3	1	1	2	2	2	1	2	2	3
CO4	2	3	3	2	2	2	2	2	2	3	1	1	2	2	2
CO5	2	2	1	1	3	3	2	1	3	3	3	1	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT482
Course title: Machine Learning for Machine Vision
Pre-requisite(s): CS327 Computer Graphics
Co- requisite(s):
Credits: L:3 T:1 P:0
Class schedule per week: 4
Class: B.Tech
Semester / Level: IV
Branch: B Tech/IT

Course Objectives
This course enables the students:

1.	Be familiar with both the theoretical and practical aspects of computing with images.
2.	Have described the foundation of image formation, measurement, and analysis.
3.	Understand the geometric relationships between 2D images and the 3D world.
4.	Grasp the principles of state-of-the-art deep neural networks

Course Outcomes
After the completion of this course, students will be able to:

1.	Develop the practical skills necessary to build computer vision applications.
2.	Explain the exposure to object and scene recognition and categorization from images.
3.	Develop algorithm for classification and clustering.
4.	Discuss the techniques of different models for vision
5.	Apply in different engineering application such Image retrieval, Object detection, etc.

Syllabus

Module 1: Understanding machine learning basics: [10 Lectures]

Probability basics: probability, common probability distributions, probability models, normal distributions, Neural Network:Perceptron, Activation functions, Artificial neural network

(ANN), CNN.Machine learning for machine vision: learning and inference in vision, modelling complex data densities, regression, and classification models

Module 2: Models for Geometry **[10 Lectures]**

Pinhole camera, Models for transformations, Multiple cameras, Predictive Models, Descriptive Models, training a Model, Model Representation and Interpretability, Evaluating Performance of a Model

Module 3:Models For Vision **[10 Lectures]**

Models for shape, style and identity, temporal models, and models for visual words, Generative Models

Module 4:Models for Image Retrieval **[10 Lectures]**

Understanding visual features, Visualizing activation of deep learning models, Embedding visualization, Model Inference, Content based image retrieval, Autoencoders.

Module 5:Models for Object Detection **[10 Lectures]**

Object Detection**,** Detecting objects in an image, Exploring the datasets, ImageNet dataset, PASCAL VOC challenge, COCO object detection challenge, Localizing algorithms , Detecting objects, The YOLO object detection algorithm.

Text Book

3. Deep Learning for Computer Vision, by Rajalingappaa Shanmugamani, Released January 2018, Publisher(s): Packt Publishing, ISBN: 9781788295628
4. Computer Vision: Models, Learning and Interface, Simon J.D Prince, Cambridge University Press, 2012

Reference Book:

5. Computer Vision a Modern Approach by David a Forsyth. Pearson Education, Second Edition 2015
6. Machine Learning by S Dutt, S Chandramouli, A.K.Das, Pearson, First Publication 2019
7. Neural Networks and Learning Machine by Simon Haking, Pearson and Prentice Hall, 2009

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

<u>Topics beyond syllabus/Advanced topics/Design:</u>N/A

<u>POs met through Topics beyond syllabus/Advanced topics/Design:</u>N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>
1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets

CD7	Simulation

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	2	3	1	1	2	1	1	1	1	2	1	1	3	2
2	2	3	3	1	1	1	1	1	1	1	1	2	1	3	1
3	2	3	2	3	3	1	1	1	1	1	1	3	2	3	3
4	3	1	1	1	2	1	1	2	1	1	1	2	1	3	1
5	2	2	1	2	3	1	1	1	1	3	1	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS381
Course title: Modern Computer Graphics Lab
Pre-requisite(s):
Co- requisite(s): CS380 Modern Computer Graphics
Credits: L: T:0 P:2
Class schedule per week: 4
Class: B. Tech
Semester / Level: III
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Apply Principles Rasterization
2.	Able to use visual computations for geometrical drawings.
3.	Apply principles of Projection techniques
4.	Able to use animation techniques
5.	Construct Virtual images using color and shading techniques

Course Outcomes
After the completion of this course, students will be able to :

1.	Build code for demonstration of different rasterization concepts.
2.	Develop different projection techniques.
3.	Develop Object Representation using Curves and Surfaces
4.	Design and build Computer Animation
5.	Write code to Create Visual Effects

Syllabus

1. Programs based on Graphics Library Functions
2. Programs on Scan Conversion
3. Programs on Filling Algorithms
4. Programs on 2D Clipping
5. Programs on 2D Transformations
6. Programs on 3D Clipping and Viewing
7. Programs on Projection
8. Programs on Curve Design
9. Programs on Surface Design
10. Programs on Multiple Color Generation
11. Programs on Shadow Creation
12. Programs on 3D Model and its Movement
13. Programs on Animation
14. Programs on Science Fiction
15. Programs on Morphing

Text books:

3. Hearn D. & Baker M.P. , Computer Graphics, 2/e , Pearson Education, New Delhi, 2005.(T1)
4. Peter Shirley & Steve MarschnerComputer Graphics: CENEAGE Learning, Second Edition 2012

Reference books:

4. Foley J.D. et. Al, A Fundamental of Computer Graphics, Addition Wesley, London, 1993.(R1)
5. Krishnamurthy N, Introduction to Computer Graphics, 1stEdn., TMH, 2002.(R2)
6. Rogers B., Mathematical elements of Computer Graphics, McGraw Hill, 1989.(R3)

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

<u>Topics beyond syllabus/Advanced topics/Design:</u>

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	**Program Outcomes (POs)**												**Program Specific Outcomes (PSOs)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	2	2	2	1	3	2	1	2	3	3	2
CO2	2	2	3	3	2	3	2	2	3	2	1	2	2	2	3
CO3	3	2	2	2	3	3	1	1	2	2	2	1	2	2	3
CO4	2	3	3	2	2	2	2	2	2	3	1	1	2	2	2
CO5	2	2	1	1	3	3	2	1	3	3	3	1	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: IT481
Course title: Visual Processing Lab
Pre-requisite(s):
Co- requisite(s): IT480 Image Processing and Pattern Recognition
Credits: L:3   T:1   P:0
Class schedule per week: 4
Class: B.Tech

Semester / Level: III
Branch: B Tech/CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic concepts for representation of an image mathematically.
2.	Use foundational techniques of image processing to solve image processing problems of real world application
3.	To understand the basic concepts of classification, clustering and its importance to image processing and pattern recognition.
4.	Use image processing and pattern recognition techniques to detect objects and activities in images.

Course Outcomes
After the completion of this course, students will be able to:

1.	Write Code to Explain the process of digital representation of images and the principles of image enhancement and restoration.
2.	Build Code for different techniques employed for the segmentation of images.
3.	Write code to Explain different feature extraction techniques for building pattern recognition applications.
4.	Build code for demonstration of different pattern recognition strategies.
5.	Develop code for solving problems related to pattern classification

Syllabus

1. Programs using the MATLAB editor [Understanding of MATLAB Working Environment]
2. Programs on Digital Image Representation
3. Programs on M Files and Function
4. Programs on Intensity Transformations and Spatial Filtering
5. Programs on Frequency domain Processing
6. Programs on Image Restoration
7. Programs on Image Segmentation
8. Programs on Color Image Processing
9. Programs on Representation and Description
10. Programs on Object Recognition
11. Programs on Learning
12. Programs on Feature Selection
13. Programs on Classification [Application]
14. Programs on Clustering [Application]

Text Book:

5. Image Processing and Pattern Recognition, Frank Y Shin, Wiley, 2nd Edition 2010.
6. Digital Image Processing, Gonzalez, R. and Woods, Prentice Hall, 2018.
7. Digital Image Processing and Pattern Recognition by Malay Kumar Pakhira, PHI, 2014.
8. Pattern Recognition, M NurshimhaMurty, University Press, 2019

Reference Book:

5. Image Processing, Analysis, and Machine Vision, Milan Sonka
6. Digital Image Processing, S.Sridhar, Oxford University Press, 2016
7. Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill, 2015
8. Pattern Recognition SergoiTardos, Academic press, 4th Edition 2008.

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce
Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10

Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

<u>Indirect Assessment</u>

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	2	2	2	2	2	1	3	2	1	2	3	3	2
CO2	2	2	3	3	2	3	2	2	3	2	1	2	2	2	3
CO3	3	2	2	2	3	3	1	1	2	2	2	1	2	2	3
CO4	2	3	3	2	2	2	2	2	2	3	1	1	2	2	2
CO5	2	2	1	1	3	3	2	1	3	3	3	1	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7

CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

SPECIALIZATION IV: HIGH PERFORMANCE COMPUTING

COURSE INFORMATION SHEET

Course code: CS421
Course title: PARALLEL COMPUTING

Pre-requisite(s): CS203 Computer Organization and Architecture, CS206Design and Analysis of Algorithm
Co-requisite(s):
Credits: L:3 T:0 P:0
Class schedule per week: 3
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Learn different types of parallelisms achieved over different computer models
2.	Write parallel algorithms (and programs) for computer problems
3.	Map parallel algorithms from architecture to architecture
4.	Identify the issues in concurrency control

Course Outcomes
After the completion of this course, students will be able to:

1.	Explain the need of concurrent execution of problems
2.	Solve the issues related to concurrency control
3.	Interpret the parallel algorithm from organization to organization
4.	Make familiar with a range of parallel algorithms on different architectures.
5.	Apply the concept parallelism in solving the problems of different domains

SYLLABUS:
Module I
Introduction: Parallel Processing Environment- Pipelining and Data Parallelism, Flynn's Taxonomy, Speedup, Scaled Speedup, Analyzing parallel algorithms, P-RAM Algorithms. **(8L)**

Module II
Processor Array, MIMD: Multiprocessors (shared) and Multi-computers (distributed), Networks(Processor organizations):Static and dynamic Interconnection Networks, Message Transferring procedures. **(8L)**

Module III
Mapping and Scheduling, Dynamic Load Balancing on Multi-computers, Static Scheduling on UMA Multiprocessors, Parallel Programming model using process and thread, Deadlock and Synchronization issues. **(8L)**

Module IV

Elementary Parallel Algorithm: Matrix Multiplication: Sequential Matrix Multiplication, Algorithms for Processor Array, Algorithms for Multiprocessors, Algorithms for Multi-computers. **(8L)**

Module V

Solving set of linear equations: Gaussian Elimination, The Jacobi Algorithm, Sorting algorithms: Enumeration Sort, ODD-EVEN Transposition sort, BITONIC Merge, Quicksort Based Algorithms. **(8L)**

TEXT BOOK:

Quin M. J., "Parallel Computing: Theory and Practice", McGraw Hill, New York, 1994.

REFERENCE BOOKS:

1. Akl Selim G., "The Design and Analysis of Parallel Algorithms", Prentice Hall International.
2. Sasikumar M., Shikhare D. and Prakash P. Ravi, "Introduction to Parallel Processing", PHI, 2006.

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure:
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	1	1	3	2	2	3	2	1	2	3	2	2	3	3	2
CO2	3	2	3	3	2	1	1	1	2	3	2	2	3	3	2
CO3	1	1	2	3	1	2	2	1	3	3	2	3	2	1	3
CO4	2	2	2	3	3	2	3	1	3	2	2	1	2	3	2
CO5	3	2	2	2	2	1	2	1	3	2	2	1	1	1	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS436
Course title: HIGH PERFORMANCE COMPUTING ARCHITECTURE
Pre-requisite(s): CS203 Computer Organization and Architecture
Co- requisite(s):

Credits: L:3 T:1 P: 0
Class schedule per week: 4
Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students:

1.	To understand the basic component of Parallel Computer Models.
2.	To explore the application areas of Parallel Computer.
3.	To understand the idea of Processors and Memory Hierarchy.
4.	To explore the different IR evolution techniques.
5.	To understand the concepts of Multithreaded and Data Flow Architecture.

Course Outcomes
After the completion of this course, students will be able to :

1.	Discuss different terminologies in High Performance Computer Architecture.
2.	Explain and Implement the concepts of High Performance Computer Architecture
3.	Compare and differentiate the different parallel architectures in terms of various parameters.
4.	Evaluate performance metrics and scalability and selection criteria for parallelism and different parallel systems and able to modify it.
5.	Design effective high-performance systems as per users' criteria with proper justification by self or in a group.

SYLLABUS
Module I
Parallel Computer Models: The State of Computing, Multiprocessors and Multicomputer, Multifactor and SIMD Computers, PRAM and VLSI Models, Architectural Development Tracks.
Program and Network Properties: Conditions for Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures. **(8L)**

Module II
Program and Network Properties: Conditions for Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures.
Principles of Scalable Performance: Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches. **(8L)**
Module III
Processors and Memory Hierarchy: Advanced Processor Technology, Super Scaler and Vector Processors, Memory Hierarchy Technology, Virtual Memory Technology.
Bus, Cache, and Shared Memory: Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models, Weak Consistency Models. **(8L)**
Module IV
Pipelining and Superscalar Techniques: Linear Pipeline Processors, Non Linear Pipeline Processor, Instruction Pipeline Design, Arithmetic Pipeline Design, Superscalar Pipeline Design

Multiprocessors and Multicomputers: Multiprocessor System Interconnects, Cache Coherence Synchronization Mechanism, Three Generations of Multicomputers, Message-Passing Mechanisms. **(8L)**

Module V

Multi-vector and SIMD Computers: Vector Processing Principles, Multivector Multiprocessor, Compound Vector Processing, SIMD Computer Organizations, The Connection Machine CM-5

Scalable, Multithreaded and Data Flow Architecture: Latency-Hiding Techniques, Principle of Multithreading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures,Data Flow and Hybrid Architectures. **(8L)**

Text Book:

1. Hwang K., Jotwani N., Advanced Computer Architecture, 2nd Edition, Tata Mc-Graw Hill, India, 2010. (T1)

Reference Book:

1.Stone, H. S., High Performance Computer Architecture, 3rd Edition, Addison Wesley Publishing Company, USA. (R1)

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher’s Assessment	5

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty

2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
1	3	2	3	1	1	2	1	1	2	1	1	1	1	3	2
2	2	3	1	1	1	2	2	1	1	1	2	1	1	2	1
3	2	3	3	3	3	1	1	1	2	2	1	2	2	3	3
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	2
5	2	2	1	2	3	1	1	1	1	3	2	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS493
Course title: GPU PROGRAMMING
Pre-requisite(s): CS203 Computer Organization and Architecture, CS211Operating System, CS201 Data Structures
Co- requisite(s): None
Credits: L: 3 T: 0 P: 0
Class schedule per week: 03

Class: B. Tech
Semester / Level: IV
Branch: CSE/IT

Course Objectives
This course enables the students to:

1.	Identify the different kinds of parallel models used in computing
2.	Identify common programming constructs used in parallel programming.
3.	Understand the basic hardware of GP-GPUs.
4.	Visualize the concepts of grids, blocks and threads in GPU computing.
	Understand the different memory types available in GPU programming.

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify the various components that go into the making of GPUs.
2.	Describe the compute capabilities of a GPU based system.
3.	Formulate logic in multiple dimensions to solve problems using GPUs.
4.	Utilize the various memory modules available in GPU.
5.	Measure the gain in performance between CPUs and GPUs.

SYLLABUS
Module I: History of Supercomputing
Von Neumann Architecture, Basic five stage RISC Pipeline, Cache Memory, Register File, SIMD instructions, GPU architectures - Streaming Multi Processors, Cache Hierarchy, The Graphics Pipeline.
(8L)

Module II: Understanding Parallelism with GPUs
Traditional Serial Code, Serial/Parallel Problems, Concurrency, Locality, Types of Parallelism, Task-based parallelism, Data-based parallelism, Flynn's Taxonomy, Some Common Parallel Patterns, Loop-based patterns, Fork/Joinpattern,
(8L)

Module III: CUDA Hardware and CUDA Programming
CUDAGPU Hardware, Types of data storage, RegisterUsage, CPUs and GPUsCompute Levels, Characteristics of different compute levels and NVIDIA, Introduction to CUDA programming
(8L)

Module IV: Grids, Blocks, and Threads
Multi-dimensional mapping of dataspace, Synchronization. Warp Scheduling, Divergence**,** Optimization examples : Kernel Fusion, Thread and Block **(8L)**

Module V: Memory Handling with CUDA
Shared Memory, Sorting using shared memory, Parallelreduction, Shared memory on different GPUs, Constant memorycaching, Constant memory broadcast, Constant memory updates at runtime, Global Memory,texture reads. OpenCL basics. **(8L)**

TEXT BOOKS:

1.John L.Hennessy and David A. Patterson, "Computer Architecture - A Quantitative Approach" - Morgan Kauffman (5th Edition)

2. Cook S., "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs," First Edition, Morgan Kauffman, 2013.

Reference Books:

Kirk W. B., Hwu W. W., "Programming Massively Parallel Processors", Second Edition, Morgan Kauffman, 2013.

Gaps in the syllabus (to meet Industry/Profession requirements):N/A

POs met through Gaps in the Syllabus:N/A

Topics beyond syllabus/Advanced topics/Design:N/A

POs met through Topics beyond syllabus/Advanced topics/Design:N/A

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
Mid semester examination	25
Two quizzes	20 (2×10)
Teacher's Assessment	5

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	2	1	1	3	1	1	1	1	1	1	2	3	1	1
CO2	2	3	2	2	3	1	2	1	2	1	1	2	2	2	2
CO3	3	3	3	3	3	1	2	1	1	2	2	2	3	3	2
CO4	3	3	3	2	3	1	1	1	2	2	2	2	2	2	3
CO5	3	3	2	3	3	1	1	1	2	2	2	2	3	2	2

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

<u>MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD</u>

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CS422
Course title: PARALLEL COMPUTING LAB.
Pre-requisite(s):
Co-requisite(s):CS421 Parallel Computing
Credits: L:0 T:0 P:2
Class schedule per week: 4
Class: B. Tech

Semester / Level: IV
Branch: CSE/IT
Course Objectives
This course enables the students to:

1.	To describe benefits and applications of parallel computing.
2.	Explain architectures of multicore CPU, GPUs and HPC clusters, including the key concepts in parallel computer architectures, e.g. shared memory system, distributed system, NUMA and cache coherence, interconnection
3.	Understand principles for parallel and concurrent program design, e.g. decomposition of works, task and data parallelism, processor mapping, mutual exclusion, locks.
4.	write programs that effectively use parallel collections to achieve performance.
5.	To use large scale parallel machines to solve problems as well as discuss the issues related to their construction and use.

Course Outcomes
After the completion of this course, students will be able to:

1	Explain about task and data parallel programs.
2	Build common algorithms in a functional style and solve them in parallel.
3	Analyse a problem, and identify, formulate and use the appropriate computing and engineering requirements for obtaining its solution.
4	Develop parallel programs using OpenMP, CUDA, MPI programming models.
5	Examine analysis and optimization of parallel program.

SYLLABUS: CS421 Parallel Computing

List of Programs as Assignments:

1. **Lab Assignment No: 1**
   Objective: To understand and Implement basic MPI program.
   Q1. Write a program that uses MPI and has each MPI process print
   'Hello world from process i of n' using the rank in MPI_COMM_WORLD for i and the size of MPI_COMM_WORLD for n.
   Q2. Write a parallel program to print any input message supplied by user.
2. **Lab Assignment No: 2**
   Objective: To Understand and Implement MPI program.
   Q1. Write a parallel program to add two one dimensional arrays of size 'n'.
   Q2. Write a parallel program to add two matrices of order n * n.
3. **Lab Assignment No: 3**
   Objective: To Understand and Implement MPI program.
   Q1.Write a parallel program to multiply two matrices.
   Q2. Write a parallel program to multiply a matrix of order n x n by a vector of size n.

4. **Lab Assignment No: 4**
   Objective: To Understand and Implement MPI program.
   Q1. Write a parallel Program to count the no. of vowels in a text.
   Q2. Write a parallel program to find the largest element of n elements.
5. **Lab Assignment No: 5**
   Objective: To Understand and Implement MPI program.
   Q1.Write a parallel program to count no. of characters, words and lines in a file.
   Q2. Write a parallel program to find factorial value of an integer.
6. **Lab Assignment No: 6**
   Objective: To Understand and ImplementMPI program.
   Q1.Write a parallel program to find the transpose of a given Matrix.
   Q2. Write a parallel program to implement ring topology.
7. **Lab Assignment No: 7**
   Objective: To Understand and Implement MPI program.
   Q1.Write a parallel program to find the largest and the second largest from a list of elements considering minimum no. of comparisons.
   Q2. Write a parallel program to sort n elements, using any sorting technique.
8. **Lab Assignment No: 8**
   Objective: To Understand and Implement MPI program.
   Q1. Write a parallel program to solve a set of linear equations using gauss elimination method.
   Q2. Write a parallel program to find the inverse of a given matrix of n*n order.
9. **Lab Assignment No: 9**
   Objective: To Understand and Implement MPI program.
   Q1. Write a parallel program to find minimal path (minimal cost) in an undirected graph.
   Q2. Write a parallel program to find roots of an equation using N-R method.

BOOKS RECOMMENDED:
TEXT BOOKS

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, Introduction to Parallel Computing (2nd Edition).
2. Edition), PDF, Amazon, cover theory, MPI and OpenMP introduction Recommended: John Cheng, Max Grossman, and Ty McKercher, Professional CUDA C Programming, 1st Edition 2014.

REFERENCE BOOKS

1. Barbara Chapman, Gabriele Jost, and Ruud van der Pas, Using OpenMP: Portable Shared Memory Parallel Programming, 2007

Course Evaluation:
Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):
Implementing of real world problems
POs met through Gaps in the Syllabus: PO5&6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure
Direct Assessment

Assessment Tools	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
CO1	3	3	3	2	2	1	1	1	2	3	1	2	3	2	2
CO2	3	2	2	2	2	1	1	3	2	1	1	1	3	3	2
CO3	2	2	3	3	3	2	1	1	3	3	1	2	2	2	3
CO4	2	2	3	3	3	3	2	1	2	2	1	1	2	2	2
CO5	2	2	1	1	3	3	2	1	3	3	3	1	2	3	3

Correlation Levels 1, 2 or 3 as defined below:

1: Slight (Low)   2: Moderate (Medium) 3: Substantial (High)

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

COURSE INFORMATION SHEET

Course code: CS482
Course title: GPU PROGRAMMING LAB.
Pre-requisite(s):
Co- requisite(s): GPU PROGRAMMING
Credits: L:0 T:0 P:2
Class schedule per week: 4
Class: B. Tech

Semester / Level: IV
Branch: CSE/IT

Course Objectives

This course enables the students to:

1.	Understand hardware limitations having impact on the efficiency of software solutions.
2.	Gain knowledge about the available libraries for programming on GPUs
3.	Learn how to design and implement accelerated programs exploiting the potential of GPUs
4.	Describe importance of the parallel programming on GPUs in the area of general purpose computing.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Familiarize yourself with the architecture and programming of graphics processing unit
CO2	Describe different parallel processing platforms involved in achieving High Performance Computing.
CO3	Given a problem, develop an efficient parallel algorithm to solve it..
CO4	Implement efficient algorithms for common application kernels, such as matrix multiplication..
CO5	Solve complex real-world problems to achieve maximum efficiency

List of Programs as Assignments:

Lab Assignment No: 1

Q1. To study the basic commands of Linux.

Lab Assignment No: 2

Write CUDA code to compute the squares of the first N integers.

Lab Assignment No: 3

- Give an example of two 3 x 3 matrices and show their addition.
- Write code for matrix multiplication using shared memory and compare its performance with CPU code

Lab Assignment No: 4

Compute the inclusive and exclusive scan using addition for the following array:
[3 2 0 1 6 5 4 2]

<u>Lab Assignment No: 5</u>

Write out each pass, including the final answer, in a parallel reduction using 2x2 blocks to find the sum of any matrix.

Lab. Assignment- 6:

Write a CUDA program for computing the dot product of a vector in parallel with each row of a matrix. You are required to have each thread access consecutivememory locations (coalescent memory access). The inputs are

- number of rows, number of columns
- a data matrix file
- a vector file (one row)

<u>Lab Assignment No: 7</u>

For a matrix of floats, create naive and optimized version of 3 simple operations both on the CPU and GPU:

- Copy
- Matrix Transpose
- Scattered Writes

BOOKS RECOMMENDED:

TEXT BOOK

1. Cook S., "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs," First Edition, Morgan Kauffman, 2013.

REFERENCE BOOK

1. Computer Architecture: A Quantitative Approach" by John L Hennessy and David A Patterson.

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

<u>Gaps in the syllabus (to meet Industry/Profession requirements):</u>

Implementing of real world problems

POs met through Gaps in the Syllabus: PO5&6

<u>Topics beyond syllabus/Advanced topics/Design:</u>

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Mapping between Objectives and Outcomes

Gaps in the syllabus (to meet Industry/Profession requirements):

POs met through Gaps in the Syllabus:

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design:

Course Outcome (CO) Attainment Assessment Tools and Evaluation Procedure

Direct Assessment

Assessment Tools	**% Contribution during CO Assessment**
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	**% Distribution**
Day to day performance & Lab files	30
Quiz(zes)	10
Viva	20

Semester End Examination	**% Distribution**
Examination Experiment Performance	30
Quiz	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	√	√	√	√	√
Semester End Examination	√	√	√	√	√

Indirect Assessment

1. Student Feedback on Faculty
2. Student Feedback on Course

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments
CD3	Laboratory experiments/Teaching aids/Seminars
CD4	Mini Projects
CD5	Seminars
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes												Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	3	2	3	1	1	2	1	1	2	1	1	1	1	3	2
2	2	3	1	1	1	2	2	1	1	1	2	1	1	2	1
3	2	3	3	3	3	1	1	1	2	2	1	2	2	3	3
4	3	1	2	1	2	1	2	2	1	1	1	2	2	3	2
5	2	2	1	2	3	1	1	1	1	3	2	3	1	2	3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7