B.Tech

CURRICULUM AND SYLLABUS

(CHOICE BASED CREDIT SYSTEM)
REGULATION - 2018

DEPARTMENT OF INFORMATION TECHNOLOGY

KALASALINGAM
ACADEMY OF RESEARCH & EDUCATION
(DEEMED TO BE UNIVERSITY)
Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade

Anand Nagar, Krishnankoil - 626126. Srivilliputtur (Via), Virudhunagar (Dt), Tamil Nadu | info@kalasalingam.ac.in | www.kalasalingam.ac.in

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B.TECH
INFORMATION TECHNOLOGY

CURRICULUM AND SYLLABUS

(For the Students Admitted from the Academic Year 2018-19 Onwards)

B.TECH

INFORMATION TECHNOLOGY

CURRICULUM AND SYLLABUS

REGULATION 2018

KALASALINGAM ACADEMY OF RESEARCH AND EDUCATION

VISION

To be a Center of Excellence of International Repute in Education and Research

MISSION

To Produce Technically Competent, Socially Committed Technocrats and Administrators through Quality Education and Research

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To become a centre of excellence in the field of Information Technology through quality education and research

MISSION

To provide high quality technical education through effective curriculum and innovative teaching to meet industry need.

To inculcate ethically and socially committed information technology professionals by value added courses.

To provide state-of-the-art learning facilities for students and faculties to investigate, apply and transfer knowledge.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: The graduates are trained to gain employment as an IT professional and to pursue higher studies to cater the global needs.

PEO-2: The graduates could comprehend, analyze, design and create novel products and technologies that provide solution to real world problems.

PEO-3: The graduates acquire multidisciplinary knowledge with ethical standards, effective communication skills and management skills to work as part of teams on all diverse professional environments.

ABET STUDENT OUTCOMES (SO)

SO1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

SO2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

SO3. Communicate effectively in a variety of professional contexts.

SO4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

SO5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

SO6. Identify and analyze user needs and to take them into account in the selection, creation, integration, evaluation, and administration of computing-based systems.

Table 1: PEOs consistency with Mission of the Department

Key Components in Department Mission	PEO1	PEO2	PEO3
Quality Education	✓	✓	✓
Research	✓	✓	-
Social Commitment, Ethical Practices	-	✓	✓
Innovative Skills	✓	✓	✓
Communication Skills (Meet Industrial and Social expectations)	✓	✓	✓

Table 2: Curriculum Contribution towards attainment of PEOs

Course Component	Number of Credits	PEOs
Basic Science and Mathematics	25	PEO1
Humanities and Social Science	3	PEO3
Soft Skills	3	PEO3
Basic Engineering	24	PEO1
Core Courses	48	PEO1, PEO2, PEO3
Community Service Project	3	PEO1, PEO2, PEO3
Project Work	10	PEO1, PEO2, PEO3
Professional Elective	18	PEO1, PEO2, PEO3
Open Elective	18	PEO1, PEO2, PEO3
Humanities Elective	6	PEO3
Internship/ Industry Training	2	PEO1, PEO2, PEO3
Total	160	

I. Basic Sciences and Mathematics

S.	Course Code	Course Name	Type	L	T	P	Credits
1.	PHY18R174	Physics –Semi conductor physics	IC	3	1	2	5
2.	CHY18R171	Chemistry	IC	3	1	2	5

S.	Course Code	Course Name	Type	L	T	P	Credits
3.	MAT18R101	Calculus and Linear Algebra	T	3	1	0	4
4.	MAT18R102	Multiple Integration, Ordinary Differential Equations and Complex Variables	T	3	1	0	4
5.	MAT18R202	Probability and Statistics	T	3	1	0	4
6.	BIT18R101	Biology for Engineers	T	3	0	0	3
						Total	**25**

II. Humanities and Social Science

S.	Course Code	Course Name	Type	L	T	P	Credits
1.	HSS18R151	English for Technical Communication	TP	2	0	2	3
2.	HSS18R101	Soft Skills – I	T	1	0	0	1
3.	HSS18R102	Soft Skills – II	T	1	0	0	1
4.	HSS18R201	Soft Skills – III	T	1	0	0	1
5.	HSS18R0XX	Humanities Elective – I	T	3	0	0	3
6.	HSS18R0XX	Humanities Elective – II	T	3	0	0	3
						Total	**12**

A. Humanities Electives

S.	Course Code	Course Name	Type	L	T	P	Credits
1.	HSS18R001	Management Concepts and Techniques	T	3	0	0	3
2.	HSS18R002	Marketing Management	T	3	0	0	3
3.	HSS18R003	Organizational Psychology	T	3	0	0	3
4.	HSS18R004	Project Management	T	3	0	0	3
5.	HSS18R005	Stress Management and Coping Strategies	T	3	0	0	3
6.	HSS18R006	Economics for engineers	T	3	0	0	3
7.	HSS18R007	Human Resource Management and Labour Law	T	3	0	0	3
8.	HSS18R008	Entrepreneurship Development	T	3	0	0	3
9.	HSS18R009	Cost Analysis and Control	T	3	0	0	3

S.	Course Code	Course Name	Type	L	T	P	Credits
10.	HSS18R010	Product Design and Development	T	3	0	0	3
11.	HSS18R011	Business Process Reengineering	T	3	0	0	3
12.	HSS18R012	Political Economy	T	3	0	0	3
13.	HSS18R013	Professional Ethics	T	3	0	0	3
14.	HSS18R014	Operations Research	T	3	0	0	3
15.	HSS18R015	Total Quality Management	T	3	0	0	3
16.	HSS18R016	Advanced Softskills	T	3	0	0	3

III. Basic Engineering

S.	Course Code	Course Name	Type	Pre requisite	L	T	P	Credits
1.	EEE18R172	Basic Electrical Engineering	IC	Nil	3	1	2	5
2.	MEC18R151	Engineering Graphics and Design	TP	Nil	3	0	2	3
3.	CSE18R171	Programming for Problem Solving	IC	Nil	3	1	2	5
4.	MEC18R152	Engineering Practice	TP	Nil	3	0	2	3
5.	ECE18R220	Principles of Signals and Systems	T	Nil	3	0	0	3
6.	INT18R171	Digital Principles and System Design	IC	Nil	3	1	2	5
							Total	**24**

IV. Program Core

A. Core Courses

Sl.	**Course Code**	**Course Name**	**Type**	**Pre-requisite/ Co-requisite**	**L**	**T**	**P**	**C**
1.	CSE18R174	Computer Architecture and Organization	IC	Nil	3	0	2	4
2.	CSE18R273	Operating Systems	IC	CSE18R174	3	0	2	4
3.	INT18R201	Web Technology	T	Nil	3	1	0	4
4.	INT18R271	Data Structures and Algorithms	IC	CSE18R171	3	1	2	5
5.	INT18R272	Analog and Digital Communication	IC	Nil	3	0	2	4

Sl.	Course Code	Course Name	Type	Pre-requisite/ Co-requisite	L	T	P	C
6.	INT18R273	Object Oriented Programming	IC	CSE18R171	3	0	2	4
7.	INT18R274	Principles of Digital Signal Processing	IC	ECE18R220	3	0	2	4
8.	INT18R251	Microcontrollers & Embedded Systems	TP	Nil	3	0	1	3.5
9.	CSE18R371	Computer Networks	IC	CSE18R273	3	1	2	5
10.	INT18R311	Artificial Intelligence	T	Nil	3	0	0	3
11.	INT18R371	Database Management Systems	IC	Nil	3	0	2	4
12.	INT18R359	Software Engineering	TP	Nil	3	0	1	3.5
							Total	**48**

B. Community Service Project

S.	Course Code	Course Name	Credits
1.	INT18R399	Community Service Project	3

C. Project Work

S.	Course Code	Course Name	Credits
1.	INT18R498	Project Work	2
2.	INT18R499	Project Work	8

V. Elective Courses

A. Professional Electives (Minimum 5 Courses)

(3.5 Credits *4) + (3 Credits * 1) **or** (4 Credits * 2) + (3.5 Credits *2) + (3 Credits * 1) **or** (4 Credits * 3) + (3 Credits * 2)

Course Code	Course Name	Type	Pre-requisite/ Co-requisite	L	T	P	C
PROFESSIONAL ELECTIVES - COMPUTER PROGRAMMING STREAM							
INT18R351	System Software	TP	CSE18R174	3	0	1	3.5
INT18R301	Object Oriented Analysis and Design	T	Nil	3	0	0	3
INT18R352	Design and Analysis of Algorithms	TP	INT18R271	3	0	1	3.5
INT18R360	Data Analysis Using Python	TP	CSE18R171	3	0	1	3.5
INT18R361	Data Science Using R Programming	TP	INT18R371	3	0	1	3.5
INT18R451	Component Based Technology	TP	INT18R273	3	0	1	3.5
INT18R401	Principles of Compiler Design	T	CSE18R171	3	1	0	4
INT18R402	Game Programming	T	CSE18R171	3	1	0	4
INT18R452	Programming with Open Source Software	TP	CSE18R171	3	0	1	3.5
INT18R453	Multimedia and Computer Graphics	TP	INT18R271	3	0	1	3.5
INT18R454	C# and .NET Programming	TP	INT18R273	3	0	1	3.5
PROFESSIONAL ELECTIVES - SOFTWARE MANAGEMENT STREAM							
INT18R353	Data Warehousing and Mining	TP	INT18R371	3	0	1	3.5
INT18R354	Advanced DBMS	TP	INT18R371	3	0	1	3.5
INT18R302	Information Storage Management	T	INT18R371	3	1	0	4
INT18R355	Data Analytics	TP	INT18R371	3	0	1	3.5
INT18R303	Software Quality Assurance	T	INT18R359	3	0	0	3
INT18R304	Mobile Application Development	T	INT18R273	3	1	0	4
INT18R403	Enterprise Resource Planning	T	Nil	3	0	0	3
INT18R404	Service Oriented Architecture	T	CSE18R174	3	0	0	3
PROFESSIONAL ELECTIVES - EMBEDDED AND SIGNAL PROCESSING STREAM							
INT18R305	Mobile Communication and Computing	T	INT18R272	3	1	0	4
INT18R306	Information Coding Techniques	T	INT18R272	3	1	0	4
INT18R307	Bluetooth Technology	T	CSE18R371	3	1	0	4
INT18R405	Wireless Sensor Networks	T	CSE18R371	3	1	0	4
ECE18R330	Digital Image Processing	T	INT18R274	3	0	0	3
INT18R406	Real Time Systems	T	CSE18R273	3	0	0	3
INT18R407	Internet of Things	T	CSE18R371	3	1	0	4

PROFESSIONAL ELECTIVES - NETWORK MANAGEMENT STREAM							
INT18R356	Network Design Security and Management	TP	CSE18R371	3	0	1	3.5
INT18R308	Information Security	T	Nil	3	1	0	4
INT18R357	Mobile Networks	TP	CSE18R371	3	0	1	3.5
INT18R309	Wireless Application Protocol	T	CSE18R371	3	0	0	3
INT18R408	High Performance Networks	T	CSE18R371	3	1	0	4
INT18R455	Cryptography and Network Security	TP	CSE18R371	3	0	1	3.5
PROFESSIONAL ELECTIVES - COMPUTING TECHNIQUES STREAM							
INT18R358	Distributed Systems	TP	CSE18R174	3	0	1	3.5
INT18R456	Formal Language and Automata	TP	CSE18R171	3	0	1	3.5
INT18R409	Computer Forensics	T	CSE18R371	3	0	0	3
INT18R410	Cloud Computing	T	CSE18R371	3	1	0	4
INT18R411	Green Computing	T	CSE18R371	3	0	0	3
INT18R412	Social Network Analysis	T	INT18R271	3	0	0	3
INT18R413	Information Retrieval Techniques	T	INT18R371	3	0	0	3
INT18R414	Parallel and Distributed Computing	T	INT18R358	3	0	0	3
INT18R415	Graph Theory	T	INT18R271	3	1	0	4
PROFESSIONAL ELECTIVES - ARTIFICIAL INTELLIGENCE STREAM							
INT18R310	Bio Informatics	T	Nil	3	0	0	3
INT18R312	Neural Networks and Fuzzy Logic	T	Nil	3	1	0	4
INT18R313	Machine Learning	T	INT18R271	3	1	0	4
INT18R314	Soft Computing	T	Nil	3	1	0	4
INT18R416	Speech and Natural Language Processing	T	CSE18R171	3	0	0	3
INT18R417	Deep Learning	T	Nil	3	1	0	4

B. <u>Open Elective for Other Departments (18 credits) (6 courses)</u>

S.	Course Code	Course Name	Type	L	T	P	Credits
1.	INT18R315	Web Programming	T	3	0	0	3
2.	INT18R316	Big Data Analytics	T	3	0	0	3
3.	INT18R317	Information Theory & Coding	T	3	0	0	3
4.	INT18R318	Introduction To Information Security	T	3	0	0	3
5.	INT18R319	Cyber Forensics	T	3	0	0	3
6.	INT18R320	Essentials Of Information Technology	T	3	0	0	3
7.	INT18R321	Internet And Java	T	3	0	0	3
8.	INT18R322	R Programming	T	3	0	0	3
9.	INT18R418	Programming With C++ And Java	T	3	0	0	3
10.	INT18R419	Network Protocols	T	3	0	0	3

S.	Course Code	Course Name	Type	L	T	P	Credits
11.	INT18R420	High Speed Networks	T	3	0	0	3
12.	INT18R421	Introduction To Storage Management	T	3	0	0	3

VI. Industrial Training / Internship

S.	Course Code	Course Name	Credits
1.	INT18R397	Industrial Training	Nil
2.	INT18R398	Internship Training	Nil

VII. Honours Courses

Course Code	Course Name	Course	Pre requisite	L	T	P	C
INT18R422	Advanced Networks	T	CSE18R371	3	1	0	4
INT18R423	Agent Based Intelligent Systems	T	INT18R311	3	1	0	4
INT18R424	Computational Linguistics	T	CSE18R171	3	1	0	4
INT18R425	E Learning Techniques	T	Nil	3	1	0	4
INT18R426	Heterogeneous Computing	T	CSE17R174	3	1	0	4
INT18R427	Pattern Recognition	T	INT18R353	3	1	0	4
INT18R428	Visualization Techniques	T	INT18R311	3	1	0	4

VIII. Mandatory Courses

1. Induction Training
2. Environmental Sciences
3. Indian Constitution
4. Essence of Indian Traditional Knowledge

CO-SO Mapping Correlation

H – High Correlation

M – Medium Correlation

L – Low Correlation

BASIC SCIENCES AND MATHEMATICS

PHY18R174	SEMI CONDUCTOR PHYSICS	L	T	P	C
		3	1	2	5
Prerequisite	Basic Knowledge in Physics				
Course Category	Basic sciences and Mathematics				
Course Type	Integrated Course				
Objective	• To provide the students a firm understanding of the basics of Semiconductors. • To introduce the students, the application of semiconducting materials and some of its measurements				

COURSE OUTCOMES (CO)	
CO1	Describe the theories of Electronic materials
CO2	Understand the basic concepts of semiconducting materials
CO3	Understand the basic knowledge on light based semiconductor interaction
CO4	Understand the fundamental measurements in semiconducting materials
CO5	Design, fabrication, and characterization of engineered semiconductor materials

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M					
CO2	M					
CO3	M					
CO4	H	M				M
CO5	M	H	M		M	H

Course Topic(s)

UNIT 1: Basic Concepts and Electronic materials

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of energy states, Occupation probability, Fermi level, Effective mass, Phonons.

UNIT 2: Semiconductors

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices.

UNIT 3: Light-semiconductor interaction

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Joint density of states, Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

UNIT 4: Engineered semiconducting materials

Density of states in 2D, 1D and 0D (qualitatively), Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication (lithiography,CVD), and characterization techniques(XRD, TEM) .

Unit 5: Measurements : Conducting and Semiconducting Materials

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, band gap by UV-Vis spectroscopy .

List of Experiments

1. Diode – V-I characteristics
2. Transistor Static characteristics – C.E. mode
3. Transistor characteristics – C.B. mode
4. Logic Gates – AND, OR, NOT – truth table verification – discrete components
5. Zener diode characteristics & Break down Voltage
6. Zener regulated power supply.
7. Hall co-efficient of a semiconductor sample
8. Resistivity of a semiconductor crystal with temperature by four probe method and to determine band gap.
9. Determination of band gap of a semiconductor using P.O box.

Text Book(s):

1. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc. (1995).
2. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
3. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).

Reference Books:

1. Yariv and P. Yeh, Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York (2007).
2. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
3. Online course: “Semiconductor Optoelectronics” by M R Shenoy on NPTEL
4. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

CHY18R171	CHEMISTRY	L	T	P	C
		3	1	2	5
Prerequisite	Nil				
Course Category	Basic sciences and Mathematics				
Course Type	Integrated Course				
Objective	To introduce the fundamental concepts and applications of Chemistry to engineering students to understand, analyze and apply the same to complex technical issues.				

COURSE OUTCOMES (CO)	
CO1	Understand the significance and role of water quality parameters in the domestic and engineering applications and analyzing the same through modern methods.
CO2	Elucidate and apply the principles of thermodynamics for solving engineering problems.
CO3	Summarize the basic concepts of electrochemistry, batteries, corrosion and to apply the same for the betterment of society.
CO4	Illustrate synthesis, characteristics and applications of technologically important polymers, composites and nanomaterials.
CO5	Utilize the underlying principles, instrumentation and applications of analytical techniques.

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					M
CO2	H					M
CO3	H	M		M		M
CO4	M	M				M
CO5	H	M				M

Course Topic(s)

Unit 1: Atomic and Molecular Structure

Schrodinger wave equation: Derivation of time independent Schrodinger wave equation, Representation of Schrodinger wave equation in polar coordinates - Radial distribution function graphs of s, p, d and f orbitals. Molecular Orbital Theory: MOT concept, MO diagrams of homo-nuclear diatomic molecules (hydrogen, nitrogen and oxygen) and hetero-nuclear diatomic molecules (carbon monoxide and nitric oxide). Crystal field theory: CFT concept, weak and strong ligands, energy level diagrams of transition metal ions (Fe^{2+}& Fe^{3+}) in octahedral and tetrahedral complexes and their magnetic properties. Intermolecular forces - Ionic, dipolar and van der Waals interactions.

Unit-2: Periodic Properties

Effective nuclear charge - Factors affecting effective nuclear charge: Penetration or shielding of orbitals - Variation of s, p, d and f orbital energies of atoms in the periodic table - Aufbau principle (Building-up principle)**:** Application of Aufbau principle in writing electronic configuration, Deviation from Aufbau principle - Periodicity of properties in a periodic table - Periodic properties: Atomic and ionic sizes, ionization energies, electron affinity and

electronegativity - Variation of periodic properties in the periodic table - Hard soft acids and bases: Concept and examples.

Unit-3: Free Energy and Chemical Equilibria

Thermodynamic functions: Definition and mathematical expression for Work, Energy, Enthalpy, Entropy and Free energy - Nernst equation: Derivation, apply Nernst equation to determine of solubility product, pH (glass electrode). Potentiometric titrations: Acid-Base, Redox and precipitation reaction - Water analysis: Hardness by EDTA method and chloride ion by Argentomentric method - Corrosion: Definition, types (dry & wet) and mechanism. and control of Dry and Wet corrosion.

Unit4: Organic Reactions

Nucleophilic substitution reactions: Definition, types and examples of nucleophile, Compare nucleophilicity and basicity of a nuceophile - Types of nucleophilic substitution (case RX and ArX): Mechanism of S_N1, S_N2, S_Ni and Benzyne. Electrophilic substitution reactions: Definition, types and examples of electrophile - Electrophilic substitution reactions of hydrocarbons: Halogenation, sulphonation, nitration. Friedel crafts alkylation and acylation reaction. Nucleophilic addition reactions (case aldehydes and ketones): Polarity of C=O bond. General mechanism of nucleophilic addition reactions on aldehydes and ketones: HCN, HOH, ROH and $NaHSO_3$ addition. Electrophilic addition reactions (case alkenes): General mechanism of electrophilic addition reactions on alkene - Addition of HBr [Markownikoff & Anti-Markownikoff (peroxide effect)] - Addition of alkene (polymerization of ethylene). Elimination reactions: Types of elimination reactions (case alkyl halides): Dehydrohalogenation of alkyl halides - E_1 and E_2 mechanism - Dehydration of alcohols to alkene and ethers. Greener synthesis of drug molecules (Aspirin and Ibuprofen)

Unit 5: Stereochemistry & Spectroscopic Techniques

Stereochemistry - Definition with examples: Geometrical isomers (alkene) and stereoisomers, symmetry, chirality, enantiomers, diastereomers, meso and racemic mixture. Representation of 3D structures: Wedge formula, Fischer projections, Newmann and Sawhorse formula (upto 2 carbons) - Conformational analysis: Ethane, butane and cyclohexane - Configurational analysis: Rules of RS nomenclature and application of RS nomenclature to molecules containing one chiral centre. Electronic spectroscopy: Principle, instrumentation, selection rules and medicinal application of fluorescence spectroscopy. Nuclear magnetic resonance spectroscopy (^{1}H-NMR): Principle, instrumentation, chemical shift, coupling constant and application (structural identification of the compound C_3H_6O from ^{1}H-NMR data). X-ray diffraction: Principle, instrumentation and applications X-ray diffraction.

List of Experiments (Any 10):

1. Determination of Viscosity by Ostwald Viscometer.
2. Determination of surface tension by stalagmometer.
3. Adsorption of acetic acid by charcoal.
4. Determination of chloride content of water.
5. Estimation of hardness of water by EDTA method.
6. Determination of the rate constant of a reaction
7. Thin layer chromatography.
8. Determination of the partition coefficient of a substance between two immiscible liquids
9. Determination of Saponification /acid value of oil.
10. Preparation of Aspirin
11. Potentiometric titration of strong acid vs strong base.

12. Potentiometric titration of weak acid vs strong base.
13. Determination of cell constant and conductance of solutions.

Text Books

1. Engineering Chemistry, 2nd Edition, Wiley India (P) Ltd., 2018.
2. Stereochemistry of Organic Compounds, Ernest L. Eliel, Samuel H. Wilen Student edition, Wiley India (P) Ltd., 2017.
3. University Chemistry, by B. M. Mahan and R.J.Mayers, Pearson Publishers, 11th Edition, Noida, 2017.
4. Chemistry Laboratory Manual, Department of Chemistry, Kalasalingam University, 2018.

Reference Books

1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell and E.M. McCash, Tata McGraw-Hill Publishers, 4th Edition, New Delhi, 2008.
2. Physical Chemistry, by P. W. Atkins and J.D. Paula, W H Freeman & Co Publishers, 10th Edition, 2014.
3. Modern Inorganic Chemistry, R. D. Madan, 4th Edition S. Chand & Company Ltd., 2009.
4. Organic Chemistry, Paula Y. Bruice, 7th Edition, Pearson (Dorling Kindersley India (P) Ltd.) 2014.
5. Principles of Physical Chemistry, B. R. Puri, L. R. Sharma, M. S. Pathania, 47th Edition, Vishal Publishing Co., 2017.
6. Spectrometric Identification of Organic Compounds, Robert M. Silverstein, Francis X. Webster, David J. Kiemle, David L. Bryce, 8th Edition, Wiley India (P) Ltd., 2010.
7. Inorganic Chemistry, Peter Atkins, Mark Weller, Fraser Armstrong, Jonathan Rourke, Tina Overton, Michael Hangerman 5th Edition, Oxford press, 2015.
8. Organic Chemistry, Volume 1, I. L. Finar, 6th Edition, Pearson (Thomson press India (P) Ltd.) 2014.

MAT18R101	Calculus and Linear Algebra	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Basic sciences and Mathematics				
Course Type	Theory				
Objective	To enable the students to acquire knowledge and skills in basic components of calculus, to handle the situations involving multivariable calculus, and to diagonalize a symmetric matrix using eigen values and eigenvectors.				
COURSE OUTCOMES (CO)					
CO1	know the fundamental theorems such as Rolle's theorem, Mean value theore Taylor's theorem and its applications				
CO2	understand the basic concepts of limit, continuity, derivative, partial derivative total derivative and its applications				
CO3	solve the real world problems using differentiation and integration				
CO4	understand the concepts of sequence, convergent of sequences, series and testing convergent of series using different methods				
CO5	find the solution of simultaneous linear equations using matrices and to find the ei values and eigen vectors of a matrix, Cayley-Hamilon theorem and orthogo transformations				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					
CO2	H					
CO3	H	M				
CO4	H					
CO5	H	M				M

Course Topic(s)

Unit 1: Calculus:

Rolle's Theorem- Mean value theorems - Taylor's and Maclaurin theorems with remainders - indeterminate forms and L'Hospital's rule - Maxima and minima.

Unit 2: Multivariable Calculus (Differentiation):

Limit, continuity and partial derivatives - directional derivatives - total derivative - Maxima, minima and saddle points - Method of Lagrange multipliers.

Unit 3: Calculus (Applications):

Curvature (Cartesian coordinates) - Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Unit 4: Sequences and series:

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions;

Unit 5: Matrices:

System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Cayley-Hamilton Theorem - Diagonalization of matrices - Orthogonal transformation- Reduction of Quadratic form to Canonical form.

TEXT BOOKS:

1. Grewal, B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Del 43rd Edition, 2015.

REFERENCE BOOKS:

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore , 10th Edn., 2001.
2. Ramana B. V., Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited New Delhi, Edition 2005.
3. Veerarajan,T., Engineering Mathematics (For First Year), Tata McGraw-Hill publishing company Limited, 2008.

MAT18R102	Multiple Integration, Ordinary Differential Equation and Complex Variables	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Basic sciences and Mathematics				
Course Type	Theory				
Objective	To enable the students to understand the concepts of multiple integrations, their applications, and to handle analytic functions on complex plane and perform complex integration.				

COURSE OUTCOMES (CO)	
CO1	Understand the concepts of double and triple integral and its applications
CO2	Know about the applications of double and triple integral in vector calculus
CO3	Know the methods of solving differential equations of first and second orders
CO4	understand the concepts of analytic functions, conformal mappings and bilinear transformations
CO5	understand the concepts of singularity, residues and evaluation of certain impro integrals

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					
CO2	H	M				
CO3	H					
CO4	H					
CO5	H					M

Course Topic(s)

Unit 1: Multivariable Calculus (Integration):
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volume; Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds;

Unit 2: Integral theorems:
Gradient, curl and divergence. Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Unit 3: Ordinary differential equations:
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equations.

Unit 4: Complex Variable – Differentiation:
Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Unit 5: Complex Variable – Integration:
Contour integrals, Cauchy Integral formula (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals (Integration around small semicircles and rectangular contours).

TEXT BOOKS:

1. **Grewal, B.S., Grewal, J.S., *Higher Engineering Mathematics*, Khanna Publishers, New Delhi, 43rd Edition, 2015.**.

REFERENCE BOOKS:

1. Kreyszig, E, *Advanced Engineering Mathematics*, John Wiley and Sons (Asia) Limited, Singapore , 10th Edn., 2001.
2. Ramana B. V., *Engineering Mathematics*, Tata McGraw-Hill Publishing Company Limited, New Delhi, Edition 2005.
3. Veerarajan,T., *Engineering Mathematics (For First Year)*, Tata McGraw-Hill publish company Limited, 2008.

MAT18R202	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Basic sciences and Mathematics				
Course Type	Theory				
Objective	To enable the students to acquire skills to handle bivariate distributions and to solve real world problems using statistical methods				

COURSE OUTCOMES (CO)	
CO1	Understand the concepts of probability, random variable, distribution function and expectation
CO2	Learn standard distributions and its applications
CO3	Evaluate the moments, skewness and kurtosis for standard distributions and to kn about the correlation and regression
CO4	Solve the physical world problems using small and large sample theory
CO5	Know the method of using analysis of variance to solve real world problems

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					
CO2	H	M				
CO3	H	M				M
CO4	H					M
CO5	H	M				M

Course Topic(s)

Unit 1: Basic Probability and Random Variables:

Axiomatic definition of Probability - Conditional probability – Independent events - Total probability – Bayes theorem - Random variables – Discrete random variable - Probability mass function – Continuous random variable - Probability density functions – Cumulative distribution function-Properties- Expectation.

Unit 2: Standard Distributions and Bivariate Distributions:

Binomial, Poisson, Uniform, Exponential and Normal distributions and their properties. Two dimensional random variables – Joint probability density function – Cumulative distribution function – Marginal density function

Unit 3: Statistics:

Measures of Central tendency: Moments, skewness and Kurtosis - evaluation of statistical parameters for Binomial, Poisson and Normal distributions, Correlation and regression – Rank correlation- Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.

Unit 4: Applied Statistics:

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. Small samples: Test for single mean, difference of means- Chi-square test for goodness of fit and independence of attributes.

Unit 5: Design of Experiments:

Analysis of variance – One way classification –Completely Randomised Design(C R D)– Two-way classification –Randomised Block Design(R.B.D)– Latin Square Design(L S D).

TEXT BOOKS:

1. T. Veerarajan, Probability, Statistics and Random process, Fourth edition, Tata McGraw-Hill Education (India) Pvt. Ltd., 2016

REFERENCE BOOKS:

1. Flynn M., Probability, Random variables and random processes, Harper & Row Publishers, New York, 1982.
2. Gupta, S.C, and Kapur, J.N., Fundamentals of Mathematical Statistics, Sultan Chand, New Delhi, 11th Edition., 2006.

BIT18R101	BIOLOGY FOR ENGINEERS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Basic sciences and Mathematics				
Course Type	Theory				

COURSE OUTCOMES (CO)	
CO1	Describe the fundamentals of cell structure and cell cycle
CO2	Understand the classification and functions of biomolecules
CO3	Elaborate the basic cellular mechanisms such as replication, transcription and translation
CO4	Describe the underlying concepts of infection and immunity
CO5	Explain various applications of biology

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M					
CO2	H					
CO3	M			L		
CO4	H			M		
CO5	M	M		M		M

Course Topic(s)

UNIT 1: INTRODUCTION

Fundamental difference between science and engineering- comparison between eye and camera, Bird flying and aircraft; major discoveries in biology- ; Classification based on: Cellularity- Unicellular and Multicellular; Ultra structure - prokaryotes and eukaryotes; three major kingdoms of life; Cell structure, intracellular organelles and their functions, comparison of plant and animal cells- Overview of Cell cycle and cell division

UNIT 2: BIOMOLECULES

Chemistry of biomolecules: Carbohydrates, Lipids, Proteins; classification of amino acids; classification of proteins based on structure and functions; Nucleic acids -types, structure and function of DNA and RNA

UNIT 3: GENES TO PROTEINS

Gene, Genome and chromosome; Central dogma of molecular biology; Classical experiments of DNA: Griffith and, Avery, McCarty and MacLeod, Meselson and Stahl - DNA replication, Transcription and Translation

UNIT 4: MICROBIOLOGY

Microscopy; Microbes as infectious agents - malaria, tuberculosis, typhoid, polio, dengue, AIDS;; cultivation of bacteria. Immunity - innate and acquired immunity - organs and cells of the immune system - classification of antibodies - types of T cells - transplantation, autoimmunity overview

Unit 5: APPLICATIONS OF BIOLOGY

Healthcare-antibiotics, vaccines, monoclonal antibodies, insulin and interferons; Beneficial bacteria - probiotic bacteria, nitrogen fixing bacteria, fermentation and fermented foods and

products Environmental - waste water treatment, bioremediation; Biomaterials and biopolymers for medical and environmental applications; Biosensors;

TEXT BOOKS:

1. De Robertis, E.D.P. and De Robertis, E.M.F. - Cell and Molecular Biology- Lippincott Williams & Wilkins- Philadelphia- USA- 8th Edition- 2010.
2. Voet, D., Voet, G., - Biochemistry - John Wiley and Sons, Singapore - 3rd Edition- 2001.
3. Pelczar MJ, Chan ECS and Krieg NR - Microbiology - Tata McGraw Hill, India- 7th Edition- 2010

REFERENCES:

1. Friefelder. D. -Molecular Biology- McGraw-Hill Companies- New York, USA- 5th Edition- 2013.

HUMANITIES AND SOCIAL SCIENCES

HSS18R151	ENGLISH FOR TECHNICAL COMMUNICATION	L	T	P	C
		2	0	2	3
Prerequisite	Nil				
Course Category	Humanities and Social Sciences				
Course Type	Theory with Practical				

Course Topic(s)

UNIT 1 – VOCABULARY BUILDING

1.1 The concept of word formation
1.2 Root words from foreign languages and their use in English
1.3 Prefixes and suffixes; word derivatives using them
1.4 Synonyms, Antonyms and standard Abbreviations

2 UNIT 2: BASIC WRITING SKILLS

2.1 Sentence structures
2.2 Use of phrases and clauses in sentences
2.3 Creating Coherence
2.4 Techniques for Writing Precisely

3 UNIT 3: IDENTIFYING COMMON ERRORS IN WRITING

3.1 Tenses
3.2 Subject – verb agreement
3.3 Noun –Pronoun Agreement
3.4 Verbs – Transitive, Intransitive
3.5 Misplaced Modifiers
3.6 Articles
3.7 Prepositions
3.8 Redundancies and Clichés
3.9 Direct, Indirect speech
3.10 Infinitives, Gerunds
3.11 Comparison of adjectives

4 UNIT 4: NATURE AND STYLE OF SENSIBLE WRITING

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction or conclusion

5 UNIT 5: WRITING PRACTICES

5.1 Comprehension
5.2 Precis writing
5.3 Essay writing
5.4 Letter writing
5.5 Instructions

5.6	Paragraph development
6	**UNIT 6: ORAL COMMUNICATION**
i)	Listening comprehension
ii)	Pronunciation, intonation, stress and rhythm
iii)	Common everyday situations: Conversations and dialogues
iv)	Interviews
v)	Formal presentations

SOFTSKILLS

HSS18R101	SOFT SKILLS I	L	T	P	C
		1	0	0	1

Course Topic(s)

UNIT 1: EFFECTIVE COMMUNICATION

Listening : Focus, Intuition about the speaker, Critical Listening, Writing : Reports, E-mail, Book & Movie Review, Notices & Advertisements, Speaking : Introducing Self, Just - a – Minute, Ad Zap, Story Telling

UNIT 2: QUANTITATIVE ABILITY

Introduction to Numerical Skills, Introduction to Logical Skills, Vedic Mathematics

UNIT 3: TIME MANAGEMENT

Prioritization, Procrastination, Multi-Tasking

UNIT 4: SOCIAL MEDIA

Blog Writing, LinkedIn, Usage of messaging applications

UNIT 5: SOFT SKILLS

Importance of Soft Skills, Lateral Thinking, Begin with the End in Mind, First things First, Think Win – Win

HSS18R102	SOFT SKILLS II	L	T	P	C
		1	0	0	1

Course Topic(s)

UNIT 1: EFFECTIVE COMMUNICATION

Reading : Speed Reading techniques, News Story Analysis, Presentation : Organizing Content, Use of fonts & animations, Mock Presentations

UNIT 2: QUANTITATIVE ABILITY

Number Properties, Averages, Progression

UNIT 3: VERBAL ABILITY

Vocabulary Building Techniques, Analogy

UNIT 4: SOCIAL INTERACTION

Interpersonal Skills, Dealing with difficult people, Stress Management

UNIT 5: SOFT SKILLS

Seek first to understand, then to be understood, Synergy, Secret, Mind Maps, Creativity

HSS18R201	SOFT SKILLS III	L	T	P	C
		1	0	0	1

Course Topic(s)

UNIT 1: EFFECTIVE COMMUNICATION

Sentence Construction, Tenses, Verbal Communication, Parts of Speech, Framing effective Sentences

UNIT 2: QUANTITATIVE ABILITY

Percentages, Profit-Loss-Discount, Ratio & Proportion, Mixtures & Allegation, Interest Calculations, Data Sufficiency

UNIT 3: LOGICAL ABILITY

Data Arrangements, Coding & Decoding, Ranking / Ordering, Venn Diagrams, Syllogisms, Introduction to Data Interpretation

UNIT 4: VERBAL ABILITY

Sentence correction, Sentence Completion, Idioms & Phrases, Articles, Analytical Writing, Descriptive Writing

UNIT 5: SOFT SKILLS

Dining Etiquette, Hygiene, Team Work, Collaboration, Interdependence, Resume Building, Power Verbs, Group Discussion, Personal Interview.

HUMANITIES ELECTIVES

HSS18R001	MANAGEMENT CONCEPTS AND TECHNIQUES	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course addresses the definition of management, its characteristics, evolution and importance as well as the functions performed by manages-planning, organizing, directing and controlling. The course also intends to show students the applications of management functions in various enterprises such as marketing, finance, personnel, production, etc.				
Course Outcome(s)					
CO1	To Explain the historical backdrop and fundamentals of Management thoughts vital for understanding the conceptual frame work of Management as a discipline.				
CO2	To Discuss about the various concepts of planning, Decision making and controlling to help solving managerial problems				
CO3	To Understanding concepts of Ethics, Delegation, Coordination and Team work				
CO4	To Study and understand the management concepts and styles in Global context				
CO5	To develop an understanding about emerging concepts in management thought and philosophy				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2			M			
CO3	H	M	M	H	H	
CO4	H		M			
CO5			M	M		

Course Topic(s)

UNIT 1: DEVELOPMENT OF MANAGEMENT THOUGHTS

Scientific Management Movement - Administrative Movement - Human Relations Movement - Decision Movement - Behavioral Science Movement - Systems Movement - Contingency Movement.

UNIT 2: ESSENTIALS OF PLANNING

Planning Objectives – Goals - Programmed Decisions and Unprogrammed Decisions; Decision – Making - Creativity in Decision - Making, Forecasting and Strategy to Formulation.

UNIT 3: EFFECTIVE ORGANIZING

Span of Control – Departmentation - Authority; Responsibility - Bureaucracy and Adhocracy;

Group Dynamics.

UNIT 4: STAFFING AND DIRECTING

Staffing: Manpower Planning – Recruitment Sources – Selection Procedure – Training Methods – Performance Evaluation Methods – Executive Development Programs - Directing: Communication Process and Barriers – Motivation Techniques – Financial and Non – Financial Motivation- Leadership Qualities and Styles.

UNIT 5: CONTROLLING AND RECENT CONCEPTS

Controlling: Meaning and Process - Requisites of Effective Control - Control Techniques. Emerging Issues in Management: Japanese and American Management – Management by Objectives – Knowledge Management – Technology Management – Business Process Outsourcing- Social Responsibility and Business Ethics.

TEXT BOOKS

1. Harold Koontz & Heinz Weihrich, "Essentials of Management: An International, Innovation and Leadership Perspective", 10th Edition, McGraw Hill Education (India) Private Ltd. New Delhi, 2016.
2. Stephen P. Robbins, Mary A. Coulter, "Managemen"t, 13th Edition, Pearson Education Limited, New Delhi, 2016

REFERENCE BOOKS

1. C.B.Gupta, "Management Theory and Practice", 19th Revised Edition, Sultan Chand & Sons, New Delhi.2017.
2. L.M.Prasad, "Principles and Practices of Management", 9th Edition, Sultan Chand and Sons Private Limited, 2015.
3. K.Aswathappa, "Essentials of Business Environment: Text Cases and Exercises" 12th, edition, Himalaya Publishing House, Mumbai, 2014.
4. Tripathi & Reddy, "Principles of Management", 5th Edition, Tata McGraw Hill publishing company Ltd, New Delhi, 2012.

HSS18R002	MARKETING MANAGEMENT	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course develops students understanding of how organizations match the requirements of consumers in competitive environments, and develop strategies to create the competitive edge. It covers areas such as analysis, planning, implementation, and control, as well as the marketing mix, exportation, and the social aspects of marketing.				
Course Outcome(s)					
CO1	To Develop understanding of marketing concepts, philosophies and historical background.				
CO2	To Develop understanding of marketing operations and complexities for students to apply in practical business situations.				
CO3	To Understand concepts related to Segmentation, Targeting and Positioning, product attributes, and pricing strategies prevalent in domestic and international scenario.				
CO4	To Study various tools and techniques of promoting the products in ethical manner.				
CO5	To Understand emerging concepts of marketing in the emerging global markets				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			M			L
CO2		H	M			H
CO3	H		M			H
CO4	H	M	M	H		
CO5			M			M

Course Topic(s)

MARKETING

Meaning - concept - functions - marketing Planning & implementation marketing Programmes - Marketing environment – Market Segmentation and consumer behaviour – Influencing factors, Decision process –Marketing mix – Marketing department.

PRODUCT

Meaning - Product planning - policies - positioning - New product development Product life cycle – BCG Matrix - branding. Packing, labeling.

PRICING

Pricing objectives – Setting and modifying the price – Different pricing method Product line pricing and new product pricing.

DISTRIBUTION

Nature of Marketing channels - Types of Channel flows – Channel functions - Channel co-operation, conflict and competition - Direct Marketing Telemarketing, Internet shopping.

PROMOTION

Promotion Mix - Advertisement - Message - copy writing – Advertisement - budgeting - Measuring advertisement effectiveness - Media strategy - sales promotion - Personal selling steps, publicity and direct marketing.

TEXT BOOKS

1. Philip.T.Khotler, Kevin Lane Keller, "Marketing Management", 15th Edition, Pearson Education, New Delhi, 2016.
2. Ramaswamy.VS & Namakumari. S, "Marketing Management – Global Perspective, Indian Contex"t, McGraw Hill Education (India) Private Limited, New Delhi, 2013.

REFERENCE BOOKS

1. Rajan Saxena, Dorector, Jain S.P., "Marketing Managemen"t, 1st edition, Tata McGraw Hill, New Delhi, 2006.
2. K.S.Chandrasekar, "Marketing Management, Text & Cases", 1st edition, Tata McGraw hill Education Pvt. Ltd. 2013.
3. Tapan K.Panda, "Marketing Management Text and Cases", 2nd Edition, Excel Books.2008.

HSS18R003	ORGANIZATIONAL PSYCHOLOGY	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course aims to clarify the principles and basic concepts of organizational psychology. Including organizations and understanding its business design based on efficiency and quality of employee life. It also aims at enhancing the quality of life of employees. When organization's aspects are gauged in terms of psychological assessment, personnel decisions inline with training and development, organizational change and organizational health in specific the intrinsic problems are understood paving way towards standards that are high.				
Course Outcome(s)					
CO1	To learn basic concepts of industrial and organizational psychology				
CO2	To illustrate different ways of achieving organizational effectiveness through individual behaviour.				
CO3	To learn the concepts relating to individual behavior to achieve group target and achieve leadership position in organization.				
CO4	To understand the organizational changes and means to evaluate based on nature of orgnizations.				
CO5	To learn implications of changes aligning the interest of individual, group and organization as a whole.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			M			
CO2	H		M		H	
CO3	H		M		H	
CO4			M			
CO5			M		H	

Course Topic(s)

FOCUS AND PURPOSE

Organizational Behaviour - Need and importance, nature and scope, framework.

INDIVIDUAL BEHAVIOUR

Personality – types – factors influencing personality – theories – learning – types of learners – learning theories – organizational Behaviour modification. Attitudes – characteristics – components – formation – measurement. Perceptions – importance – factors influencing perception – interpersonal perception.

GROUP BEHAVIOUR

Organization structure – formation – groups in organizations – influence – group dynamics – emergence of informal leaders and working norms – group decision making techniques – interpersonal relations –communication process and Group Communication.

LEADERSHIP

Leadership styles – theories – Qualities - leaders Vs managers – sources of power – power

centers – power and Organisational Politics- Motivation.

ORGANISATIONAL DEVELOPMENT

Organizational development - Importance, characteristics, objectives, stability Vs change, proactive vs reaction change , the change process, resistance to change, managing change, team building - Organizational effectiveness, perspective, effectiveness Vs efficiency, approaches, the time dimension, achieving organizational effectiveness

TEXT BOOKS

1. Stephen P.Robins and Timothy A . Judge, "Organisational Behavior", Peason Education, 17th edition, 2017.
2. Fred Luthans, "Organisational Behavior", McGraw Education, 12th Edition, 2010.

REFERENCES

1. Aswathappa, "Organisational Behavior", Himalaya Publishing House, 12th edition, 2016.
2. P.Subba Rao, "Management and Organisational behavior: Text, Cases and Games", Himalaya Publishing House, 1st edition, 2010.
3. Mullins, "Organisational Behavior", Pearson Education Limited, 9th edition, 2010.
4. L.M.Prasad, "Organisational Behaviour", 5th edition, Sultan Chand and Sons, New Delhi, 2014.

HSS18R004	PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course describes concepts relating to project management and enable students to evolve project objectives appropriately with relevance to business proposals. It covers the required dimensions relating to evaluation of project by testing the technical feasibility, financial viability, market acceptability and social desirability of projects. It gives an account on risk and profitability analysis that facilitates the making of the effective project proposal and guides learners in project planning, implementation and control. It also emancipates the scope of project management in undertaking foreign collaboration projects.				
Course Outcome(s)					
CO1	Familiarizes the concept of project and steps in project management.				
CO2	Understand the basics stages involved in preparing business proposals.				
CO3	Evaluate the technical feasibility, financial viability, market acceptability and social desirability of projects.				
CO4	Enabled to analyse the Risk and profitability of the project proposals				
CO5	Act effectively as project managers and as part of project teams.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			M			
CO2	H		M			
CO3	H		M			H
CO4	H					M
CO5			M		H	

Course Topic(s)

INTRODUCTION TO PROJECT MANAGEMENT

Projects - Project ideas and preliminary screening. Developments - Project planning to Project completion - Pre-investment phase, Investment phase, operational phase - Governmental Regulatory framework. Capital Budgeting .

STAGES OF PROJECT MANAGEMENT

Opportunity studies - prefeasibility studies, functional studies or support studies, feasibility study expansion projects, data for feasibility study. Market and Technical Appraisal : Market and Demand analysis, Market Survey, Demand forecasting. Technical analysis- Materials and inputs, Choice of Technology, Product mix, Plant location, capacity, Machinery and equipment.

APPRAISAL PROCESS

Concepts. Time value of money - Present and future value. Appraisal criteria - Urgency, Payback period, Rate of return, Debt service coverage ratio, Net present value, Benefit cost ratio, Internal rate of return, Annual capital charge, Investment appraisal in practice.

RISK AND PROFITABILITY ANALYSIS

Risk analysis- Measures of risk, Sensitivity analysis, and Decision tree analysis. Means of

financing, Term Loans, Financial Institutions. Cost of capital. Profitability - Cost of Production, Break-even analysis. Assessing the tax burden and financial projections.

PROJECT PLANNING, IMPLEMENTATION, AND CONTROL

Forms of Project Organization, Project Planning, Implementation, and Control - Network construction, CPM, PERT, Development of Project schedule, Crashing of Project Network. Introduction to Foreign collaboration projects - Governmental policy framework, Need for foreign technology, Royalty payments, Foreign investments and procedural aspects.

TEXT BOOKS

1. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Financing, Implementation", 8th Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2014.
2. M.R. Gopalan, "Project Management Core Textbook",(Paper Back) 2nd edition, Wiley India, 2015

REFERENCES

1. Harold Kerzne, "Project Management - Best Practices: Achieving Global Excellence", 3edition, Wiley Publications, 2013
2. George Ritz, Sidney Levy, "Project Management in Construction", Sixth Edition, Mc. Graw Hill Education, 2011.
3. Gary Heerkens, "Project Management", Second Edition, Mc. Graw Hill Education, 2013
4. P.Gopalakrishnan and V.E.Rama Moorthy "Text Book of Project Management",1st Edition, Macmillan India Ltd., New Delhi, 2014.
5. John M. Nicholas, Herman Steyn, "Project Management for Engineering, Business and Technology", 5th Edition, Routledge, 2016.

HSS18R005	STRESS MANAGEMENT AND COPING STRATEGIES	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	Stress has become an integral part of every professional's life. Approaching the stress in the right manner has become imperative as it has become an unavoidable one. The stress and its effect over performance has also become notable in today's organization. In order to cope well and to sustain in market, for that the skills are required to understand and to overcome the same. This course helps in understanding the intricacies of stress and overcoming the stress through appropriate approaches.				
Course Outcome(s)					
CO1	The students understand the responsibility of tackling stress				
CO2	The students identify and modify the approaches of stress accordingly while dealing with team in workplace.				
CO3	Those students who are prone to face high- pressure working conditions will be in a position to tackle stress appropriately without ignoring.				
CO4	The students will implement a stress -free work environment.				
CO5	The students will enrich their way of behavior and personality as a whole and ensure professional working condition and balanced quality of life.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1				H		
CO2				M	H	
CO3	H	M		M		
CO4	H		M			
CO5			M	M		

Course Topic(s)

UNDERSTANDING STRESS

Meaning - Symptoms: Biological and Behavioural - Work Related Stress - Individual Stress – Reducing Stress – Burnout.

COMMON STRESS FACTORS TIME

Common Sources of Stress Biological, Personality and Environmental – Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area - Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No'.

CRISIS MANAGEMENT

Implications – People issues – Structure issues, environmental issues, psychological fall outs – Learning to keep calm – Preventing interruptions – Controlling crisis – Importance of good

communication – Taking advantage of crisis – Pushing new ideas – Empowerment

WORK PLACE HUMOUR

Developing a sense of Humour – Learning to laugh, role of group cohesion and team spirit, using humour at work, reducing conflicts with humour. Coping Styles Defensive Behaviours and Problem-Solving.

SELF DEVELOPMENT

Improving Personality – Leading with Integrity, enhancing creativity – Effective Decision Making – Sensible Communication – The Listening Game – Managing Self - Meditation for Peace – Yoga for Life.

TEXT BOOKS

1. D. Girdano and G. Everly., "Controlling Stress and Tension", 9 th Edition, Prentice-Hall, 2013.
2. Greenberg Jerrold S., “Comprehensive Stress Management“, 14th Edition, McGraw Hill Education, 2017.

REFERENCES

1. Dr. P.K.Dutta, “Stress Management” Himalaya Publishing House, First Edition 2010.
2. Schafer, “Stress Management”, 4th Edition, Cengage Learning, Delhi, 2008
3. Wolfgang Linden, ”Stress Managemen”t, Sage Publication, 1st Edition 2005.
4. Daniel Girdano, Dorothy Dusek and George S. Everly, ”Controlling Stress and Tension”, 8th Edition, Pearson Education, 2009.
5. Brian Luke Seaward, ”Essentials of managing Stress”, 1st edition, Jones & Bartlett Publishers, 2013.

HSS18R006	ECONOMICS FOR ENGINEERS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course provides an introduction to a broad range of economic concepts, theories and analytical techniques. It considers both microeconomics - the analysis of choices made by individual decision-making units (households and firms) - and macroeconomics - the analysis of the economy as a whole. Demand and market structure will be analysed at the firm level. Macroeconomic issues regarding National Income, Inflation, labour and money at an aggregate level will be modelled. The role of government policy to address microeconomic market failures and macroeconomic objectives will be examined.				
Course Outcome(s)					
CO1	Identify and learn economic concepts into market economies.				
CO2	Understand the pricing methods, interpret the market factors to determine the price for products or services and to making decisions based on demand factors.				
CO3	Understand the major characteristics of different market structures and the implications for the behavior of the firm				
CO4	Measure living standards, inflation, and unemployment for use as economic indicators.				
CO5	Analyze the determinants of the relative strengths of monetary policy for sustainable growth of our nation and International Trade.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H				M
CO2	H		M			M
CO3	H		H	H	H	M
CO4		H	H		H	
CO5						M

Course Topic(s)

DEFINITION AND SCOPE OF ECONOMICS

Definitions by A. Smith, A. Marshal and L. Robbins, P.Samuels on and their critical examination - Nature and scope of Economics - Micro-economics in relation to other branches of Economics.

PRICING AND LAW OF DEMAND

Demand, Factors influencing demand, Elasticity of demand - price, income and cross, concepts and measurement - Break Even Analysis – Law of Demand - Price, income and substitution effects - Giffen goods- Pricing Methods.

MARKET STRUCTURE

Definition of market. Concepts of product and factor markets. Different types of market: perfect

competition, monopoly, imperfect competition, monopolistic, competition and oligopoly. Demand and Supply schedules. Price determination under perfect competition in long and short run. Price determination under monopoly. Discriminating monopoly.

MACRO-ECONOMICS

Meaning, Macro-economic Policy and Its Objectives and Instruments - National Income and Social Accounting - Concepts, components, and measurement - Basic circular flow of income model, Unemployment, trade cycle, Inflation - causes, types, effects and control.

COMMERCIAL AND CENTRAL BANKS

Credit creation, monetary policy and tools - Balance of payments - Items in the balance of payments account, equilibrium in the balance of payments.

TEXT BOOKS

1. Gupta, S.B., ”Monetary Economics”, S. Chand & Co., New Delhi, 2nd Edition, 2009.
2. Ruddar Datt and K.P.M.Sundharam, ”Indian Economy”, 70th Edition, S.Chand & Company Ltd., New Delhi, 2013.

REFERENCES

1. D.N.Dewedi, ”Managerial Economics”, 8th Edition, S.Chand & Company Ltd., New Delhi, 2005.
2. Gupta, G.S. ”Macroeconomics, Theory and Applications”, 2nd edition, Tata McGraw-Hill publishing company Ltd., New Delhi, 2004.
3. “Macroeconomic –Theory and polic“, 3rd Edition, Tata McGraw-Hill publishing company Ltd., New Delhi, 2010.“Micro Economic“, Mas Colell, 1st edition, Oxford Press, Delhi, 2012.

HSS18R007	HUMAN RESOURCE MANAGEMENT AND LABOUR LAW	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course aims at exploring key issues related to the management, performance, and development of human resources in the workplace. It places special emphasis on making decisions and developing plans that will enable managers to make the best possible use of their human resources, and covers areas such as: manpower planning, analysis and evaluation, recruitment and selection, wages and salaries, training and management development, performance appraisal, and industrial relations.				
Course Outcome(s)					
CO1	Provide the basic knowledge on developing the employment relations and knowledge to resolve the issues.				
CO2	Design an appropriate and suitable role of HR specialist for implementing Human Resource Management policies.				
CO3	Manage the manpower to motivate and attract them to retain in the organization.				
CO4	Develop the responsibility of employer and legal system to manage the employment relations				
CO5	Provide more insights on the applicability of business law on various functional domains this in turn enhances a strong human relation.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			M	H	M	
CO2	H		M		M	
CO3	H	H	M		H	
CO4			M	H		
CO5	M		M	M	M	

Course Topic(s)

FUNDAMENTALS OF HRM

Human Resource Development Systems-HR environment in India-Functions and Operations of a Personnel Office - Emerging HR Trends - HR information system

HRM FUNCTIONS

Job analysis and job design - HR planning – Recruitment - selection and induction- Staff Training and Development-Career planning and Development- Job Evaluation-Performance Appraisal and Potential Evaluation-Wage determination; salary structure-Wage policies and Regulations-Employee benefits and services

MOTIVATING HUMAN RESOURCES

Team and Team work - Collective Bargaining Employee Morale – Participative Management – Quality Circle – Empowerment –counseling and mentoring.

MAINTENANCE OF WORKERS

Compensation Management- Reward system – Labour relations –Employee Welfare, Safety and

Health – Employee benefits and services – Promotion , Transfers and separation – Ethical issues in HR Management and International Human Resource Management - Legal Aspect of Labour

BUSINESS LAW

Factories Act, 1948 - Industrial Dispute Act, 1947 – Industrial employment – Standing Orders Act, 1946 – Trade Union Act, 1926 - Workmen Compensation Act, 1923, Employees State Insurance Act, 1948, Employees Provident Fund and Miscellaneous Provision Act, 1952, Payment of Gratuity Act, 1972. Payment of Wages Act 1936, Minimum wages Act, 1948– Payment of Bonus Act, 1965.Tamil Nadu Shops and Establishments Act.

TEXT BOOKS

1. Decenzo and Robbins,"Human Resource Manageme"t, Wilsey, 12th edition, 2015.
2. Prasad L.M.,"Human Resource Managemen", 3rd edition, Sultan Chand, New Delhi, 2014.

REFERENCES

1. Biswajeet Pattanayak,"Human Resource Manageme"t, 3rd edition, Eastern Economy Edition, New Delhi, 2010.
2. C.B. Gupta,"Human Resource Managemen", 13th Edition, Sultan Chand, New Delhi 2011.
3. V.S.P. Rao,"Human Resource Managemen", 3rd edition, Excel Books, New Delhi, 2010.
4. Frank B. Cross and Roger LeRoy Miller,"The Legal Environment of Business Text and case", 9th Edition, Cengage Learning, 2015.

HSS18R008	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3
Prerequisite	Nill				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course focuses on the entrepreneurial process and the different kinds of entrepreneurial outcomes. Topics covered include opportunity identification through analysis of industry niches, skills needed in order to turn an opportunity into reality, business plans, launch decisions, and obtaining risk capital. This course deals with the problems and challenges facing the management of businesses in raising funds, marketing products and services, improving effectiveness and flexibility, and achieving growth.				
Course Outcome(s)					
CO1	It provides more insights into the concept of entrepreneurship and which in turn leads to think creatively for new business opportunities to sustain individual as well as social goals.				
CO2	It provides and promotes entrepreneurial spirit and provides a framework of successful business world with relation to agencies to promote employment opportunities.				
CO3	It focuses on women entrepreneurship and promotes a successful business models and explains operational implementations for investment details.				
CO4	It provides the role of government in promoting the entrepreneurship among the individuals and organizations as a whole				
CO5	Understand emerging concepts of marketing in the emerging global markets and provide more insights into project management and venture promotion				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1				M		M
CO2	H		H			
CO3	H	H	M			
CO4		H		M		M
CO5						H

Course Topic(s)

INTRODUCTION

Concepts of entrepreneur, entrepreneurship and entrepreneur - Characteristics and competencies of a successful entrepreneur - General functions of an entrepreneur - Type of entrepreneurs - Role of entrepreneur in economic development - Distinction between an entrepreneur and a manager - Entrepreneur and Intrepreneur.

GROWTH OF ENTREPRENEURSHIP

Emergence of entrepreneurship - Economic and non economic factors for stimulating entrepreneurship development - Obstacles to entrepreneurship development in India - Growth of entrepreneurship in India.

WOMEN AND ENTREPRENEURSHIP

Concept of women entrepreneurship - Reasons for growth of woman entrepreneurship - Problems faced by them and remedial measures.

ROLE OF THE GOVERNMENT IN ENTREPRENEURSHIP DEVELOPMENT

Concept and meaning of entrepreneurship development - Need for entrepreneurship development programmes (EDPs) - Objectives of EDPs - Organizations for EDPs in India; NIESBUD, SISI – their roles and activities.

VENTURE PROMOTION AND PROJECT FORMULATION

Concept of projects classification of projects and project report - Project identification and selection - Constraints in project identification - Techniques of Project Identification, Significance – contents - formulation of project report - Need for Project Formulation - Elements of project Formulation

TEXT BOOKS

1. Michael H Morris, "Corporate Entrepreneurship and Innovation in Corporation", 7th Edition, CENGAGE Learning, Delhi, 2010
2. Jerry Katz, "Entrepreneurship Small Busines", 5th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.

REFERENCES

1. Khanka S.S. " Entrepreneurial Development", 1st edition, S.Chand and Company Limited, New Delhi, 2013.
2. Prasama Chandra, "Projects: Planning, Analysis, Selection, Implementation and Review", 2nd edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 1996.
3. Robert D. Hisrich, "Entrepreneurship", 10th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2017.

HSS18R009	COST ANALYSIS AND CONTROL	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course in meant to exhibit the concepts on costing by describing its elements, types and cost sheet preparation. It also encompasses the analytical framework that can be applied in cost analysis like Marginal costing, CVP analysis, Break even analysis, etc enabling the students to make decisions on cost parameters. Students are enabled to apply techniques like standard costing, activity based costing, etc to manage and control cost effectively.				
Course Outcome(s)					
CO1	Understand the basics of Costing and preparation of Cost sheet.				
CO2	Analyze the cost by applying tools like Marginal costing, CVP analysis and other applications.				
CO3	Enabled to use Budgets for controlling cost in Manufacturing or Production Centre.				
CO4	Defining cost standards and critically examining the application of Standard costing in a Production Centre.				
CO5	Understanding the application of various strategic cost alternatives including Activity based costing.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1						H
CO2	H	H	H			H
CO3	H		M		H	
CO4	H	H	M	H		
CO5						H

Course Topic(s)

INTRODUCTION TO COSTING

Costing, Elements of costing, Types of cost, Preparation of cost sheet.

COST ANALYSIS

Marginal costing, Cost - volume – Profit analysis, Break-Even- Analysis, Break –Even - Chart, Applications.

CONTROL TECHNIQUES

Budgeting and Budgetary control, Types of Budgets , Preparation of purchase Budget, Flexible budgets, Cash Budget, Sales Budget, Materials Budget, Master Budget, Zero based Budgeting.

STANDARD COSTING

Types of Standards, Setting up of standards, Advantages and Criticism of Standard Costing – Control through variances.

ACTIVITY BASED COSTING

Transfer Pricing, Target costing, Life Style Costing, Activity Based Costing (only theory).

TXT BOOKS

1. K.Saxena & C.D. Vashist, "Advanced Cost Accounting and Cost Systems", 2nd Edition, V.Sultan Chand & Sons Publishers. 2014
2. S.P. Jain & K. L. Narang, "Advances Cost Accounting", Kalyani Publishers, 1st Edition, 2017.

REFERENCES

1. J. Blocher, K. H. Chen, G. Cokins and T. W. Lin., "Cost Management: A Strategic Emphasis", Irwin/McGraw-Hill, 3d edition, 2008
2. Don R. Hansen, Maryanne M. Mowen, "Cornerstones of Cost Management", 6th Edition,Cengage Learning, 2015
3. Roger Hussey, Audra Ong, "Strategic Cost Analysis", Business Expert Press, 2012

HSS18R010	PRODUCT DESIGN AND DEVELOPMENT	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course aims to clarify the principles and basic concepts of Product Design and Development. Including organizations and understanding of its products. It also aims at enhancing the quality of products. Product Design means recognition of a new product need, information gathering and requirements setting up, unambitious-clear and complete specification list, study on the product's mechanical architecture, selection of materials and production processes and engineering the various components necessary to make the product work. Product Development means identification of market opportunity, creation of product to appeal to the identified market, and finally, testing, modifying and optimizing the product until it is ready for production.				
Course Outcome(s)					
CO1	Learn basic concepts related to design and development of New product				
CO2	Understand the structured approach towards incorporating quality, safety, and reliability into design.				
CO3	Learn the concepts relating to simulating product performance and manufacturing processes.				
CO4	Understand the technologies related to computer aided group technology				
CO5	Learn implications of changes related to Economic analysis.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		M				
CO2	H			H		
CO3	H	H				M
CO4		M	H	M		H
CO5						M

Course Topic(s)

NEW PRODUCT IDEA

Definition – Design by Evolution and by Innovation - factors to be considered for product design – Production-Consumption cycle – The morphology of design – Primary design Phases and flowcharting. Role of Allowance, Process Capability, and Tolerance in Detailed Design and Assembly Product strategies, Market research – identifying customer needs – Analysis of product – locating ideas for new products, Selecting the right product, creative thinking, curiosity, imagination and brain storming - product specification.

NEW PRODUCT DESIGNING

Task - Structured approaches – clarification – search – external and internal – systematic exploration – conception, selection - methodology benefits. The value of appearance - principles and laws of appearance – incorporating quality, safety, and reliability into design. Man-machine considerations – Designing for ease of maintenance.

ROLE OF TECHNOLOGY IN DESIGNING

Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing process – Needs for industrial design-impact – Industrial design process – Technology driven products - user driven products – assessing the quality of the product.

METHODS AND PRINCIPLES OF DESIGNING

Methodologies and tools - Design axioms - Design for assembly and evaluation - Minimum part assessment - Taguchi Method - Robustness assessment - Manufacturing process rules - Designer's tool kit - Computer aided group process rules - Designer's tool kit - Computer aided group technology - Failure Mode Effective Analysis – Design for minimum number of parts – Development of modular design – Minimising part variations – Design of parts to be multifunctional, multi-use, ease of fabrication – Poka Yoka principles.

FEASIBILITY ANALYSIS

Estimation of manufacturing cost – cost procedures – Value Engineering - reducing the component cost and assembly cost – minimizing the system complexity – Basics and Principals of prototyping – Economic Analysis: Break even analysis. Classes of exclusive rights – Patents – Combination versus aggregation – Novelty and Utility – Design patents – Paten disclosure – Patent application steps - Patent Office prosecution - Sales of paten rights - Trade marks – copy rights.

TEXT BOOKS:

1. Karl.T.Ulrich, Steven D.Eppinger, Product Design and Development, McGraw Hill International, 6th Edition, 2016.
2. A.K.Chitale and R.C.Gupta, "Product Design and Manufacturing", 3rd edition, Prentice Hall of India Private Limited, New Delhi, 2005.

REFERENCES:

1. Richard Crowson, "Product Design and Factory Development", 2nd Edition, crc Press, 2005.
2. Thomke, Stefan, and Ashok Nimgade. "IDEO Product Development." Boston, MA: Harvard Business School Case 9-600-143, June 22, 2000.
3. George E.Dieter, Linda C.Schmidt, "Engineering Design", McGraw-Hill Higher Education, 4th Edition, 2012.
4. Kevin Otto, Kristin Wood, "Product Design", Indian Reprint 2004, Pearson Education

HSS18R011	BUSINESS PROCESS REENGINEERING	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course aims to clarify the principles and basic concepts of Business Process Engineering. This course focuses on both quantitative and qualitative analytical skills and models essential to operations process design, management, and improvement in both service and manufacturing oriented companies. The main objective of the course is to prepare the student to play a significant role in the management of a world class company which serves satisfied customers through empowered employees, leading to increased revenues and decreased costs.				
Course Outcome(s)					
CO1	Learn the basic concepts related to Business Process Reengineering.				
CO2	Understand the methodologies and tools used for Business Process Reengineering.				
CO3	Learn the concepts relating to benefit/cost analysis and its impact on the business organizations.				
CO4	Understand the need for assessment of business re-engineering and the factors contributing to its success.				
CO5	Learn the best practices used in Business Process Reengineering with illustrations from corporate world.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1						H
CO2	H			H		H
CO3	H	H		M		H
CO4	H		M			
CO5	H					M

Course Topic(s)

BASIC CONCEPTS

Introduction to BPR Definition; the paradigm shifts in production; the positioning concept; the re-engineering visions; the benefits of business re-engineering.

METHODOLOGIES FOR BPR

Methodologies and Tools for BPR, Process management; dynamic business re-engineering change framework; steps to reengineer the process.

MODELLING THE BUSINESS

Tools used in Modelling the Business: flow-charting, business activity maps, relational diagrams, benefit/cost analysis. The enabling role of information technology in business re-engineering.

CHANGE MANAGEMENT

Change Management, Planned changes in business re-engineering projects; challenges of business change; business change development. Success factors in re-engineering. The

assessment of business re-engineering.

BEST PRACTICES IN BPR

Best Practices in BPR, Case studies: Bell Atlantic, Nissan, Chrysler, Xerox, and Hewlett Packard etc.

TEXTBOOKS:

1. Ali K. Kamrani, Maryam Azimi (2011). "New Methods in Product Design: New Strategies in Reengineering (Engineering and Management Innovation)". CRC Press. 1st ed.

2. Bassam Hussein (2008). PRISM: "Process Reengineering Integrated Spiral Model. VDM Verlag Dr. Mueller e.K.

REFERENCES:

1. Harmon, P. (2007), Business Process Change : A Guide for Business Managers and BPM and Six Sigma Professionals, Elsevier/Morgan Kaufmann Publishers.

2. R. Anupindi et al. (2006), Managing Business Process Flows: Principles of Operations Management, Pearson Education Inc.

HSS18R012	POLITICAL ECONOMY	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This course provides an introduction to the political economy of India. It examines the interplay of politics and economics. Some of the key themes to be explored are globalization, economic reform, poverty, redistribution, federalism, political protest, public goods delivery, gender, and ethnic politics. Although this class focuses specifically on India, a number of the themes discussed in this course are functions of institutions, rights, Party Systems and challenges.				
Course Outcome(s)					
CO1	Explain the key concepts of political economy analyse the significant developments in the political ideologies.				
CO2	Describe the salient features of the constitution of India and its functions and also interpret, integrate and critically analyse the fundamental rights duties and responsibilities.				
CO3	Understand the Political party system their evolution and role in the economy				
CO4	Understand the various ideological of Indian Political Thoughts				
CO5	have a deep understanding and appreciation of India undergoing major economic and social transformation				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			M			
CO2	H		H	H		
CO3			M		H	
CO4	H		M			
CO5			M			

Course Topic(s)

INTRODUCTION TO POLITICAL ECONOMY

Political Economy as a Method, perspectives, Politics as Reproduction of Social Relations, State and Social Opportunity, Politics of Rent Seeking -Evolution of State in India: Historical Roots of planning, Redistribution.

INDIAN CONSTITUTION

The Pre-ample- Fundamental rights and duties, Directive Principles- Offices of the President, Prime Minister, Cabinet Government, Chief Election Commissioner, and Governor – Parliamentary system and Procedures - The Judiciary system.

PARTY SYSTEM

National and regional political parties, ideological and social bases of parties; patterns of coalition politics; Pressure groups, trends in electoral behaviour; changing socio- economic profile of Legislators.

INDIAN POLITICAL THOUGHT:

Political Ideologies**:** Liberalism, Socialism, Marxism, Fascism, Gandhism and Feminism -

Dharamshastra, Arthashastra and Buddhist traditions; Sir Syed Ahmed Khan, Sri Aurobindo, M.K. Gandhi, B.R. Ambedkar, M.N. Roy.

CHALLENGES TO INDIAN DEMOCRACY

Uneven Development of Regions in India – Communalism – Regionalism – Violence – Corruption – environmental degradation- illiteracy –Population.

TEXT BOOKS

1. Charles Sackrey, Geoffrey Schneider, Janet Knoedler, Introduction to Political Economy, Dollars & Sense, 8th Edition, 2016.
2. Robert.S.Dimand, Review of Political Economy: An Introductory Text, 1st Edition, Routledge, 2008.

REFERENCES

1. Barry R. weingast and Donald a.Wittman, Handbook of Political Economy, 1st Edition, Oxford University Press, New York, 2006.
2. Ed. Sanjay Ruparelia; Sanjay Reddy; John Harriss & Stuart Corbridge, Understanding India's New Political Economy: A Great Tranformation, Routledge 1st Edition edition 2011.
3. M.Laxmikanth, Indian Polity, 4th Edition, McGraw Hill Education, New Delhi,2017.
4. Niraja Gopal Jayal, Pratap Bhanu Mehra, The Oxford Companion to Politics in India: Student Edition, Oxford Press, 2011.

HSS18R013	PROFESSIONAL ETHICS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	It is essential for professionals in any field to have an understanding of the ethical problems and principles in their field. The general principles of professional ethics will be examined, as well as the distinctive problems. This course is presented in three parts: theory; case studies; and research and presentation. Theory includes ethics and philosophy of engineering. Historical cases are taken primarily from the scholarly literatures on engineering ethics, and hypothetical cases are written by students. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.				
Course Outcome(s)					
CO1	Identify the multiple ethical interests at stake in a real-world situation or practice				
CO2	assess their own ethical values and the social context of problems				
CO3	Develop critical thinking skills and professional judgement and understand practical difficulties of bringing about change				
CO4	demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work				
CO5	Manage differing opinions on complex ethical scenarios. It's important for those confronted with ethical challenges to be able to hold multiple conflicting points of view, without necessarily adhering to any of them.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1				H		
CO2	H			H		H
CO3		H	M	H		
CO4	H		M	H		M
CO5	H		M	H	H	

Course Topic(s)

ENGINEERING ETHICS

Functions of Being a Manager – Stock holder and stakeholder management – Ethical treatment of employees - ethical treatment of customers- supply chain management and other issues.

ENGINEERING AS SOCIAL EXPERIMENTATION

Senses of Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories.

ENGINEER RESPONSIBILTY FOR SAFETY

Corporate social responsibility - Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Discrimination.

RESPONSIBILITY AND RIGHTS

Moral imagination, stake holder theory and systems thinking - One approach to management Decision – making Leadership.

GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample code of conduct.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, Introduction to Engineering Ethics, 2nd Edition, McGraw Hill Higher Education, New Delhi, 2010.
2. Charles D Fledderman, Engineering Ethics, 4th Edition, Pearson Education, Delhi, 2011.

REFERENCES

1. R.S.Naagarazan, Text book on Professional Ethics and Human Values, New Age International, 2007.
2. Gail Baura, Engineering Ethics- An Industrial Perspective, 1st Edition, Academic Press, 2006.
3. Charles e. Harris , Michael s. Pritchard and Michael J. Rabins Texas , Engineering Ethics- Conecpts and Cases, 4th Edition, Cengage Learning, 2009.
4. Charles Byms Fleddermann, Engineering Ethics, 3rd Edition, Pearson Prentice Hall, 2008.
5. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2013.
6. Dr.V.Jeyakumar, Professional Ethics in Engineering, Lakshmi Publication, Chennai, 2014.

HSS18R014	OPERATIONS RESEARCH	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This subject will provide students with ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively. It also provides the knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry. It enhances the skills in the use of Operations Research approaches and computer tools in solving real problems in industry.				
Course Outcome(s)					
CO1	Identify and develop operational research models from the verbal description of the real System.				
CO2	Be able to build and solve Transportation Models and Assignment Models				
CO3	Use mathematical software to solve the proposed models.				
CO4	Develop a report that describes the model and the solving technique, analyse the results and propose recommendations in language understandable to the decision making processes in Management Engineering.				
CO5	Be able to design new simple models, like: CPM, MSPT to improve decision – making and develop critical thinking and objective analysis of decision problems.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					
CO2	H	H				
CO3		H		H		
CO4	M					H
CO5		H				H

Course Topic(s)

INTRODUCTION TO LINEAR PROGRAMMING

Introduction to applications of operations research in functional areas of management - Linear Programming - formulation, solution by graphical and simplex methods (Primal - Penalty, Two Phase), Special cases - Dual simplex method.

TRANSPORTATION MODELS AND ASSIGNMENT MODELS

Transportation Models (Minimising and Maximising Cases) – Balanced and unbalanced cases – Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation ethods - Check for optimality - Solution by MODI / Stepping Stone method - Cases of degeneracy - Transshipment Models - Assignment Models (Minimising and Maximising Cases) – Balanced and Unbalanced Cases - Solution by Hungarian and Branch and Bound Algorithms - Travelling Salesman problem - Crew Assignment Models.

INTEGER LINEAR PROGRAMMING AND GAME THEORY

Solution to pure and mixed integer programming problem by Branch and Bound and cutting

plane algorithms - Game Theory - Two person Zero sum games - Saddle point, Dominance Rule, graphical and LP solutions.

REPLACEMENT MODELS AND DECISION THEORY

Replacement Models-Individuals replacement Models (With and without time value of money) – Group Replacement Models - Decision making under risk – Decision trees – Decision making under uncertainty.

PROJECT MANAGEMENT METHOD AND SIMULATION

PERT / CPM – Drawing the network, computation of processing time, floats and critical path. Resource leveling techniques - Application of simulation techniques for decision making.

TEXT BOOKS

1. Kalavathy S, Operations Research, Vikas Publishing House, 4TH Edition, 2013.
2. Paneerselvam R., Operations Research, Prentice Hall of India, 2ND Edition, 2006.
3. Tulsian P.C, Vishal Pandey, Quantitative Techniques (Theory and Problems), Pearson Education, Asia, First Indian Reprint 2002.

REFERENCES

1. D.S.Hira, Problems in Operations Research, Kindle Edition, S.Chand, 2010.
2. Prem Kumar Gupta and D.S. Hira, Operations Research,S.Chand, 2016.
3. R.C.Mishra,Principles of Operations Research, 1st Edition, New Age International 2011.
4. Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, 15th Edition, Sultan Chand and Sons 2010.

HSS18R015	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	This subject provides students with the knowledge to understand the philosophy and core values of Total Quality Management (TQM). It helps to determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization; apply and evaluate best practices for the attainment of total quality. Students who complete this course will be able to critically appraise management techniques, choose appropriate statistical techniques for improving processes and write reports to management describing processes and recommending ways to improve them.				
Course Outcome(s)					
CO1	Understand the role and nature of quality in evolving international economic conditions				
CO2	Apply the Principles of Quality Management for real time problems.				
CO3	the quality encounter process, including supporting facilities and customer requirements/characteristics				
CO4	Classify quality measurement methods and continuous improvement process				
CO5	Frame Management strategy methods, including identification, development, implementation and feedback processes				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					M
CO2		M		M		H
CO3	H	H		H		M
CO4	H					M
CO5			M	M		M

Course Topic(s)

INTRODUCTION TO QUALITY MANAGEMENT

Definitions – TOM framework, benefits, awareness and obstacles - Quality – vision, mission and policy statements - Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi, Shingeo and Walter Shewhart - Concepts of Quality circle, Japanese 5S principles and 8D methodology.

STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed - Process capability – meaning, significance and measurement – Six sigma concepts of process capability - Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve - Business process re-engineering (BPR) – principles,

applications, reengineering process, benefits and limitations.

TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT

Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation.

TAGUCHI TECHNIQUES

Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio - Seven old (statistical) tools - Seven new management tools - Bench marking and POKA YOKE.

TEXT BOOKS:

1. Poornima M.Charantimath., Total quality management, Pearson Education, 2ND Edition, 2011.
2. Dale H.Besterfield et al, Total Quality Management, Perarson Education, Thrid edition, (First Indian Reprints 2004).

REFERENCES

1. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, First Edition, 2002.
2. Jams R. Evans, Total Quality: Management, Organisation and strategy, 4th Edition, South-Western College, 2004.
3. Vincent K.Omachonu, Joel E.Ross, Principles of Total Quality, 3rd Edition, CRC Press, 2004.
4. S.Rajaram, M.Sivakumar, Total Quality Management, Wiley Publishers, 1st Edition, 2008.

HSS18R016	ADVANCED SOFTSKILLS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Humanities Elective				
Course Type	Theory				
Objective(s)	1. To strengthen professional communication skills for workplace environments. 2. To build quantitative and analytical reasoning abilities for industry readiness. 3. To develop logical decision-making and problem-solving skills. 4. To improve verbal comprehension, grammar, critical reasoning, and articulation. 5. To enhance data interpretation skills required in competitive and corporate scenarios.				
Course Outcome(s)					
CO1	Demonstrate effective oral, written, and cross-cultural communication in professional settings.				
CO2	Apply quantitative aptitude techniques to solve business and technical problems efficiently.				
CO3	Apply logical reasoning to analyze patterns, sequences, and decision problems.				
CO4	Apply verbal reasoning and comprehension techniques to workplace communication tasks.				
CO5	Interpret and analyze tabular, graphical, and case-based data to support decision making.				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H	M	H	
CO2	M	M				
CO3	H					
CO4			H			
CO5	M					H

Course Topic(s)

EFFECTIVE COMMUNICATION

Comprehending Ability, Business Vocabulary, Speed Reading, Non-Verbal Communication, Cross Cultural Communication, Meeting Management, Technology trend awareness

QUANTITATIVE ABILITY

Time & Work, Time-Speed-Distance, Permutation & Combination Probability, Geometry & Mensuration, Number Properties, Ratio & Proportion, Mixtures & Alligation, Percentages, Profit-Loss-Discount, Averages, Progression, Higher Mathematics

LOGICAL ABILITY

Non-Verbal Reasoning, Deductive & Inductive Reasoning, Binary Logic, Number Series, Clocks, Calendars

VERBAL ABILITY

Reading Comprehension, Parajumbles, Critical Reasoning, Subject-Verb Agreement, Synonyms & Antonyms, Grammar Reading Comprehension & Logic Miscellaneous Verbal questions

DATA INTERPRETATION

Line Charts, Bar Charts, Pie Charts, Venn diagrams, Caselets, Data tables.

Text Books

1. Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford University Press.
2. Arun Sharma, Quantitative Aptitude, McGraw Hill.
3. R.S. Aggarwal, A Modern Approach to Logical Reasoning, S. Chand.
4. Norman Lewis, Word Power Made Easy, Goyal Publishers.

Reference Books:

1. Barun Mitra, Personality Development and Soft Skills, Oxford.
2. K.N. Krishnaswamy, Communication Skills for Professional Students.
3. Gajendra Singh, Data Interpretation and Logical Reasoning, Wiley.
4. S.P. Bakshi, Objective General English, Arihant.

BASIC ENGINEERING

EEE18R172	BASIC ELECTRICAL ENGINEERING	L	T	P	C
		3	1	2	5
Prerequisite	Nil				
Course Category	Basic Engineering				
Course Type	Integrated Course				
Objective	To focus the fundamental ideas of the Electrical Engineering by providing wide exposure to the basic concepts of Electrical Engineering such as DC Circuits, AC Circuits, electrical machines, and Electrical installations etc.				

COURSE OUTCOMES (CO)	
CO1	Apply basic laws of electricity in DC circuits
CO2	Apply the basic laws of electricity in AC circuits
CO3	Study the construction and working principles of DC Machines and Transformers
CO4	Study the construction and working principle of AC Machines
CO5	Study the basic components of Low Voltage Electrical Installations

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	M				
CO2	H	M				
CO3	M	M				L
CO4	M	M				L
CO5	M	M		L		M

Course Topic(s)

UNIT 1: DC CIRCUITS

DC Circuits: Electrical quantities – Electric Circuit Elements - Resistors - Inductors - Ccapacitors - Ohm's Law - Kirchhoff's Laws - Series and Parallel circuits - Analysis of DC circuits – Mesh - Nodal – Superposition - Thevenin - Norton Theorems - Simple problems

UNIT II: AC CIRCUITS

Sinusoidal functions - Phasor representation - Real power - Reactive power - Aapparent power - Power factor - RMS value - Average value - Form and Peak factors - Analysis of single-phase AC series circuits consisting of RL, RC, RLC combinations – Problems - concept of three phase system.

UNIT III: DC MACHINES AND TRANSFORMERS

DC Machines: Construction and working principle of DC Generator and DC Motor - EMF equation – Torque equation - Related problems

Transformer: Construction - working and types - Ideal and practical transformer - Equivalent circuit - Losses in transformers - Regulation and Efficiency –problems

UNIT IV: AC MACHINES

Synchronous machine: Construction - working of alternator – EMF Equation – Problem – Working principle of synchronous motor

Three phase induction motor: Constructional details - Principle of operation – Types - Torque-slip characteristics - Starting torque - Relation between torque and slip - Losses and efficiency.
Single phase induction motor: Construction – Working principle - Types of single phase induction motor

UNIT V: ELECTRICAL INSTALLATIONS

Components of LT Switchgear - Switch Fuse Unit (SFU) – MCB – ELCB – MCCB - Domestic wiring - accessories - types - Staircase wiring - Fluorescent tube circuits – Earthing - Types of Batteries - Important Characteristics for Batteries - Elementary calculations for energy consumption - power factor improvement and battery Backup

LIST OF EXPERIMENTS

1. Verification of Kirchoff's Laws.
2. Verification of Mesh and Nodal analysis
3. Verification of Thevinin's and Norton's theorems
4. Measurement of electrical quantities-voltage current, power & power factor in RL and RC series circuits
5. Determine the power and power factor of RLC series circuit
6. Open circuit and load characteristics of Separately excited DC Generator
7. Open circuit and load characteristics of Self excited DC Generator
8. Draw the characteristic between output power versus efficiency of DC shunt motor
9. Verification of turns ratio on single phase transformer
10. Load test on single phase transformer
11. Load test on three phase squirrel cage induction motor.
12. Load test on single phase induction motor.
13. Load test on Alternator
14. Study of basic electrical installation components for LT switchgear
15. Residential house wiring using fuse, two way switches and lamp
16. Wiring layout for Fluorescent lamp
17. Experiment for Calculation of charging and discharging current of battery

TEXT BOOK(S):

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012
2. Kothari D P and Nagrath I J, "Basic Electrical Engineering", McGraw Hill, 2009.
3. Mithal G K, Electronic Devices & Circuits, Khanna Publications, 1997

REFERENCE(S):

1. T. Thyagarajan, "Fundamentals of Electrical and Electronics Engineering", SciTech publications (Ind.) Pvt. Ltd., 3rd Edition, 2015.
2. Muraleedharan K.A, Muthususbramanian R and Salivahanan S, "Basic Electrical, Electronics and Computer Engineering" Tata McGraw Hill, 2006.
3. Sunil S.Rao., Switchgear Protection and Power system, Khanna Publishers, New Delhi, 13th Edition, 1999.
4. Ravindranath B., Chander, N., Power Systems Protection and Switch Gear, Wiley Eastern (P) Ltd., Second Edition, 2011.

MEC18R151	ENGINEERING GRAPHICS & DESIGN	L	T	P	C
		3	0	2	3
Prerequisite	Nil				
Course Category	Basic Engineering				
Course Type	Theory with Practical				
Objective	This course aims to introduce the concept of graphic communication, develop the drawing skills for communicating concepts, ideas and designs of engineering products, Demonstrate skills in interpreting, and producing engineering drawings accurately and to give exposure to national standards relating to engineering drawing.				

COURSE OUTCOMES (CO)	
CO1	Create the projection of points in all quadrants and straight lines
CO2	Construct the projections of planes and solid objects with refer to reference planes
CO3	Illustrate the true shape of truncated solids in both the manual and computerized manner
CO4	Develop surfaces of truncated solids in both the manual and computerized man
CO5	Apply orthographic and isometric projections in both the manual and computerized man

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H				
CO2	H					
CO3	H			H	H	M
CO4		H				H
CO5		H	M			H

Course Topic(s)

Unit 1: Projection of Points and Straight Lines

Importance of graphics – use of drafting instruments – BIS conventions and specifications – size, layout and folding of drawing sheets – lettering dimensioning and scales - Projection of points, located in all quadrants - projection of straight lines located in the first quadrant, determination of true lengths and true inclinations

Unit 2: Projection of Planes and Solids

Projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes-Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method

Unit 3: Section of Solids

Section of simple solids like prisms, pyramids, cylinder and cone in vertical position by cutting planes inclined to any one of the reference planes, obtaining true shape of section

Unit 4: Development of Surfaces

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones

Unit 5: Orthographic and Isometric Projection

Orthographic principles – missing view - free hand sketching in first angle projection from

pictorial views. Principles of isometric projection – isometric view and projections of simple solids, truncated prisms, pyramids, cylinders and cones. Introduction to CAD software – menus and tools – drafting platform demonstration

Practical Modules

1. Construction of conic sections using CAD software
2. Construction of simple planes using exclusive commands like extend, trim etc.,
3. Construction of 3D model – solids and sectional views
4. Generating 2D orthographic blue prints from 3D part models
5. Vectorization of simple building plan and elevation

Text Book(s):

1. Basant Aggarwal and C. Aggarwal, Engineering Drawing, McGraw-Hill, 2013.
2. N.S. Parthasarathy, Vela Murali, Engineering Drawing, Oxford University Press, 2015.
3. K. Venugopal, Engineering Drawing + AutoCAD, New Age; Fifth edition, 2011.

Reference(s):

1. Shah, M.B., and Rana, B.C., Engineering Drawing, Pearson 2009
2. Natarajan, K.V., A Text Book of Engineering Graphics, 21st Edition, Dhanalakshmi Publishers, Chennai, 2012.
3. Paul Richard, Jim Fitzgerald., Introduction to AutoCAD 2017: A Modern Perspective, Pearson, 2016.
4. Bhatt, N.D., Engineering Drawing, Charotar publishing House, New Delhi, 53trd Edition, 2014.
5. Luzadder and Duff, “Fundamentals of Engineering Drawing”, Prentice Hall of India Pvt. Ltd., 2009.
6. Venugopal, K., Engineering Graphics, New Age International (P) Limited, 2009.

CSE18R171	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	C
		3	1	2	5
Prerequisite	Nil				
Course Category	Basic Engineering				
Course Type	Integrated Course				
Objective	To make the students to understand the basic concepts of programming language, rules to be followed while writing a program and how to compile and execute C programs.				

COURSE OUTCOMES (CO)	
CO1	Understand the basic programming concepts and syntax of C language
CO2	Develop efficient code using pointers, arrays and dynamic memory allocation Techniques
CO3	Create user defined data types and functions to solve given problems.
CO4	Design an efficient algorithm for a given problem
CO5	Build efficient code to solve the real world problem
CO6	Elucidate the programming constructs of C during interviews

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H					
CO2	H	H				M
CO3	H	M		H		M
CO4	H	H		H		H
CO5	H	H				H
CO6			M			

Course Topic(s)

UNIT 1: 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/ Pseudocode 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, Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops.

UNIT 2: ARRAYS AND STRINGS

Arrays (1-D, 2-D), Character arrays and Strings,

UNIT 3: BASIC ALGORITHMS

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT 4: FUNCTION

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

UNIT 5: STRUCTURE, POINTERS & FILE HANDLING

Structures, Defining structures and Array of Structures, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling (only if time is available, otherwise should be done as part of the lab)

LIST OF EXPERIMENTS

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

TEXT BOOKS

(i) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
(ii) E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

REFERENCE BOOKS

(i) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

MEC18R152	ENGINEERING PRACTICE	L	T	P	C
		3	0	2	3
Prerequisite	Nil				
Course Category	Basic Engineering				
Course Type	Theory with Practical				
Objective	Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.				

COURSE OUTCOMES (CO)	
CO1	Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
CO2	They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes
CO3	By assembling different components, they will be able to produce small devices of their interest

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H			M	
CO2	H	M				
CO3		H			H	

Course Topic(s)

Lectures & videos:

Detailed contents

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Carpentry **(1 lecture)**
5. Plastic moulding, glass cutting **(1 lecture)**
6. Metal casting **(1 lecture)**
7. Welding (arc welding & gas welding), brazing **(1 lecture)**

Suggested Text/Reference Books:

(i) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
(ii) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
(iii)Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
(iv) Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall

India, 1998.
(v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

(ii) Workshop Practice:
1. Machine shop **(10 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(6 hours)**
4. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
5. Casting **(8 hours)**
6. Smithy **(6 hours)**
7. Plastic moulding & Glass Cutting (6 hours)

*Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

ECE18R220	PRINCIPLES OF SIGNALS AND SYSTEMS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Basic Engineering				
Course Type	Theory				

COURSE OUTCOMES (CO)	
CO1	Identify different types of continuous time and discrete time signals.
CO2	Identify different types of continuous time and discrete time systems.
CO3	Analyze signals using Z Transform and FT.
CO4	Analyze signals using DFT and FFT
CO5	Appreciate different Digital Filter structures

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H				H	
CO2	H				M	
CO3	H			H		H
CO4	H	H		H	H	
CO5	M	M				

Course Topic(s)

UNIT 1 : BASICS OF SIGNALS

Basic operations on signals, continuous time and discrete time signals: step, impulse, ramp, exponential and sinusoidal functions

UNIT 2: BASICS OF SYSTEMS

Continuous time and discrete time systems, properties of systems: linearity, causality, time invariance, memory, stability, invertibility. Linear time invariant systems, convolution

UNIT 3 : Z-TRANSFORM

Z-transform, region of convergence, properties of Z-transform, inverse Z-transform.

UNIT 4: FOURIER TRANSFORM

Fourier transform (FT) of discrete time signals, properties of FT, relation between Z-transform and FT.

Unit 5: DFT

Discrete Fourier transform (DFT), Properties of DFT, inverse DFT, Fast Fourier transform (FFT), Radix-2 FFT algorithms, butterfly structure

Text Book(s):

1. Tarun Kumar Rawat, “Signals and Systems”, Oxford University Press, 2010.
2. V. Krishnaveni, A. Rajeswari, “Signals and Systems”, Wiley, 2012

Reference(s):

1. Michael J Roberts and Govind Sharma, “Signals and Systems”, McGraw Hill, 2010
2. M. N. Bandyopadhyaya, “Introduction to Signals and Systems and Digital Signal Processing”, PHI, 2008

INT18R171	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	1	2	5
Prerequisite	Basic Electrical and Electronics Engineering (EEE17R151)				
Course Category	Basic Engineering				
Course Type	Integrated Course				
Objective(s)	• To understand different methods used for the simplification of Boolean Functions. • To design and implement combinational circuits. • To design and implement synchronous and asynchronous sequential circuits. • To study the fundamental of VHDL/ Verilog HDL.				
Course Outcome(s)					
CO1	Able to design Logic gates with multi functionality implementation of Boolean functions				
CO2	Write Program for combinational and sequential circuits like Multiplexers, Flip flops, Counters using VHDL language				
CO3	Analyze and develop Synchronous Sequential circuits				
CO4	Analyze and Design Asynchronous Sequential circuits				
CO5	Design the specified logic (simple electronic circuits) with CMOS/Memory and Implementation of Programming logics concepts				

Mapping of COs with ABET Sos

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	H				
CO2	H	H				M
CO3	H	H		H		M
CO4	H	H				M
CO5	H	H				H

Course Topic(s)

UNIT 1 : BOOLEAN ALGEBRA AND LOGIC GATES

Number System-Code Conversion-Boolean algebra & theorems-Binary Arithmetic-Simplification of Boolean functions using Theorem, Karnaugh map and Tabulation method-Logic gates-Multilevel NAND & NOR Circuits implementations.

UNIT 2: COMBINATIONAL LOGIC

Combinational Circuits-Analysis and design procedure-Adder/Subtractor-Serial/Parallel Adder & Subtractor-Decoder & Encoder-Multiplexer& Demultiplexer-Design of Code Conversion Circuits-HDL for Combinational Logic.

UNIT 3 : SEQUENTIAL LOGIC

Sequential Circuits-Analysis and design procedure-Flip Flops-Realization of one Flip Flop using other Flip Flops-Shift Registers & Counters-State Reduction & Assignment-HDL for Sequential Logic Circuits.

UNIT 4: ASYNCHRONS SEQUENTIAL LOGIC

Asynchronous Circuits-Analysis and design procedure-Primitive State/Flow table-Minimization

of Primitive State table-State Assignment-Excitation table-Excitation map cycles-Races-Hazards.

UNIT 5 : MEMORIES AND LOGICAL PROGRAMMING

Memory Classification-RAM-ROM-memory decoding- Error detection and correction - Programmable Logic Array (PLA)-Programmable Array Logic (PAL) - Application Specific Integrated Circuits.

LIST OF EXPERIMENTS

1. Verification of Boolean theorems using digital logic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters, etc.
3. Design and implementation of 4-bit binary adder / subtractor using basic gates and MSI devices.
4. Design and implementation of parity generator / checker using basic gates and MSI devices.
5. Design and implementation of magnitude comparator
6. Design and implementation of application using multiplexers
7. Design and implementation of Flip-flops
8. Design and implementation of Shift registers
9. Design and implementation of Synchronous and Asynchronous counters
10. Coding combinational circuits using Hardware Description Language (HDL software required)
11. Coding sequential circuits using HDL (HDL software required)

TEXT BOOK

1. Morris Mano M, “Digital Design”, Pearson Education, 5th edition, 2013.

REFERENCES

1. Charles H.Roth, Jr., “Fundamentals of Logic Design”, Jaico Publishing House, 7th Edition, 2014.
2. Donald D.Givone, “Digital Principles and Design”, Tata McGraw-Hill, 2003.

PROGRAM CORE

CSE18R174	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	C
		3	0	2	4
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	To make acquainted the students about the functional units of computer and how each unit works along with the architectural and performance issues.				

Course Outcome(s)	
CO1	Examine functional units of computer, bus structure and addressing mode
CO2	Apply the knowledge of algorithms to solve arithmetic unit problems.
CO3	Demonstrate single bus, multiple bus organization and pipelining concepts
CO4	Analyze RAM, ROM, Cache memory and virtual memory concepts
CO5	Evaluate the various I/O interfaces

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H					H
CO3			H		H	
CO4	H					M
CO5		H				

Course Topic(s)

UNIT 1: BASIC STRUCTURE OF COMPUTERS

Functional Units - Basic Operational Concepts - Bus Structures - Software Performance – Memory Locations and Addresses – Memory Operations – Instruction and Instruction Sequencing – Addressing Modes – Assembly Language – Basic I/O Operations – Stacks and Queues.

UNIT 2 : ARITHMETIC UNIT

Addition and Subtraction of Signed Numbers – Design of Fast Adders – Multiplication of Positive Numbers - Signed Operand Multiplication and Fast Multiplication – Integer Division – Floating Point Numbers and Operations.

UNIT 3: BASIC PROCESSING UNIT

Fundamental Concepts – Execution of a Complete Instruction – Multiple Bus Organization – Hardwired Control – Micro Programmed Control - Pipelining – Basic Concepts – Data Hazards – Instruction Hazards – Influence on Instruction Sets – Data Path and Control Consideration – Superscalar Operation.

UNIT 4: MEMORY SYSTEM

Basic Concepts – Semiconductor Rams - Roms – Speed - Size and Cost – Cache Memories - Performance Consideration – Virtual Memory - Memory Management Requirements – Secondary Storage.

UNIT 5 : I/O ORGANIZATION

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface Circuits – Standard I/O Interfaces (PCI, SCSI, USB).

List of Practical Components

1. Implementation of booth algorithm
2. Implementation of sequential circuit binary multiplier
3. Implementation of bit pair recording
4. Implementation of carry save addition
5. Implementation of Integer restoring division
6. Implementation of Integer Non restoring division
7. Implementation of twos complement addition
8. Implementation of twos complement subtraction

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, Computer Organization, McGraw-Hill, 5th Edition 2012

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, PHI pvt Ltd, 4th Edition, 2012.
2. David A.Patterson and John L.Hennessy, Computer Organization and Design: The hardware software interface, Morgan Kaufmann, 3rd Edition, , 2007.
3. John P.Hayes, Computer Architecture and Organization, McGraw Hill, 3rd Edition, 1998

CSE18R273	OPERATING SYSTEMS	L	T	P	C
		3	0	2	4
Prerequisite	Computer Architecture and Organization (CSE18R174)				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	1. To learn the mechanisms of OS to handle processes and threads and their Communication 2. To learn the mechanisms involved in memory management in contemporary OS 3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols 4. To know the components and management aspects of concurrency management				

Course Outcome(s)	
CO1	Interpret Operating System Structure, Operations, Services and Process
CO2	Elaborate Multithreaded Programming, Process Scheduling and Synchronization
CO3	Analyze and apply process synchronization mechanisms and deadlock handling techniques to ensure efficient and reliable process coordination in operating systems
CO4	Compare, evaluate, and implement different memory management schemes to optimize workloads
CO5	Experiment with various disk management schemes

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			M
CO2	H					
CO3		H			H	L
CO4	H	H			H	
CO5		H				

Course Topic(s)

UNIT 1 : INTRODUCTION TO OPERATING SYSTEMS

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System

UNIT 2 : PROCESS SCHEDULING

Processes: Definition, Process Relationship, Different states of a Process, Process State

transitions, Process Control Block (PCB), Context switching **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

UNIT 3: PROCESS SYNCHRONIZATION AND DEADLOCK

Operations on Processes , Cooperating Processes , Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT 4 : MEMORY MANAGEMENT

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

UNIT 5: FILE AND SECONDARY STORAGE MANAGEMENT

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

List of Practical Components:

1. Windows and UNIX Commands
2. Simulation of System calls
3. Implementation of CPU Scheduling algorithms
4. Simulation of IPC in UNIX
5. Implementation of deadlock avoidance algorithms
6, Implementation of Page replacement algorithms
7. Implementation of memory management functions
8. Implementation of disk scheduling algorithms

TEXT BOOKS :

1. Abraham Silberschatz, Peter Galvin,Greg Gagne, "Operating System Concepts and Essentials", 9th Edition, Wiley Asia Student Edition.
2. William Stallings, "Operating Systems: Internals and Design Principles", 5th Edition, , Prentice Hall of India.

REFERNCE BOOKS

1. Charles Crowley, "Operating System: A Design-oriented Approach", 1st Edition by, Irwin

Publishing.
2. Gary J. Nutt, “Operating Systems: A Modern Perspective”, 2nd Edition, Addison-Wesley.
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India

INT18R201	WEB TECHNOLOGY	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Theory				
Objective(s)	• To learn the theoretical and practical concepts of web programming. • To introduce the programming languages for developing simple web applications. • To make students to understand about the architecture of web server and deployment of web site • To teach methodologies useful for the implementation of dynamic web applications • To efficiently design and implement web applications using server side programming languages				
Course Outcome(s)					
CO1	Understand the theoretical and practical concepts (internet basics) to design, implement and maintain a typical web page, to understand different protocols used over the internet, to obtain good knowledge in web programming in JavaScript				
CO2	Develop and incorporate dynamic capabilities in Web pages using DHTML and JavaScript.				
CO3	Understand the basic concepts of client-server architecture, features, web applications, web servers to deploy web site, to include multimedia contents				
CO4	Understand database basics related to develop dynamic web applications and Apply XML for designing web pages.				
CO5	Apply advanced web development programming to design and implement server-side software that interacts with a database for the purposes of querying the database, test and debug the software, deploy the software, to design and implement interactive web pages				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	H				
CO2	H				H	
CO3			H			
CO4	H					H
CO5		M	M	H	L	H

Course Topic(s)

UNIT 1 : INTRODUCTION

History and basic idea of Internet; Internet services: telnet, e-mail, ftp, WWW- HTML- List, Tables, Images, Forms, Frames, XML- Document type definition, XML Schemas,* Document Object model - Web page design: Designing web pages with HTML5 – New elements added - semantic elements -attributes of form -graphic elements- multimedia elements-APIs-CSS-javascript-Jquery-AJAX

UNIT 2: DYNAMIC HTML

Introduction – Object refers, Dynamic style, Dynamic position, frames, navigator, Event Model – On check – On load – On error – Mouse related – Form process – Event Bubblers – Filters – Transport with the Filter – Creating Images – Adding shadows – Creating Gradients – Creating Motion with Blur – Data Binding – Simple Data Binding – Moving with a record set – Sorting table data – Binding of an Image and table.

UNIT 3: MULTIMEDIA

Audio and video speech synthesis and recognition – Electronic Commerce – E-Business Model – E- Marketing – Online Payments and Security – Web Servers – HTTP request types – System Architecture – Client Side Scripting and Server side Scripting – Accessing Web servers – IIS – Apache web server.

UNIT 4 : ASP

ASP – Working of ASP – Objects –File System Objects – Session tracking and cookies – ADO – Access a Database from ASP –Server side Active-X Components – Web Resources – XML – Structure in Data – Name spaces– DTD – Vocabularies – DOM methods

UNIT 5 : DATABASE CONNECTIVITY

Database Connectivity - ADO.NET- SqlConnection- SqlCommand- Reading Data with the SqlDataReader - Working with Disconnected Data - Adding Parameters to Commands - Using Stored Procedures

TEXT BOOK

1. Deitel & Deitel, Goldberg, "Internet and World Wide Web 5th Edition – How to Program", Pearson Education Asia, 2012.

REFERENCES

1. Eric Ladd, Jim O' Donnel, "Using HTML 4, XML and JAVA1.2", Prentice Hall of India, QUE, 1999.
2. Aferganatel, "Web Programming: Desktop Management", PHI, 2004.
3. Rajkamal, "Web Technology", Tata McGraw-Hill, 2001.

INT18R271	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	1	2	5
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	• To learn the systematic way of solving problems. • To understand the different methods of organizing large amounts of data. • To introduce the practical and formal aspects of data structures • To teach methodologies useful for the implementation and empirical evaluation of sorting and searching algorithms. • To efficiently implement the solutions for specific problems using data structures				
Course Outcome(s)					
CO1	Examine and implement different data structures such as: arrays, linked lists, stacks, queues, both array and linked list representation.				
CO2	Design and implement applications using general tree data structures and analyze their time and space complexity				
CO3	Demonstrate understanding of various operations of heap and sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.				
CO4	Apply appropriate inferential statistical methods to analyze datasets and derive evidence-based conclusions.				
CO5	Design and implement the various algorithms design techniques.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H	H	H			
CO3	M		H			
CO4			H		M	H
CO5	H		H			M

Course Topic(s)

UNIT 1: LINEAR STRUCTURES

Abstract Data Types (ADT)-List ADT- Array based implementation- linked list implementation- Cursor based linked lists-Doubly linked lists- Applications of lists- stack ADT- Queue ADT- Circular queue implementation- Applications of stacks and queue.

UNIT 2: TREE STRUCTURES

Tree ADT- Tree Traversals Binary Tree ADT – Express trees Application of trees- binary search tree ADT- Threaded Binary Trees. AVL Trees – Splay Trees – B –Tree – heaps – Binary heaps – Applications of binary heaps

UNIT 3 : HASHING AND SORTING

Hashing- Separate chaining – open addressing – rehashing – extendible hashing – Sorting – Insertion Sort – Selection Sort -Shell Sort – Heap Sort – Merge Sort – Quick Sort

UNIT 4 : GRAPHS

Graph Definitions and types, Graph Representation -topological sorting – breadth first traversal – shortest path algorithm – minimum spanning tree – Prims and Kruskal's algorithm – Depth first traversal- biconnectivity- Euler circuits – Applications of graphs

UNIT 5: ALGORITHM DESIGN TECHNIQUES

Introduction – Greedy Method- Divide and Conquer – Dynamic Programming- Back Tracking- Branch and Bound.

PRACTICE COMPONENTS

1. Write a program to implement Stack Using Array and Linked list.
2. Write a program to implement Queue Using Array and Linked list.
3. Write a program to create a singly linked list.
4. Develop a date structure for trees, Include addition, deletion, access procedures. Apply this to problems like students list, passengers list, and polynomial representations.
5. Write a program to implement Binary Search Tree.
6. Write a program to implement Conversion of Infix Expression to Postfix Expression.
7. Write a program to implement Conversion of Postfix Expression to Infix Expression.
8. Write a program to implement Postfix Expression Evaluation.
9. Write an algorithm to convert a tree into a binary tree. Also traverse the tree.
10. Write a program to check for balanced parentheses of an expression using array implementation of stack.
11. Write a program to check for balanced parentheses of an expression using linked list implementation of stack.
12. Write a program to sort a set of elements using bubble sort, insertion sort, shell sort, heap sort, merge sort and quick sort.
13. Write a C program to implement the Dijkstra's Algorithm
14. Write C program for the implementation of minimum spanning using Kruskal

Write C program for the implementation of minimum spanning using Prims algorithm

TEXT BOOK

1. M.A.Weiss, "Data Structures and Algorithm Analysis in C", 4th Edition, Pearson Education, 2013.

REFERENCES

1. A.V.Aho, J.E.Hopcroft and J.D.Ullman, "Data Structures and Algorithms", Pearson Education, 2005.
2. R.F.Gilberg, B.A.Forouzan, "Data Structures", Second Edition, Thomson India Edition, 2005.

INT18R272	ANALOG AND DIGITAL COMMUNICATION	L	T	P	C
		3	0	2	4
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	• Provide a detailed introduction to the basic principles and techniques used in analog and digital communications. • To introduce analog and digital modulation techniques, communication receiver and transmitter design, baseband and band pass communication techniques, line coding techniques, noise analysis, and multiplexing techniques. • To know about analytical techniques to evaluate the performance of communication systems				
Course Outcome(s)					
CO1	Design systems for generating and demodulating the amplitude modulated signals, Frequency Modulated Signals and Phase Modulated Signals				
CO2	Analyze the performance of a digital communication system in terms of error rate and bandwidth efficiency				
CO3	Explain how communication works in data networks and the Internet				
CO4	Understand the basic concepts of Information and Coding Theories and design error correcting codes				
CO5	Gain the ability to analyze data services in cellular communication				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H				
CO2	H					
CO3			H		H	
CO4	H	H	H		M	
CO5	H		M			M

Course Topic(s)

UNIT 1 : ANALOG COMMUNICATION

Noise: Source of Noise - External Noise- Internal Noise- Noise Calculation. Introduction to Communication Systems: Modulation – Types - Need for Modulation. Theory of Amplitude Modulation - Evolution and Description of SSB Techniques - Theory of Frequency and Phase Modulation – Comparison of various Analog Communication System (AM – FM – PM).

UNIT 2: DIGITAL COMMUNICATION

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) –Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – 16 PSK - Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

UNIT 3 : DATA AND PULSE COMMUNICATION

Data Communication: History of Data Communication - Standards Organizations for Data Communication- Data Communication Circuits - Data Communication Codes - Error Detection

and Correction Techniques - Data communication Hardware - serial and parallel interfaces. Pulse Communication**:** Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) - Comparison of various Pulse Communication System (PAM – PTM – PCM).

UNIT 4: SOURCE AND ERROR CONTROL CODING

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

UNIT 5 : MULTI-USER RADIO COMMUNICATION

Advanced Mobile Phone System (AMPS) - Global System for Mobile Communications (GSM) - Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse - Channel Assignment and Hand off - Overview of Multiple Access Schemes - Satellite Communication - Bluetooth.

TEXT BOOK

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2014.

REFERENCES

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004.
2. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2007.
3. H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3rd Edition, Pearson Education, 2007.

LIST OF EXPERIMENTS

1. Generation and detection of Amplitude Modulation
2. Generation of Frequency modulation and its detection
3. Generation and detection of PAM
4. Generation and detection of PCM
5. Generation and detection of PDM
6. Generation of ASK Modulators and demodulators
7. Generation of FSK Modulators and demodulators
8. Generation of PSK Modulators and demodulators
9. Pseudo Random Noise sequence generation with digital IC’s.
10. Generation of Line Code Encoding
11. Characteristics of Mixer.
12. Sampling theorem verification
13. Delta modulation and demodulation
14. QPSK modulation and demodulation
15. DPSK modulation and demodulation

INT18R273	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	2	4
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	• To study the object oriented programming principles, tokens, expressions, control structures and functions. • To introduce the classes, objects, constructors and Destructors. • To introduce the operator overloading, inheritance and polymorphism concepts in C++				
Course Outcome(s)					
CO1	Have a sound understanding of the fundamental concepts of the OOP paradigm				
CO2	Develop the program and projects in Oops concepts.				
CO3	Examine and implement the inheritance and virtual function concepts in real time projects.				
CO4	Solve real-life problems using File concepts and stream classes.				
CO5	Understand and implement the template and exception handling concepts in programs				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	M	H				H
CO3					H	
CO4	H				M	H
CO5			H			

Course Topic(s)

UNIT 1 : INTRODUCTION

Need of OOP, History, Development, Concepts, and Benefits of OOP. Object-oriented paradigm - elements of object oriented programming - Merits and demerits of OO methodology – Structure of a C++ program - tokens, keywords, identifiers, data types, expressions, control structures, declaration and initialization of variables, operators, expressions and implicit conversions. Functions in C++.

UNIT 2 : OBJECT ORIENTED PROGRAMMING IN C++

Classes and objects - member functions - constructors and destructors - operator overloading and type conversions – Inheritance - virtual functions and polymorphism.

UNIT 3 : FILE HANDLING

Managing console I/O operations: C++ streams, C++ Stream classes, formatted and unformatted I/O operations - File handling in C++: classes for file stream operations, Opening, closing, and updating files, file pointers and their manipulations - Templates and exception handling: class and function templates

UNIT 4 : JAVA INTRODUCTION

An overview of Java - data types - variables and arrays, operators, control statements, classes, objects, methods – Inheritance.

UNIT 5: JAVA PROGRAMMING

Packages and Interfaces- Exception handling – Multithreaded programming - Strings, Input /Output

PRACTICAL COMPONENTS

1. Programs Using Functions
   - Functions with default arguments
   - Implementation of Call by Value, Call by Address and Call by Reference
2. Simple Classes for understanding objects, member functions and Constructors
   - Classes with primitive data members
   - Classes with arrays as data members
   - Classes with pointers as data members – String Class
   - Classes with constant data members
   - Classes with static member functions
3. Compile time Polymorphism
   - Operator Overloading including Unary and Binary Operators.
   - Function Overloading
4. Runtime Polymorphism
   - Inheritance
   - Virtual functions
   - Virtual Base Classes
   - Templates
5. File Handling
   - Sequential access
   - Random access
6. Simple Java applications
   - for understanding reference to an instance of a class (object), methods
   - Handling Strings in Java
7. Simple Package creation.
   - Developing user defined packages in Java
8. Interfaces
   - Developing user-defined interfaces and implementation
   - Use of predefined interfaces
9. Threading
   - Creation of thread in Java applications
   - Multithreading
10. Exception Handling Mechanism in Java
    - Handling pre-defined exceptions
    - Handling user-defined exceptions

TEXT BOOKS

1. Robert Lafore,"Object Oriented Programming in C++" Sams Publishing copyright 2002, fourth edition.
2. Venugopal, R.,Rajkumar Buyya, Ravishankar, Mastering C++, TMH, 2003

3. Herbert Schildt, The Java 2: Complete Reference, 7th edition, TMH, 2006

REFERENCE

1. Ira Pohl, Object oriented programming using C++, Pearson Education Asia, 2003
2. Herbert Schildt, The Java 2 : Complete Reference, Fourth edition, TMH, 2002.
3. Rajaraman, Object Oriented Programming and C++, New Age International, 2007.

INT18R274	PRINCIPLES OF DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	2	4
Prerequisite	Principles of Signals and Systems (ECE18R220)				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	• The basic concepts and techniques for processing signals on a computer. • Signals, systems, time and frequency domain concepts which are associated with the mathematical tools (i.e.) fundamental to all DSP techniques. • To provide a thorough understanding and working knowledge of design, implementation, analysis and comparison of digital filters for processing of discrete time signals. • To study various sampling techniques and different types of filters and will also understand Basic principles of Estimation Theory. • The most important methods in DSP, including digital filter design, transform-domain processing and importance of Signal Processors.				
Course Outcome(s)					
CO1	Analyze and process signals in the discrete domain				
CO2	Analyze signals using fast fourier transform				
CO3	Design IIR Filters to suit specific requirements for specific applications				
CO4	Design FIR Filters to suit specific requirements for specific applications				
CO5	Design and develop applications of signal processing algorithms to suite specific needs				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2	H		H			
CO3		H	H			
CO4	H	H	M			
CO5		H	M			M

Course Topic(s)

UNIT 1 : SIGNALS AND SYSTEMS

Basic elements of digital signal Processing – Concept of frequency in continuous time and discrete time signals – Sampling theorem – Discrete time signals, Discrete time systems – Analysis of Linear time invariant systems – Z transform –Convolution and correlation - MATLAB programs for signals and systems.

UNIT 2 : FAST FOURIER TRANSFORMS

Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Use of FFT algorithms in Linear Filtering.

UNIT 3 : IIR FILTER DESIGN

Structure of IIR – Analog filter design - Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – Design of IIR filter in the Frequency domain.

UNIT 4 : FIR FILTER DESIGN

Structure for FIR systems - Symmetric & Anti-symmetric FIR filters – Linear phase FIR filter – Filter design using windowing techniques (Rectangular Window, Kaiser Window), Frequency sampling techniques - Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

UNIT 5: APPLICATION OF DSP

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor –Application of DSP: Model of speech wave form – Vocoder – Musical sound processing, Digital music synthesis.

TEXT BOOK

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, "Discrete Time Signal Processing", PHI/Pearson Education, 2010.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3. Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006.

PRACTICAL EXPERIMENTS

1. Generation of input Signals.
2. Analysis of linear system [with convolution and de-convolution operation]
3. FIR filters design by Rectangular window using MATLAB Programming.
4. FIR filters design by Kaiser Window using MATLAB Programming.
5. IIR Butterworth filters design using MATLAB Programming.
6. IIR Chebyshev filters design using MATLAB Programming.
7. Implementation of FFT
8. Implementation of Interpolation and decimation
9. Estimation of power spectral density using MATLAB Programming
10. Spectral analysis using MATLAB Programming
11. Verification of linear phase characteristics of FIR filters .

INT18R251	MICROCONROLLERS AND EMBEDDED SYSTEMS	L	T	P	C
		3	0	1	3.5
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Theory with Practice				
Objective(s)	• To have an in depth knowledge of the architecture and programming of 8 bit and 16 bit microcontrollers • To study the interface of various peripheral devices				
Course Outcome(s)					
CO1	Understand basic structure microcontroller.				
CO2	Ability to program microcontroller				
CO3	Understand basic structure embedded systems				
CO4	Understand fundamentals of real time operating system				
CO5	Create some embedded products				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H	M				M
CO3	H		H			
CO4	H		H			
CO5				H	H	H

Course Topic(s)

UNIT 1 : MICROCONTROLLER ARCHITECTURE

Introduction to Microprocessor – Architecture, Memory Organization, Pin configuration. Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, Interrupts.

UNIT 2: ASSEMBLY LANGUAGE PROGRAMMING OF 8051

Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and ISR.

UNIT 3 : INTRODUCTION TO EMBEDDED SYSTEMS

Overview of Embedded System Architecture, Application areas, Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC.

UNIT 4 : EMBEDDED / REAL TIME OPERATING SYSTEM

Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems, Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems.

UNIT 5 : EMBEDDED SYSTEM - DESIGN CASE STUDIES

Digital clock, Battery operated smart card reader, Automated meter reading system, Digital

camera.

TEXT BOOKS

1. M. A. Mazidi, J. G. Mazidi, R. D, "The 8051 microcontroller & Embedded systems", McKinlay, Pearson Edition. 2010
2. Kenneth J. Ayala, Dhananjay V, Gadre "The 8051 microcontroller & Embedded systems", Cengage Learning, 2010
3. Dr. K. V. K. K. Prasad, "Embedded / real – time systems: concepts, design & programming", Black Book, Dreamtech press, Reprint edition 2013

REFERENCES

1. Shibu K. V "Introduction to embedded systems", McGraw Hill, 2011
2. Ray A.K, and Burchandi K.M, "Intel Microprocessors Architecture Programming and Interfacing", McGraw Hill International Edition, 2004.
3. Rafi Quazzaman M., "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall of India, Pvt. Ltd., New Delhi, 3rd edition, 2008.
4. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012 .

PRACTICAL EXPERIMENTS

1. Arithmetic Operations with 8051
2. Finding sum of elements in an array
3. Number Conversions
4. To find the largest number in a data array
5. To write a program to initiate 8251 and to check the transmission and reception of character.
6. To interface 8253 programmable interval timer.
7. Stepper Motor Interfacing with 8051
8. Data transfer programs using 8051
9. Timers and Interrupts
10. Serial Communication
11. Interfacing with Traffic Generator ,DAC, ADC
12. Basic and Interfacing Programs Using Embedded C
13. Real time system programs (Embedded C)
14. KEIL software example programs
15. ARM/Atom based Application Development:
    i. Programs to practice data processing instructions.
    ii. Interfacing programs
    iii. Program that uses combination of C and ARM/Atom assembly code.

INT18R311	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Theory				
Objective(s)	• To Understand different planning problems • To have the basic knowledge how to design and implement AI planning systems • To know how to use AI planning technology for projects in different application domains • Ability to make use of AI planning literature				
Course Outcome(s)					
CO1	Learn the basics of the theory and practice of Artificial Intelligence as a discipline about intelligent agents capable of deciding what to do, and do it				
CO2	Understand the strengths and limitations of various state-space search algorithms and choose the appropriate algorithms for a problem				
CO3	Apply knowledge representation techniques and choose specific problem solving strategies to ensure ethical practices in AI applications				
CO4	Design simple software to experiment with various AI concepts and analyze results				
CO5	Build self-learning and research skills to be able to tackle a topic of interest on his/her own or as part of a team				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1				M		
CO2				H		
CO3	H		M	H		H
CO4		H		M		
CO5	H			M	H	

Course Topic(s)

UNIT 1: INTRODUCTION

Intelligent Agents – Agents and environments - Good behavior – The nature of environments – structure of agents - Problem Solving - problem solving agents – example problems – searching for solutions – uniformed search strategies - avoiding repeated states – searching with partial information.

UNIT 2: SEARCHING TECHNIQUES

Informed search and exploration – Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments - Constraint satisfaction problems (CSP) – Backtracking search and Local search for CSP – Structure of problems - Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning.

UNIT 3: KNOWLEDGE REPRESENTATION

First order logic – representation revisited – Syntax and semantics for first order logic –

Using first order logic – Knowledge engineering in first order logic - Inference in First order logic – prepositional versus first order logic – unification and lifting – forward chaining – backward chaining - Resolution

UNIT 4: LEARNING

Learning from observations - forms of learning - Inductive learning - Learning decision trees - Ensemble learning - Knowledge in learning – Logical formulation of learning – Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods - Learning with complete data - Learning with hidden variable - EM algorithm- Instance based learning - Neural networks

UNIT 5: APPLICATIONS

Communication – Communication as action – Formal grammar for a fragment of English – Syntactic analysis – Augmented grammars – Semantic interpretation – Ambiguity and disambiguation – Discourse understanding – Grammar induction - Probabilistic language processing - Probabilistic language models – Information retrieval – Information Extraction – Machine translation.

TEXT BOOK

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 2nd Edition, Pearson Education / Prentice Hall of India, 2004.

REFERENCES

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 2003.
3. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education / PHI, 2002.

CSE18R371	COMPUTER NETWORKS	L	T	P	C
		3	1	2	5
Prerequisite	Operating Systems (CSE18R273)				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	1. To provide students with an overview of the concepts and fundamentals of data communication and computer networks. 2. To introduce students to local, metropolitan and wide area networks using the standard OSI reference model as a framework and to the Internet protocol suite and network tools and programming using various networking technologies.				
Course Outcome(s)					
CO1	Inspect the basics of data communication and various categories of networks				
CO2	Identify the technologies for error free transmission of data over internet				
CO3	Apply various routing protocols to select optimal path and relate addressing entities in Network Layer				
CO4	Implement different transport and application layer protocols which enables data communication over internet				
CO5	Configure intermediate devices used in networks				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2			H			
CO3	M	H				H
CO4	M		H	H		
CO5			H	M		

Course Topic(s)

UNIT 1: INTRODUCTION TO NETWORKS AND PHYSICAL LAYER

Introduction: Networks, Uses of Networks, Network Topology, Transmission Modes - Network Hardware - Transmission technology - Categories of Networks - Network Software - Protocol Hierarchy - Design issues for the layers – Services - Reference Model: TCP/IP and OSI - Internet: Architecture of Internet - Physical Layer: Need and Issues, Data Communication, Guided transmission media, Wireless Transmission, Communication Satellites, Multiplexing and Switching.

UNIT 2 : DATA LINK LAYER

DLL: Need and Issues - Error Detection and Correction - Protocol Verification and Data Link Layer protocols - MAC Sub layer - Channel Allocation Problem - Multiple Access Protocols – Ethernet - Wireless LANs and VLAN - Data Link Layer Switching - Connectivity Devices - Configuration of Switches.

UNIT 3: NETWORK LAYER

Network Layer - Need and Issues - Routing algorithms - Congestion Control Algorithms – QOS - Network Layer in Internet - Network Addressing - Configuration of Router - ARP and RARP.

UNIT 4: TRANSPORT LAYER

Transport Layer - Need and Issues - Transport service - Elements of Transport Protocols -

Simple Transport Protocol - TCP and UDP.

UNIT 5: APPLICATION LAYER

Application Layer - Need and Issues – DNS - Electronic Mail – FTP – HTTP – WWW - RPC - RMI.

List of Experiments:

1. Study of Socket Programming
2. Socket Programming for Client-Server Communication
3. Configuration of Switch
4. Implementation of ARP
5. Implementation of RARP
6. Configuration of Router
7. Enable Client Server Communication using TCP Protocol
8. Implementation of Client Server communication using UDP Protocol
9. Implementation of FTP client
10. Download a File from HTTP Server
11. Implementation of Port Scanning

TEXT BOOKS:

1. Andrew S Tenenbaum, David J. Wetherall, "Computer Networks", Fifth Edition Pearson Education, 2011

REFERENCE BOOKS:

1. Behrouz A. Forouzan, "Data Communications and Networking", Fiftth Edition, McGraw-Hill, 2012
2. Larry Peterson, Bruce Davie, Morgan Kaufmann, "Computer Networks - A Systems Approach", Fifth Edition, 2011
3. Todd Lammle, "CCNA Cisco Certified Network Associate Study Guide", 7th Edition, 2011
4. B. S. Manoj, C. Siva Ram Murthy , "Ad Hoc Wireless Networks Architectures and Protocols", Prentice Hall, 2004

INT18R371	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	2	4
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Integrated Course				
Objective(s)	To learn the principles of systematically designing and using large scale database Management systems for various applications				
Course Outcome(s)					
CO1	Understand the features of database management systems and create conceptual models of a database using ER modeling				
CO2	Create and populate a RDBMS with keys, constraints, queries using SQL				
CO3	Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database				
CO4	Analyze various data storage and retrieval of information from database and the identify issues in query processing				
CO5	Apply secure database techniques and manage advanced data models such as distributed, object-oriented, and XML databases to meet organizational requirements.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H					
CO3		H			H	M
CO4	M	H	M	H		
CO5			M	H	M	H

Course Topic(s)

UNIT 1: INTRODUCTION

Introduction to File Systems - Introduction to Database Systems - Database System Structure – Views of Data - Data Models - Types of Data Models – Database Languages - Database Users and Administrator— ER Model - E-R Diagrams.

UNIT 2 : RELATIONAL MODEL

Relational Model – Catalog – Types – Keys - Relational Algebra- Domain - Tuple Relational Calculus - SQL – Data Definition - Queries In SQL – Updates - Views – Integrity and Security – Sub Queries - Correlated Sub Queries - Relational Database Design – Functional Dependences And Normalization For Relational Databases (up to BCNF).

UNIT 3 : DATA STORAGE AND QUERY PROCESSING

Record storage and Primary file organization- Secondary storage Devices- Operations on Files - Heap File - Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes – B-Tree - B+Tree – Database Tuning - Query Processing.

UNIT 4 : TRANSACTION MANAGEMENT

Transaction Concepts – Transaction Recovery – ACID Properties –Need for Concurrency Control - Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time Stamp based Concurrency Control – Recovery Techniques – Concepts - Immediate Update - Deferred Update - Shadow Paging.

UNIT 5: DATABASE SECURITY AND ADVANCED DATABASES

Data Classification – Threats and Risks – Database Access Control and Privilege Management – Cryptographic Methods for Data Protection – Security Administration and Policy Enforcement – Statistical Databases and Privacy Preservation – Distributed Databases: Architecture and Secure Transaction Processing – Object-Oriented and XML Databases – Web Data Management: Crawling, Indexing, and Relevance Ranking – Approaches for Developing and Managing Secure and Integrated Database Systems.

PRACTICAL COMPONENTS

1. Implementation of DDL commands in RDBMS.
2. Implementation of DML and DCL commands in RDBMS.
3. Implementation of Date and Built in Functions of SQL.
4. Implementation of Simple Programs.
5. Implementation of High-level language extension with Cursors.
6. Implementation of High level language extension with Triggers
7. Implementation of stored Procedures and Functions.
8. Embedded SQL.
9. Database design using E-R model and Normalization.
10. Database Connectivity using ADO
11. Database Connectivity using ODBC
12. Database Connectivity using JDBC

TEXT BOOK

1. Abraham Silberschatz, Henry F., Korth and Sudarshan S, “Database System Concepts”, McGraw-Hill, Sixth Edition, 2010.

REFERENCES

1. Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, Pearson Education, Fifth Edition 2008.
2. Raghu Ramakrishnan, “Database Management System”, Tata McGraw-Hill Publishing Company, 2003.
3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom, “Database System Implementation”, Pearson Education, Second Edition, 2009

INT18R359	SOFTWARE ENGINEERNG	L	T	P	C
		3	0	1	3.5
Prerequisite	Nil				
Course Category	Program Core				
Course Type	Theory with Practice				
Objective(s)	• This course helps to understand theories, methods, and technologies applied for professional software development. • To define software engineering and explain its importance To discuss the concepts of software products and software processes				
Course Outcome(s)					
CO1	Analyze and identify an appropriate process model for a given project				
CO2	Understand the principles at various phases of software development				
CO3	Understand the software project estimation models and estimate the work to be done, resources required and the schedule for a software project				
CO4	Translate specifications into design, and identify the components to build the architecture for a given problem, all using an appropriate software engineering methodology				
CO5	Analyze a software project, identify challenges, propose appropriate solutions, and design testing strategies to validate those solutions				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	H				
CO2	H		H			
CO3						
CO4				M	H	H
CO5	H		H	H		

Course Topic(s)

UNIT 1 : SOFTWARE ENGINEERING CONCEPTS

Software and Software Engineering - Project Management Concepts - Software Engineering Paradigms – Generic Process Models, Assessment and Improvement - Water Fall Life Cycle Model - Prototype Model - RAD Model - Spiral Model - Incremental Model –Requirements Engineering

UNIT 2: MANAGING SOFTWARE PROJECTS

Metrics : Metrics in Process and Project Domains - Software Measurement - Metrics for Software Quality - Integrating Metrics in a Software Engineering Process - Estimation , Scheduling – Risk Management – Review Techniques - Software Quality Assurance

UNIT 3 : DESIGN CONCEPTS

Design Process - Design Principles - Design Concepts - Software Architecture – Architectural Style, Design and Mapping - User Interface Design

UNIT 4: SOFTWARE TESTING AND DEBUGGING

Testing Fundamentals and Strategies - White-box and Black-box testing - Basis Path Testing - Data Flow Testing - Testing for Special Environments - Unit Testing, - Integration Testing - Validation Testing - System Testing – Debugging - Software Maintenance – Software

Configuration Management

UNIT 5 : ADVANCED TOPICS

Computer Aided Software Engineering - Clean room software engineering – Reengineering - Reverse Engineering

PRACTICAL COMPONENTS

1. Introduction to UML (Unified Modeling Language)
    b) Visualizing
    c) Specifying
    d) Constructing
    e) Documenting
2. Program Analysis and Project Planning : Study of Problem definition – Identification of project Scope, Objectives, Infrastructure
3. Preparation of System Requirement Specification (SRS) and related analysis documents as Per the guidelines in ANSI/IEEE Std 830-1984.
4. Create UML Diagrams (Use diagrams, Activity diagrams, Class diagrams, Sequence diagrams)
5. Software Development (Implementation)
6. Software Testing and Prepare test plan,
7. Execution of Test cases.
8. Debugging and demonstration.

TEXTBOOK

1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, seventh Edition, Mc-Graw Hill, 2014.

REFERENCE BOOKS

1. Steve McConnell, “Code Complete”, Second Edition, Microsoft Press.2004
2. Ian Somerville, “Software Engineering”, Addison-Wesley, Ninth edition, 2011.
3. Richard E. Fairley, “Software Engineering Concepts”, Second Edition McGraw- Hill, 1985.

PROFESSIONAL ELECTIVES

COMPUTER PROGRAMMING

INT18R351	SYSTEM SOFTWARE	L	T	P	C
		3	0	1	3.5
Prerequisite	Computer Architecture and Organization (CSE18R174)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To introduce the essential concepts of System Programming • To know about the functions of loaders, linkers and macro processors.				

Course Outcome(s)	
CO1	Know the background Knowledge of System Software
CO2	Design a simple Assembler
CO3	Identify the use of Linkers and Loaders
CO4	Understand Machine Independent Macro Processor
CO5	Formulate various Compilers and Interpreters

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2		H				
CO3			H			
CO4			H			
CO5	M		H			

Course Topic(s)

UNIT 1 : BACKGROUND

Introduction – System Software and Machine Architecture – The Simplified Instructional Computer (SIC) – Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming. Practical: Basic system programming

UNIT 2 : ASSEMBLERS

Basic Assembler Functions – Machine Dependent Assembler Features – Machine Independent Assembler Features – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler. Practical: Assembly language programming

UNIT 3: LOADERS AND LINKERS

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker. Practical: Dynamic

link programming

UNIT 4: MACRO PROCESSORS

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language. Practical: Macro implementation

UNIT 5: SYSTEM SOFTWARE TOOLS

Text editors - Overview of the Editing Process - User Interface – Editor Structure. -Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria. Practical: User interface design

TEXT BOOK

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd Edition, Pearson Education Asia, 2006.

REFERENCES

1. J. Nithyashri, "System Software", Tata McGraw Hill, 2nd Edition, 2010.
2. A.A. Puntambekar, I. A. Dhotre, "System Programming", McGraw Hill, 2008.

INT18R301	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To know about OOAD method • To know about software design steps				
Course Outcome(s)					
CO1	Pointing out the importance and function of each UML model throughout the process of object-oriented analysis and design and explaining the notation of various elements in these models				
CO2	Highlighting the importance of object-oriented analysis and design patterns				
CO3	Providing students with the necessary knowledge and skills in using object-oriented CASE tools				
CO4	Applying Design Patterns in software development process				
CO5	Familiar with various coding and testing process				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M		H			
CO2		H	H			
CO3	H					
CO4	H		H		M	
CO5			H			H

Course Topic(s)

UNIT 1 : UML DIAGRAMS

Introduction to OOAD – Unified Process - UML diagrams – Use Case – Class Diagrams– Interaction Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams

UNIT 2 : DESIGN PATTERNS

GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller - Design Patterns – creational - factory method - structural – Bridge – Adapter -behavioral – Strategy – observer

UNIT 3 : CASE STUDY

Case study – the Next Gen POS system, Inception -Use case Modeling - Relating Use cases – include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies - Aggregation and Composition

UNIT 4 : APPLYING DESIGN PATTERNS

System sequence diagrams - Relationship between sequence diagrams and Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams - UML interaction diagrams - Applying GoF design patterns

UNIT 5 : CODING AND TESTING

Mapping design to code – Testing: Issues in OO Testing – Class Testing – OO Integration

Testing – GUI Testing – OO System Testing

TEXT BOOK

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", fourth Edition, Pearson Education, 2013.

REFERENCES

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.
3. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.

INT18R352	DESIGN AND ANALYSIS OF ALGORITHM	L	T	P	C
		3	0	1	3.5
Prerequisite	Data Structures and Algorithms (INT18R271)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• Analyze the asymptotic performance of algorithms. • Write rigorous correctness proofs for algorithms. • Demonstrate a familiarity with major algorithms and data structures. • Apply important algorithmic design paradigms and methods of analysis. • Synthesize efficient algorithms in common engineering design situations				
Course Outcome(s)					
CO1	Apply the basic concepts of algorithms and analyze the performance of algorithms				
CO2	Identify various algorithm design techniques for developing algorithms				
CO3	Analysis various searching, sorting and graph traversal algorithms				
CO4	Understand NP completeness and identify different NP complete problems				
CO5	Formulate the advanced topics on algorithms				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2		H	H			
CO3	H				H	
CO4			H			
CO5			H			

Course Topic(s)

UNIT 1 : BASIC CONCEPTS OF ALGORITHMS

Introduction – Notion of Algorithm – Fundamentals of Algorithmic Solving – Important Problem types – Fundamentals of the Analysis of Algorithm Efficiency - Analysis Framework – Asymptotic Notations and Basic Efficiency Classes.

UNIT 2 : MATHEMATICAL ASPECTS AND ANALYSIS OF ALGORITHMS

Mathematical Analysis of Non-recursive Algorithm – Mathematical Analysis of Recursive Algorithm – Example: Fibonacci Numbers – Empirical Analysis of Algorithms – Algorithm Visualization. Practical: Mathematical Analysis of Recursive Algorithm

UNIT 3: ANALYSIS OF SORTING AND SEARCHING ALGORITHMS

Brute Force – Selection Sort and Bubble Sort – Sequential Search and Brute-force string matching – Divide and conquer – Merge sort – Quick Sort – Binary Search – Binary tree-Traversal and Related Properties – Decrease and Conquer – Insertion Sort – Depth first Search and Breadth First Search. Practical: Sorting

UNIT 4: ALGORITHMIC TECHNIQUES

Transform and conquer – Presorting – Balanced Search trees – AVL Trees – Heaps and Heap sort – Dynamic Programming – Warshall's and Floyd's Algorithm – Optimal Binary Search trees – Knapsack problem and memory functions - Greedy Techniques – Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman trees. Practical: Trees

UNIT 5: ALGORITHM DESIGN METHODS

Backtracking – n-Queen's Problem – Hamiltonian Circuit problem – Subset-Sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem – NP and NP-Complete problems – Approximation Algorithms for NP – Hard Problems. Practical: Knapsack problem

TEXT BOOK

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", 3rd Edition, Pearson Education India, 2013.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, "Introduction to Algorithms", PHI Learning Private Limited, 2012..

REFERENCES

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", PHI Pvt. Ltd., 2001.
2. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", 2nd Impression, Pearson Education India, 2008.
3. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2003.

INT18R360	DATA ANALYSIS USING PYTHON	L	T	P	C
		3	0	1	3.5
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	The student will be able to learn • Fundamentals and Data structures of pythons programming language. • Object oriented concepts in python programming language. • Retrieving, processing, storing and visualization of data using python.				
Course Outcome(s)					
CO1	Explore Python language fundamentals, including basic syntax, variables, and types				
CO2	Use functions, create and manipulate regular Python lists by using data structures concepts				
CO3	Understand the basic object oriented concepts in python				
CO4	Effectively use numerical analysis libraries of python				
CO5	Create and customize plots on real data and supercharge your scripts with control flow, and get to know the Pandas Data Frame				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		M	H			
CO2	M		H			
CO3			H			
CO4	H		H			
CO5			H			

Course Topic(s)

UNIT I: INTRODUCTION TO PYTHON

Brief history of python, Data types -Built-in, Sequence, Sets, Strings, Literals, constants, keywords, variables, naming convention. Operators –Types, Precedence & Associativity, Input, Output, file handling, Control Statements.

UNIT II: FUNCTIONS AND DATA STRUCTURES IN PYTHON

Functions–basics of functions, functions as objects, recursive functions, List –methods to process lists, Shallow & Deep copy, Nested lists, lists as matrices, lists as stacks, Queues, -De-queues, Tuples -basic operations on tuples, nested tuples, Dictionaries –operations on dictionary, ordered dictionary, iteration on dictionary, conversion of lists & strings into dictionary, Sets & frozen sets, looping techniques on lists & dictionaries, Lamda, filter, reduce, map, list comprehension, iterators and generators.

UNIT III: OBJECTS IN PYTHON

Class and instance attributes, inheritance, multiple inheritance, methos resolution order, magic methods and operator overloading, meta classes, abstract and inner classes, exception handling, modular programs and packages.

UNIT IV: NUMERICAL ANALYSIS IN PYTHON

Introduction to NumPy, NumPy array object, Creating a multidimensional array, NumPy

numerical types -Data type objects, Character codes, dtype constructors. dtype attributes. One-dimensional slicing and indexing. Manipulating array shapes --Stacking arrays, Splitting NumPy arrays, NumPy array attributes, Converting arrays, Creating array views and copies. Indexing with a list of locations. Indexing NumPy arrays with Booleans. Broadcasting NumPy arrays.

UNIT V: DATA MANIPULATION AND VISUALIZATION IN PYTHON

Data frames in panda, Creating dataframes from .csv and excel files, Lists of tuples, Dataframes aggregation and concatenation, plotting data using matplotlib & panda

TEXT BOOK(S):

1. Ivan Idris, Python Data Analysis, Packt Publishing,UK, 2014 (freely available online)
2. Fabio Nelli, Python Data Analytics with Pandas, NumPy and Matplotlib, 2nd Edition, Apress, 2018.

REFERENCES:

1. Wesley J Chun, Core Python Programming, Prentice Hall, Second Edition, 2006
2. Wes McKinney, Python for Data Analysis, O'Reilly -2013

INT18R361	DATA SCIENCE USING R PROGRAMMING	L	T	P	C
		3	0	1	3.5
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	The student will be able to learn • Students will develop relevant programming abilities. • Students will develop the ability to build and assess data-based models. • Students will demonstrate skill in data management. • Students will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively				
Course Outcome(s)					
CO1	Examine the data, generate hypothesis and quickly test them				
CO2	Transform the dataset into a form convenient for analysis				
CO3	Learn powerful R tools for solving data problems with greater clarity and ease				
CO4	Provide a low-dimensional summary that capture true signals in the dataset				
CO5	Learn R Markdown for integrating prose, code and results				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H	H			
CO2	H		M			HH
CO3				H		
CO4	H			H		H
CO5			H			

Course Topic(s)

Unit I - Explore

Introduction to Data Science - **Data Visualization with ggplot2**- Introduction – First steps - Aesthetic Mappings – Common Problems – Facets – Geometric objects- Statistical Transformations – Positional Adjustments - **Data Transformation with dplyr:** Introduction – Filter Rows with filter() –Arrange Rows with arrange() – Select Columns with select() –Add New Variables with mutate() - **Exploratory Data Analysis:** Introduction- Questions- Variations- Missing values- Covariation – Patterns and Models – ggplot2 Calls.

Unit II - Wrangle

Tibbles with tibble – Introduction - Creating Tipples - Tibbles Vs data.frame - Data Import with readr- Introduction - Parsing a vector - Parsing a file – writing to a file – **Tidy Data with tidyr** – Introduction – Tidy Data – Spreading and Gathering – Separating and Pull – Missing Values – Nontidy Data – **Relational Data with dplyr** – Introduction – nycflights13 – Keys- Mutating Joins – Filtering Joins – Join Problems – Set Operations – Strings with stringr – String Basics – Matching Patterns with Regular Expressions.

Unit III - Program

Pipes with magrittr – Introduction – Piping Alternatives – When Not to use the Pipe – other tools from magrittr – **Functions** – Introduction – Function are for Humans and Computers – Conditional Execution – Function Arguments – Return Values – Environment – **Vectors** –

Introduction – Vector Basics – Important types of Atomic Vector – Using Atomic Vectors – Recursive Vectors (Lists) – Attributes – Augmented Vectors – **Iteration with purr** – Introduction – For Loops – For Loop Variations – For Loop Vs Functionals – The Map Functions – Mapping over Multiple Arguments.

Unit IV - Model

Model Basics with modelr – Introduction – A simple model – Visualizing Models – Formulas and Families – Missing Values – Other Model Families – **Model Building** – Introduction – Why are Low-Quality Diamonds More Expensive? – What Affects the Number of Daily Flights? – Learning more about Models – **Many Models with purr and broom** – Introduction – gapminder – List-Columns – Creating List-Columns – Simplifying List-columns – Making Tidy Data with broom.

Unit V - Communicate

R Markdown – Introduction – R Markdown Basics – Text Formatting with Markdown – Code Chunks – Troubleshooting – YAML Header – **Graphics for Communication with ggplot2** – Introduction – Label – Annotations – Scaling – Zooming – Themes – Saving your plots – **R Markdown Formats** – Introduction – Output options – Documents – Notebooks – Presentations – Dashboards – Interactivity – Websites – Other Formats

TEXT BOOK(S):

1. Hadley Wickham, Garrett Grolemund, “R for Data Science Import, Tidy, Transform, Visualize and Model Data”, O’Reilly, 2017.

REFERENCES:

1. Matthias Templ, “Simulations for Data Science with R”, Packt Publisher, 2016.
2. Yu-Wei, David Chiu, “R for Data Science Cookbook”, Packt Publisher, 2016

INT18R451	COMPONENT BASED TECHNOLOGY	L	T	P	C
		3	0	1	3.5
Prerequisite	Object Oriented Programming (INT18R273)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To deal with the fundamental properties of components, technology and architecture and middleware. • Students are given exposure to java based component technologies such as Java Beans, EJB and RMI. • To impart knowledge on component technologies such as CORBA, ORB and application server. • To introduce COM, DCOM and .NET technologies. • To identify the component frameworks and its development				
Course Outcome(s)					
CO1	Demonstrate how components can be the key to successful software design, construction & delivery of software solutions through reuse				
CO2	Familiarity with the Java realization of components including Java Beans, EJB, and Java RMI				
CO3	Expertise with the CORBA realization of components				
CO4	Gaining extensive information about distributed object systems and mastering the .NET realization of components (.NET assemblies)				
CO5	Provide in depth knowledge in component frameworks & its development				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5
CO1	H		H		
CO2		M		H	H
CO3	H		H		H
CO4			M	H	H
CO5					

Course Topic(s)

UNIT 1 : INTRODUCTION

Software Components – objects – fundamental properties of Component technology – modules – interfaces – callbacks – directory services – component architecture – components and middleware. Practical: Development of simple com components in VB and use them in applications.

UNIT 2 : JAVA BASED COMPONENT TECHNOLOGIES

Threads – Java Beans – Events and connections – properties – introspection – JAR files – reflection – object serialization – Enterprise Java Beans – Distributed Object models – RMI and RMI-IIOP. Practical: Deploying EJB for simple arithmetic operator.

UNIT 3 : CORBA COMPONENT TECHNOLOGIES

Java and CORBA – Interface Definition language – Object Request Broker – system object model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture. Practical: SIMPLE APPLICATION USING

CORBA

. UNIT 4: NET BASED COMPONENT TECHNOLOGIES

COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls – .NET components - assemblies – appdomains – contexts – reflection – remoting. Practical: Sample applications.

UNIT 5 : COMPONENT FRAMEWORKS AND DEVELOPMENT

Connectors – contexts – EJB containers – CLR contexts and channels – Component Frameworks- Object-Oriented Frameworks (OOFW) - Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools - assembly tools. Practical: Distributed objects deployment-EJB and CORBA

TEXT BOOK

1. Clemens Szyperski, “Component Software: Beyond Object-Oriented Programming”, Pearson Education publishers, 2003.

REFERENCES

1. Ed Roman, “Mastering Enterprise Java Beans”, John Wiley & Sons Inc., 2002.
2. Mowbray, “Inside CORBA”, Pearson Education, 2003.
3. Freeze, “Visual Basic Development Guide for COM & COM+”, BPB Publication, 2001.

INT18R401	PRINCIPLES OF COMPILER DESIGN	L	T	P	C
		3	1	0	4
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To understand the basics of computation • To understand the process in compilation of a programs • To understand the computer's way of generating code. • To understand the optimization techniques in code generation				
Course Outcome(s)					
CO1	Understand the basics of compilation(computing)				
CO2	Understand grammar of compilers				
CO3	Understand the intermediate form of codes in compilers				
CO4	Understand the code generation technique(Machine code)				
CO5	Understand the optimization of code in compilers				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5
CO1			H		
CO2	H	M	L		
CO3			H		
CO4	H		H		
CO5	M				

Course Topic(s)

UNIT 1: INTRODUCTION TO COMPILING

Compilers – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools - Lexical Analysis - Role of Lexical Analyzer – Input Buffering – Specification of Tokens - Recognition of tokens.

UNIT 2 : SYNTAX ANALYSIS

Role of the parser –Writing Grammars –Context-Free Grammars – Top Down parsing - Recursive Descent Parsing - Predictive Parsing – Bottom-up parsing - Shift Reduce Parsing – Operator Precedent Parsing - LR Parsers - SLR Parser - Canonical LR Parser - LALR Parser.

UNIT 3: INTERMEDIATE CODE GENERATION

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements – Back patching – Procedure calls.

UNIT 4 : CODE GENERATION

Issues in the design of code generator – The target machine – Runtime Storage management – Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG representation of Basic Blocks – Peephole Optimization.

UNIT 5: CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS

Introduction– Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – Runtime Environments – Source Language issues – Storage Organization – Storage Allocation strategies – Access to non-local names – Parameter Passing.

TEXT BOOK

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2011.

REFERENCES

1. Allen I. Holub "Compiler Design in C", Prentice Hall of India, 2003.
2. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings, 2003.
3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.

INT18R402	GAME PROGRAMMING	L	T	P	C
		3	1	0	4
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To know the mechanics and logic of Game design • To train the students to acquire knowledge in game modeling techniques • To acquire knowledge about the issues in game design • To gain skill in game engine development				
Course Outcome(s)					
CO1	Have knowledge on the concepts and techniques used in Game design				
CO2	Design and model interactive game.				
CO3	Design and implement algorithms and techniques applied to Game design				
CO4	Analyze the various Gaming platforms and Networks				
CO5	Develop some gaming applications				

Mapping of COs with ABET SOs

CO\SO			H		
CO1	H	H	L		
CO2		H	H		
CO3	H		H		
CO4	H			M	L
CO5			H		

Course Topic(s)

UNIT 1: 3D GRAPHICS FOR GAME PROGRAMMING

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

UNIT 2 : GAME DESIGN PRINCIPLES

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding

UNIT 3 : GAMING ENGINE DESIGN

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics

UNIT 4: GAMING PLATFORMS AND FRAMEWORKS

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity

UNIT 5: GAME DEVELOPMENT

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games.

TEXT BOOK

1. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics"Morgan Kaufmann, 2 Edition, 2006.
2. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC,1st

edition, 2011.

REFERENCES

1. Mike Mc Shaffrfy, “Game Coding Complete”, Third Edition, Charles River Media, 2009.
2. Jonathan S. Harbour, “Beginning Game Programming”, Course Technology PTR, 3 edition, 2009.
3. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, Prentice Hall 1st edition, 2006.

INT18R452	PROGRAMMING WITH OPEN SOURCE SOFTWARE	L	T	P	C
		3	0	1	3.5
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To learn about the various Linux distributions. • To learn the programming practices in FOSS • To explore Linux embedded device • To acquire the knowledge of open source programming using embedded Linux device.				
Course Outcome(s)					
CO1	Work in the linux environment and contribute to free and open source software				
CO2	Implement content management systems				
CO3	Install and configure linux operating system distribution in embedded devices that support linux				
CO4	Build simple hardware projects using embedded linux devices				
CO5	Create web programming using embedded linux device				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2			H			
CO3	M	H				H
CO4			H	H		
CO5			H	M		

Course Topic(s)

UNIT 1: INTRODUCTION TO LINUX BASED DISTRIBUTIONS

Philosophy - licenses - Distributions - Desktop environments - Bash commands - Files and file systems - Partitions- Practical: Installing software – Configuration, Bash commands

UNIT 2 : PROGRAMMING TECHNIQUES AND PRACTICES

Programming using python - GUI development - Menu and toolbar - Layout management - event-dialog - widget - Programming practices - Documentation - use of version control system in FOSS. Practical: GUI development

UNIT 3: OVERVIEW OF AN EMBEDDED LINUX DEVICE

Peripherals - Choice of distribution and installation - commands - files and file systems - configuration - game programming. Practical: File systems

UNIT 4: WEB PROGRAMMING USING EMBEDDED LINUX DEVICE

Web server - Linux - Apache - Mysql - Php - Content management systems - adding content - text - images - components, modules and plugin- development of a sample content management site. Practical: Mysql

UNIT 5: INTERFACE WITH OTHER HARDWARE

Basic Inputs and outputs - Scheduling commands with Cron - installing and testing GPIO with python- Expansion boards - Prototyping boards. Practical: Scheduling commands

TEXT BOOK

1. Roderick W Smith, “Linux Essentials”, Wiley Publications, 2012.

REFERENCES

1. Simon Monk, "Programming the Raspberrypi: Getting started with python", McGraw Hill, 2013
2. Stephen Burge,Joomla! 3 Explained: Your step-by-step guide, Pearson education, 2014.

INT18R453	MULTIMEDIA AND COMPUTER GRAPHICS	L	T	P	C
		3	0	1	3.5
Prerequisite	Data Structures and Algorithm (INT18R271)				
Course Category	Program Core				
Course Type	Theory with practical				
Objective(s)	• To understand computational development of graphics with mathematics • To provide in-depth knowledge of display systems, image synthesis, shape modeling of 3D application. • To Understand basic concepts related to Multimedia including data standards, algorithms and software • To Experience development of multimedia software by utilizing existing libraries and descriptions of algorithms				
Course Outcome(s)					
CO1	Understand the proficiency in 3D computer graphics API programming				
CO2	Analyze the perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information				
CO3	Understand different realizations of multimedia tools				
CO4	Develop interactive animations using multimedia tools				
CO5	Understand the knowledge of different media streams in multimedia transmission				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2		H	H			
CO3	M		H			
CO4			H		M	H
CO5	H		H			M

Course Topic(s)

UNIT 1 : MULTIMEDIA SYSTEMS DESIGN

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – objects used in Multimedia systems – Multimedia Data interface standards – Multimedia Databases

UNIT 2 : MULTIMEDIA FILE HANDLING

Compression & Decompression Algorithms– Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT 3: HYPERMEDIA

Multimedia Authoring & User Interface – Multimedia Messaging - Hypermedia messaging – Hypermedia message component – creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

UNIT 4: OUTPUT PRIMITIVES

Introduction - Line - Curve and Ellipse Algorithms – Attributes –Two-Dimensional Geometric Transformations – Two-Dimensional Viewing.

UNIT V : THREE-DIMENSIONAL CONCEPTS

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation

TEXT BOOKS

1. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2013.
2. Donald Hearn and M.Pauline Baker, "Computer Graphics C Version", Pearson Education, 2009.

REFERENCES

1. Judith Jeffcoate, Multimedia in practice technology and Applications, PHI, 2007.
2. Foley, Vandam, Feiner, Huges, 'Computer Graphics: Principles & Practice', Pearson Education, second edition 2003.

PRACTICAL EXPERIMENTS

1. To implement Bresenham's algorithms for line, circle and ellipse drawing
2. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
3. To implement Cohen-Sutherland 2D clipping and window-view port mapping
4. To perform 3D Transformations such as translation, rotation and scaling.
5. To visualize projections of 3D images.
6. To convert between color models.
7. To implement RLE compression algorithm
8. To implement image compression algorithm
9. To perform animation using any Animation software.
10. To perform basic operations on image using any image editing software

INT18R454	C# AND .NET PROGRAMMING	L	T	P	C
		3	0	1	3.5
Prerequisite	Object Oriented Programming (INT18R273)				
Course Category	Program Core				
Course Type	Theory with practical				
Objective(s)	• To understand .NET framework and C#. • To understand Object oriented concepts of C#. • To understand and design Application using C# • To understand Web based application development. • To understand in depth concepts of .NET framework				

Course Outcome(s)	
CO1	Understand the C# programming model
CO2	Understand Object oriented concepts of C#
CO3	Model and sole Data base applications using C#
CO4	Understand and Design web based design
CO5	Understand the .NET workflow in detail

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	M	H				H
CO3					H	
CO4	H				M	H
CO5	H		H			

Course Topic(s)

UNTI 1 : INTRODUCTION TO C#

Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

UNIT 2 : OBJECT ORIENTED ASPECTS OF C#

Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT 3: APPLICATION DEVELOPMENT ON .NET

Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT 4: WEB BASED APPLICATION DEVELOPMENT ON .NET

Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling

transaction, handling exceptions, returning exceptions from SQL Server.

UNIT 5: CLR AND .NET FRAMEWORK

Assemblies, Versoning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference: C# 4.0", 4th Edition Tata McGraw Hill, 2012.
2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.

REFERENCES:

1. Andrew Troelsen , "Pro C# 2010 and the .NET 4 Platform", Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O"Reilly, 2010.

PRACTICAL COMPONENTS

1. To write a C# program using Branching and Looping statements
2. To write a C# program using Arrays and Strings methods.
3. To write a C# program using Structures and enumerations
4. To write a C# program using inheritance concepts.
5. To write a C# program using Polymorphism.
6. To write a C# program using interfaces.
7. To write a C# program by using operator overloading
8. To write a C# program using delegates, events, errors and exceptions.
9. To write a C# program using Errors and Exceptions.
10. To build a calculator widget in windows application using C#.

Software Management

INT18R353	DATA WAREHOUSING AND MINING	L	T	P	C
		3	0	1	3.5
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To know the concepts and techniques of data mining and data warehousing • To understand the systems for data warehousing and/or data mining				
Course Outcome(s)					
CO1	Learn concepts in Data Warehouses and implementation of architectures				
CO2	Learn data preprocessing, language, architectures, concept description				
CO3	Learn to use Association Rule Mining				
CO4	Learn Classification And Clustering Techniques				
CO5	Learn Recent Trends .in Data Mining				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2					H	
CO3	H	H		H	M	M
CO4	H	H				M
CO5			H			

Course Topic(s)

UNIT 1: INTRODUCTION TO DATA WAREHOUSING

Introduction - Data Warehouse - Multidimensional Data Model - Data Warehouse Architecture – Implementation - Further Development - Data Warehousing to Data Mining. Practical: Data Model

UNIT 2: DATA PREPROCESSING, LANGUAGE, ARCHITECTURES, CONCEPT DESCRIPTION

Why Pre processing - Cleaning, Integration – Transformation – Reduction – Discretization - Concept Hierarchy Generation, Data Mining Primitives, Query Language, Graphical User Interfaces – Architectures - Concept Description - Data Generalization - Characterizations - Class Comparisons - Descriptive Statistical Measures. Practical: Query Language

UNIT 3: ASSOCIATION RULES

Association Rule Mining - Single-Dimensional Boolean Association Rules from Transactional Databases - Multi-Level Association Rules from Transaction Databases. Practical: Association Rules

UNIT 4: CLASSIFICATION AND CLUSTERING

Classification and Prediction – Issues - Decision Tree Induction - Bayesian Classification - Association Rule Based - Other Classification Methods – Prediction - Classifier Accuracy - Cluster Analysis - Types of data - Categorization of methods - Partitioning methods - Outlier

Analysis. Practical: Categorization of methods

UNIT 5 : RECENT TRENDS

Multidimensional Analysis and Descriptive Mining of Complex Data Objects -Spatial Databases - Multimedia Databases - Time Series and Sequence Data - Text Databases – relationless databases- World Wide Web -Applications and Trends in Data Mining. Practical: Spatial Databases - Multimedia Databases

TEXT BOOK

1. J. Han, M. Kamber, “Data Mining: Concepts and Techniques”, Harcourt India Morgan Kauffman, 2011.

REFERENCES

1. Margaret H.Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education 2006.
2. Sam Anahory, Dennis Murry, “Data Warehousing in the real world”, Pearson Education 2009.
3. David Hand, Heikki Manila, Padhraic Symth, “Principles of Data Mining”, PHI 2004.

INT18R354	ADVANCED DBMS	L	T	P	C
		3	0	1	3.5
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• Learn different types of databases. • Be exposed to query languages. • Be familiar with the indexing techniques.				
Course Outcome(s)					
CO1	To understand the underlying principles of Relational Database Management System.				
CO2	To understand and implement the advanced features of DBMS.				
CO3	To develop database models using distributed databases.				
CO4	To Understand the Query Processing				
CO5	To implement and maintain an efficient database system using emerging trends				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H		M			
CO3	**H**	H	M		H	M
CO4		H	M	H		
CO5			M	H	M	H

Course Topic(s)

UNIT 1: PARALLEL AND DISTRIBUTED DATABASES

Inter and Intra Query Parallelism – Architecture – Query evaluation – Optimization – Distributed Architecture – Storage – Catalog Management – Query Processing – Transactions – Recovery – Large-scale Data Analytics in the Internet Context – Map Reduce Paradigm – run-time system for supporting scalable and fault-tolerant execution – paradigms: Pig Latin and Hive and parallel databases versus Map Reduce. Practical: DDL, DML, TCL commands

UNIT 2: ACTIVE DATABASES

Syntax and Sematics (Starburst, Oracle, DB2) – Taxonomy – Applications – Integrity Management – Workflow Management – Business Rules – Design Principles – Properties – Rule Modularization – Rule Debugging – IDEA methodology – Open Problems. Practical: DB2 AULibrary.com

UNIT 3: TEMPORAL AND OBJECT DATABASES

Overview – Data types – Associating Facts – Temporal Query Language – TSQL2 – Time Ontology – Language Constructs – Architecture – Temporal Support – Object Database and Change Management – Change of Schema – Implementing Database Updates in O2 – Benchmark Database Updates – Performance Evaluation. Practical: SQL

UNIT 4 : COMPLEX QUERIES AND REASONING

Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Data log – Fix point semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues. Practical: SQL

UNIT 5: SPATIAL, TEXT AND MULTIMEDIA DATABASES

Traditional Indexing Methods (Secondary Keys, Spatial Access Methods) – Text Retrieval – Multimedia Indexing – 1D Time Series – 2d Color images – Sub pattern Matching – Open Issues – Uncertainties. Practical: SQL Programs

TEXT BOOK:

1. Raghu Ramakrishnan "Database Management System", Mc Graw Hill Publications, McgrawHill Publications, 2014 reprint.

REFERENCES:

1. Carlo Zaniolo, Stefano Ceri "Advanced Database Systems", Morgan Kauffmann Publishers. 2007
2. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011

INT18R302	INFORMATION STORAGE MANAGEMENT	L	T	P	C
		3	1	0	4
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Understand Storage Area Networks characteristics and components. • Describe the challenges associated with data center networking and the need for switch network convergence. • Storage Area Networks including storage architectures, logical and physical components of a storage infrastructure, managing and monitoring the data center. • Describe the business continuity and disaster recovery in a storage infrastructure. • Describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities. • Identify key areas to monitor in a data center for different components in a storage				
Course Outcome(s)					
CO1	Identify and describe the functions to build data center networking for switch network				
CO2	Discuss different types of logical and physical components of a storage infrastructure				
CO3	Understand the importance of fiber Channel protocols and how to communicate with each other and the benefits of the different network storage options for different application environments				
CO4	Identify single points of failure in a storage infrastructure and list solutions				
CO5	Identify and analyzes the common threats in each domain				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H					
CO3		H	H		H	
CO4			M		H	
CO5	H					

Course Topic(s)

UNIT 1 : INTRODUCTION TO STORAGE TECHNOLOGY

Review data creation and the amount of data being created and understand the value of data to a business - challenges in data storage and data management - Solutions available or data storage - Core elements of a data center infrastructure - role of each element in supporting business activities.

UNIT 2 : STORAGE SYSTEMS ARCHITECTURE

Hardware and software components of the host environment - Key protocols and concepts used by each component - Physical and logical components of a connectivity environment Major physical disk - access characteristics - and performance implications - Concept of

RAID and its components - Different Raid levels and their suitability for different application environments: RAID 0 RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6 - Compare and contrast integrated and modular storage systems - High-level architecture and working of an intelligent storage system.

UNIT 3 : INTRODUCTION TO NETWORKED STORAGE

Evolution of networked storage – Architecture – Components - and topologies of FC-SAN, NAS, and IP-SA Benefits of the different networked storage options -Understand the need for long-term archiving solutions and describe how CAS fulfills the need - Understand the appropriateness of the different networked storage options for different application environments.

UNIT 4: INFORMATION AVAILABILITY & MONITORING & MANAGING DATA CENTER

List reasons for planned/unplanned outages and the impact of downtime - impact of downtime - Differentiate between business continuity (BC) and disaster recovery (DR) - RTO and RPO - Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures - Architecture of backup/recovery and the different backup/recovery topologies - replication technologies and their role in ensuring information availability and business continuity - Remote replication technologies and their role in providing disaster recovery and business continuity capabilities - Identify key areas to monitor in a data center - Industry standards for data center monitoring and management - key metrics to monitor for different components in a storage infrastructure - key management tasks in a data center.

UNIT 5: SECURING STORAGE AND STORAGE VIRTUALIZATION

Information security - Critical security attributes for information systems - Storage security domains - List and analyzes the common threats in each domain - Virtualization technologies – block-level and file-level virtualization technologies and Processes

TEXT BOOK

1. EMC, EMC Education Services, Lastemc, “Information Storage and Management: Storing, Managing, and Protecting Digital Information”, John Wiley and Sons, 2nd edition, 2012.

REFERENCES

1. Robert Spalding, **“**Storage Networks: The Complete Reference”. Tata McGraw Hill, Osborne, 2003
2. Marc Farley, “Building Storage Networks”, 2nd Edition, Tata McGraw Hill, Osborne, 2001.
3. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Limited, 2002.

INT18R355	DATA ANALYTICS	L	T	P	C
		3	0	1	3.5
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To provide the students with a fundamental Of Big Data Analytics • To acquire skills various Data Analytics. • To introduce Data Mining Stream concepts. • To familiarize the students with Clustering and Framework concepts				

Course Outcome(s)	
CO1	Understand the Big Data Platform and Modern data analytic Tools
CO2	Learn neural networks, Fuzzy logic and data analytic concepts
CO3	Learn Data Mining rules to implement and Analysis
CO4	Understand types of clustering
CO5	Understand and implement the data analytic tools-Map reduce and Hadoop

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H	M				
CO3	M				M	M
CO4			H			
CO5		M				H

Course Topic(s)

UNIT 1: INTRODUCTION TO BIG DATA

Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error. Practical: Hadoop Map Reduce job flow

UNIT 2 : DATA ANALYSIS

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods. Practical: Creating and customizing applications to analyze data

UNIT 3 : MINING DATA STREAMS

Introduction to Streams Concepts – Stream data model and architecture - Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window - Realtime Analytics Platform(RTAP) applications - case studies - real time sentiment analysis, stock market predictions. Practical: Implementing a targeted Big Data strategy

UNIT 4 : FREQUENT ITEMSETS AND CLUSTERING

Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets

in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism. Practical: Apply different classification techniques to classify the given data set

UNIT 5 : FRAMEWORKS AND VISUALIZATION

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications. Practical: Apply various association rule mining algorithms

TEXT BOOKS

1. Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2nd edition, 2012.

REFERENCES

1. Bill Franks, T”aming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics”, John Wiley & sons, 2012.
2. Glenn J. Myatt, “Making Sense of Data”, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O‟Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

INT18R303	SOFTWARE QUALITY ASSURANCE	L	T	P	C
		3	0	0	3
Prerequisite	Software Engineering (INT18R359)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Understand the quality management process. • Distinguish between the various activities of quality planning, quality assurance and quality control. • Understand the importance of standards in the quality management process and their impact on final product. • To present the concepts, techniques and metrics for quality assurance in software development. • To develop a good understanding of issues, techniques and tools for software testing				
Course Outcome(s)					
CO1	Understand the need of software quality and learn software project life cycle components				
CO2	Analyze software development methodologies and testing implementations.				
CO3	Develop the capability to create good software quality infrastructure with effective management strategies.				
CO4	Evaluate the performance of software project and develop models for software quality management.				
CO5	Obtain the knowledge about various quality management standards.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H					
CO3		M				H
CO4		H				
CO5	H	M	H			

Course Topic(s)

UNIT 1 : INTRODUCTION TO SOFTWARE QUALITY & ARCHITECTURE

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall‟s quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

UNIT 2 : SQA COMPONENTS AND PROJECT LIFE CYCLE

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project

Management.

UNIT3:SOFTWAREQUALITYINFRASTRUCTURE

Procedures and work instructions - Templates - Checklists – 3S development - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

UNIT 4: SOFTWARE QUALITY MANAGEMENT & METRICS

Project process control – Computerized tools - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Implementation – Limitations of software metrics – Cost of software quality – Classical quality cost model – Extended model – Application of Cost model.

UNIT 5: STANDARDS, CERTIFICATIONS & ASSESSMENTS

Quality manangement standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities – SQA units and other actors in SQA systems.

TEXT BOOK

1. Daniel Galin, “Software Quality Assurance”, Pearson Publication, 2009.

REFERENCES

1. Alan C. Gillies, “Software Quality: Theory and Management”, International Thomson Computer Press, 1997.
2. Mordechai Ben-Menachem “Software Quality: Producing Practical Consistent Software”, International Thompson Computer Press, 1997.

INT18R304	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	1	0	4
Prerequisite	Object Oriented Programming (INT18R273)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	To introduce the programming techniques and design pattern of mobile application development.				
Course Outcome(s)					
CO1	Study about the mobile application market and web services for various mobile devices				
CO2	Understand and develop the various Mobile Information Design and Mobile Platforms				
CO3	Design the User interface with various features of Android SDK like displaying pictures, menu etc				
CO4	Utilize the messaging, networking and location based service in Android application				
CO5	Create, Debug and build the apps for the latest Windows and IOS				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	M	H				M
CO3	M	H				
CO4			H			
CO5		M		H	H	H

Course Topic(s)

UNIT 1: INTRODUCTION

Preliminary Considerations – Cost of Development – Importance of Mobile Strategies in Business World – Mobile Web Presence – Mobile Applications – Marketing – Web Services for Mobile Devices – Creating Example Web Service _ Debugging Web Service

UNIT 2: MOBILE USER INTERFACE DESIGN

Effective Use of Screen Real Estate – Understanding Mobile Application Users – Understanding Mobile Information Design – Understanding Mobile Platforms – Using the Tools for Mobile Interface Design – Choosing a Mobile Web Option – Adaptive Mobile Website – Mobile Web Applications with HTML 5

UNIT 3: ANDROID APPLICATION DEVELOPMENT

Getting to know the Android User Interfaces – Designing Your User interface using Views – Displaying Pictures and Menus with Views – Using Image views to Display pictures – Using menus with views – Data Persistence – Saving and loading user performances - Persisting data to files – Creating and using Data bases – Content Providers.

UNIT 4 : ANDROID MESSAGING, NETWORKING, LOCATION BASED SERVICES

SMS Messaging, Sending E-mail – Networking – Downloading Binary Data, Text Files- Accessing Web Services – Performing Asynchronous Calls – Location Based Services – Displaying Maps – Getting Location Data – Creating your own services – Communicating between a service and an activity – Binding activities to Services

UNIT 5: IOS AND WINDOWS PHONE

Getting started with iOS – iOS Project – Debugging iOS Apps – Objective C Basics – Hello Word App – Building the derby app in iOS – Windows Phone 7 Project – Building Derby App in Windows Phone 7.

TEXT BOOK

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development," Wrox 2012.

REFERENCES

1.Wei – Meng Lee, "Beginning Android Application Development", Wiley 2011
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", Dream Tech.2012
3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
4. David Mark, Jack Nutting, Jeff LaMouche, and Fredric Olsson, "Beginning iOS6 Development: Exploring the iOS SDK", Apress, 2013

INT18R403	ENTERPRISE RESOURCE PLANNING	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To know the basics of ERP • To understand the key implementation issues of ERP • To know the business modules of ERP • To be aware of some popular products in the area of ERP • To appreciate the current and future trends in ERP				
Course Outcome(s)					
CO1	Understand basics and key implementation issues of ERP				
CO2	Identify various roles of human resources in an Enterprise				
CO3	Aware of ERP markets				
CO4	Learn functional modules in an ERP package				
CO5	Study current trends and predict future trends in ERP				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2		H				M
CO3			H	H		H
CO4	M		M			
CO5	H	M				

Course Topic(s)

UNIT 1 : INTRODUCTION

ERP: An Overview, Enterprise – An Overview, Benefits of ERP- ERP and Related Technologies- Business Process Reengineering (BPR)- Data Warehousing- Data Mining - OLAP - SCM

UNIT 2: ERP IMPLEMENTATION

ERP Implementation Lifecycle - Implementation Methodology - Hidden Costs - Organizing the Implementation – Vendors - Consultants and Users - Contracts with Vendors - Consultants and Employees - Project Management and Monitoring

UNIT 3: THE BUSINESS MODULES

Business modules in an ERP Package - Finance – Manufacturing (Production) - Human Resources - Plant Maintenance - Materials Management - Quality Management - Sales and Distribution

UNIT 4: THE ERP MARKET

ERP Market Place and Marketplace Dynamics - SAP AG - People soft – Baan - JD Edwards-Oracle corporation – QAD – SSA Global - Lawson software

UNIT 5: ERP – PRESENT AND FUTURE

Turbo Charge the ERP System – EIA - ERP and E-Business - ERP, Internet and WWW- ERP II - Future Directions and Trends in ERP

TEXT BOOK

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, New Delhi, 3rd edition 2014.

REFERENCES

1. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology, USA, 2001.
2. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning –Concepts and Practice", PHI, New Delhi, 2003.

INT18R404	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3
Prerequisite	Computer Architecture and Organization (CSE18R174)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To learn the concepts of distributed application development • To differentiate XML based web services from other standard models • To study the importance of service composition				

Course Outcome(s)	
CO1	Understand crucial concepts of SOA
CO2	Know the integration of SOA technological points with Web Services.
CO3	Implement of SOA in development cycle of Web Services.
CO4	Build SOA based applications for Web services, some of the prevailing standards and Technologies of Web Services.
CO5	Implement the applications based on Java Web Services

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M					
CO2			H			
CO3	L	H				
CO4				M	H	H
CO5	L	H				

Course Topic(s)

UNIT 1 : SOA FUNDAMENTALS

SOA – Services – Loose Coupling – The Enterprise service bus – Service Classification – Business process management – SOA and the organization – SOA and the organization - SOA in context – Message exchange patterns – SOA life cycle – Versioning – Web services

UNIT 2: SERVICE-ORIENTED ANALYSIS AND DESIGN

SOA Terminology and Concepts - REST Design Constraints and Goals - RESTful Service-Orientation - Service Contracts with REST - Service-Orientation and REST Service-Oriented Analysis and Design with REST - Mainstream SOA Methodology - Analysis and Service Modeling with REST - Service-Oriented Design with REST HTML - Cookies - Simple PHP scripts

UNIT 3 : SERVICE COMPOSITION

Service Composition with REST - Fundamental Service Composition with REST - Advanced Service Composition with REST - Service Composition with REST Case Study - Design Patterns for SOA with REST - Service Versioning with REST - Uniform Contract Profiles

UNIT 4: RESTFUL SERVICES AND THE RESOURCE-ORIENTEDARCHITECTURE

Introducing the Simple Storage Service - Object-Oriented Design of S3 - URIs - Addressability - Statelessness - Representations - Links and Connectedness - The Uniform Interface - Resource Design - Turning Requirements into Read-Only Resources - Service Implementation - Web service case studies - Connect Resources to Each Other - Controller Code - Model Code

UNIT 5 : SOA TRANSACTION AND SECURITY

SOA and performance - SOA and security – Service Management - Model driven service deployment – Establishing SOA and SOA governance

TEXT BOOK

1. Nicolai M.Josuttis, “SOA in design - The art of distributed system design”, O'REILLY publication, 2007.
2. 2. Raj Balasubramanian, Benjamin Carlyle, Thomas Erl, Cesare Pautasso, "SOA with REST - Principles, Patterns & Constraints for building Enterprise solutions with REST", Prentice Hall/PearsonPTR , 2012.
3. 3. Leonard Richardson and Sam Ruby, “RESTful Web Services”, O'REILLY publication, 2007.

REFERENCES

1. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson education,2005.

EMBEDDED AND SIGNAL PROCESSING

INT18R305	MOBILE COMMUNICATION AND COMPUTING	L	T	P	C
		3	1	0	4
Prerequisite	Analog and Digital Communication Techniques (INT18R272)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To learn the fundamental concepts of mobile communication and mobile computing. • To analyze about internet protocols, its issues while dealing with mobile computing. • To make students to understand about various communication systems such as GSM,GPRS etc., • To learn the basic concepts of adhoc networks and analyze the issues involved in it. • To design and implement mobile applications in different kinds of operating systems				
Course Outcome(s)					
CO1	Understand the basic concepts of mobile computing				
CO2	Analyze about internet protocol and Mobile internet protocol.				
CO3	Learn about the different kinds of mobile telecommunication system.				
CO4	Analyze the issues involved in adhoc networks and learn the various kinds of adhoc networks.				
CO5	Identify, design and implement mobile applications in various platforms.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H					
CO3	H	M				
CO4	M	H				
CO5		H		M	H	H

Course Topic(s)

UNIT 1 : INTRODUCTION

Mobile Computing – Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. MAC Protocols – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes – Reservation Based Schemes. Practical: MAC Protocols

UNIT 2: MOBILE INTERNET PROTOCOL AND TRANSPORT LAYER

Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. Overview of TCP/IP – Architecture of TCP/IP- Adaptation of TCP Window – Improvement in TCP Performance. Practical: Key Distribution mechanisms

UNIT 3 : MOBILE TELECOMMUNICATION SYSTEM

Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS). Practical: GSM Technique

UNIT 4 : MOBILE AD-HOC NETWORKS

Ad-Hoc Basic Concepts – Characteristics – Applications – Design Issues – Routing – Essential of Traditional Routing Protocols –Popular Routing Protocols – Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security. Practical: Routing Protocols

UNIT 5: MOBILE PLATFORMS AND APPLICATIONS

Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – M-Commerce – Structure – Pros & Cons – Mobile Payment System – Security Issues. Practical: Security Mechnisms

TEXT BOOK

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi – 2012.

REFERENCES

1. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

INT18R306	INFORMATION CODING TECHNIQUES	L	T	P	C
		3	1	0	4
Prerequisite	Analog and Digital Communication Techniques (INT18R272)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To expose to students some concepts in information theory, and the performance characteristics of an ideal communications system. • To expose to students fundamentals in coding and its applications.				
Course Outcome(s)					
CO1	Explain basic information and channel capacity.				
CO2	Understand different types of data and voice coding techniques				
CO3	Explain and analyse source coding compression, decoding and error control methods as applied in communication system.				
CO4	Analysis of various text and image compression techniques				
CO5	Analysis of audio and video coding techniques				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H		M			
CO3	H	M	H		H	
CO4	H		L			
CO5	H	M				H

Course Topic(s)

UNIT 1 : INFORMATION ENTROPY FUNDAMENTALS

Uncertainty- Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

UNIT 2 : DATA AND VOICE CODING

Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive sub band coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoder, LPC).

UNIT 3: ERROR CONTROL CODING

Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes – Generator Polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome – Convolutional codes.

UNIT 4: COMPRESSION TECHNIQUES

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

UNIT 5: AUDIO AND VIDEO CODING

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video

standards.

TEXTBOOKS

1. Simon Haykin & Michael Moher, "Communication Systems", John Wiley and Sons, 5th Edition, 2009.
2. Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards", Pearson Education, Asia 2002.

REFERENCES

1. Mark Nelson, "Data Compression Book", BPB Publication 2nd edition 1996.
2. Watkinson J, "Compression in Video and Audio", Focal Press, London, 1995.

INT18R307	BLUETOOTH TECHNOLOGY	L	T	P	C
		3	1	0	4
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To Understand Bluetooth's standards, architecture and operation. • To Understand the APIs, radio interface and protocol layers used by Bluetooth. • To Configure Bluetooth-enabled devices including mobile phones, PDAs and Access Points. • To Install and configure Bluetooth hardware and software. • To Configure LAN access, remote access and FAX gateway access point solutions using Bluetooth				
Course Outcome(s)					
CO1	Demonstrate the students about how Bluetooth devices pair set up and the options concerning discoverability				
CO2	Analyze the various kinds of data transfer between Bluetooth devices				
CO3	Create trust and security related policies which are handled by Bluetooth.				
CO4	Implement profiles like the Headset profile, LAN, OBEX, and Serial port compatible to specified applications.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H	M				
CO3	M	H				
CO4		H				M
CO5			H			

Course Topic(s)

UNIT 1: BASIC CONCEPTS

Components-networks-Topologies-Protocols and Standards –ISO/OSI model-Origin- blue tooth SIG - Protocol stack - Security applications and profiles – management - test and qualification technology basics - RF and IR wireless communication.

UNIT 2: BLUETOOTH MODULE

Antennas patterns - gain and losses- types of antennas- on chip antennas radio interference - FH, modulation, symbol timing, power emission and control, performance parameters - RF architecture - Blur RF - Base band - Blue tooth device address system timing - Physical links - packet structuring types and construction - channel coding and time base synchronization.

UNIT 3 : LINK CONTROLLER AND MANAGEMENT

LCP- controller states - Pico net and scattered operations - Master / slave role switching LC Architectural overview – LMC - Link set up - Quality of service - LMP version - Name represent - Test mode.

UNIT 4 : BLUETOOTH HOST

LLC and adaptation protocol L2 cap signaling – connections- Blue tooth profiles- Version 1.0-

Generic profiles-serial and object exchange.

UNIT 5: SECURITY

Encryption and security Key generation - security Modes and architecture - Low power operation and QOS management.

TEXT BOOK

1. Jennifer, Sturman, "Bluetooth Connect without cables", 2nd Edition, Pearson education 2005.

REFERENCES

1. Brent A.Miller and Bisdikian C, "Bluetooth reveeled", 2nd Edition, Pearson Education 2002.
2. Muller J, "Blue tooth Demystified", Nathan Tata Mc Graw Hill 2001.

INT18R405	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	1	0	4
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	To teach the general principles of wireless sensor networks, and the state of the art in information processing in wireless sensor networks.				

Course Outcome(s)	
CO1	Demonstrate familiarity with common wireless sensor node architectures
CO2	Illustrate knowledge of MAC and routing protocols developed for WSN
CO3	Emphasize the importance of time synchronization and localization of WSN
CO4	Interpret the operating system developed for WSN
CO5	Identify the suitable topology for WSN

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	M				
CO2		M	H			
CO3	H		H			
CO4	L	M				
CO5	L			M		

Course Topic(s)

UNIT 1 : INTRODUCTION AND OVERVIEW OF WIRELESS SENSOR NETWORKS

Introduction - Basic overview of the technology - Range of applications - Examples of category 1 and 2 WSN application - Sensor node technology - Sensor taxonomy - WN node operating environment – WN Trends - Wireless Transmission Technology and Systems – Applications of Wireless Sensor Network

UNIT 2: POWER MANAGEMENT AND ROUTING IN WSN

Distributed Power – Aware micro sensor networks - Dynamic voltage scaling techniques – Operating system for energy Scalable in WSN - Dynamic power management -Energy aware routing - Altruists or Friendly neighbors in the Pico radio sensor network - Aggregate queries - Bluetooth in the distributed sensor network - Mobile networking for smart dust

UNIT 3 : CLUSTERING AND SECURITY PROTOCOLS IN WSN

Topology discovery and clusters in sensor networks - Adaptive clustering with deterministic Cluster – Head selection -Sensor cluster's performance - Power – aware functions -Efficient flooding with passive Clustering -Security protocols in sensor networks - Communication security

UNIT 4: NETWORK MANAGEMENT AND OPERATING SYSTEM

Network management requirements - Traditional network management models - Network management design issues – MANNA - other issues related to network management - Operating system design issues – TinyOS – Mate – MagnetOS – MANTIS – OSPM - EYES OS – SenOS – EMERALDS – PicsOS - WSN design issues -Performance modeling - Case study: Simple computation of the System Life Span. WSN Network architecture: typical network architectures-data relaying and aggregation strategies

UNIT 5 : TOPOLOGY CONTROL

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN.Topology Control - Distributed Topology Control- Design Guidelines -Ideal Features of a Topology Control Protocol .The Quality of Information - Logical and Physical Node Degrees ; Location-based Topology Control, Localization- Absolute and relative localization. Neighbor-based Topology Control - The Number of Neighbors for Connectivity - The KNeigh Protocol - The XTC Protocol; Dealing with Node Mobility

TEXT BOOKS

1. Kazem Sohraby, Daniel Minoli, Taieb Znati, “Wireless Sensor Networks Technology - Protocols and Applications”, John Wiley & Sons, Ltd, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley & Sons, Ltd, 2003.
3. Paolo Santi, “Topology Control in Wireless Ad Hoc and Sensor Networks”, John Wiley & Sons, Ltd, 2005.

REFERENCES

1. Andreas Willing, “Protocols and Architecture for Wireless Sensor Networks”, , John Wiley & Sons Ltd., 2005.
2. Ian F. Akyildiz and Mehmet Can, “Wireless Sensor Networks”, John Wiley & Sons Ltd., 2010.
3. Mohammad Ilyas and Imad Mahgoub, “Handbook of sensor networks : Compact wireless and wired sensing systems”, CRC Press LLC, 2005.

ECE18R330	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3
Prerequisite	Digital Signal Processing (INT18R274)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	To introduce the basic concepts and methodologies for analysis, modeling, synthesis and coding of speech and music and to provide a foundation for developing applications and for further study in the field of digital audio standards and its techniques				

Course Outcome(s)	
CO1	Explain the basic concepts like sampling, image representation
CO2	Carry various transformations on images and restore them
CO3	Enhance the images using various filtering techniques for the region of interest
CO4	Apply various segmentation techniques on digital images
CO5	Describe various representations of digital images

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	M				
CO2		M	H			
CO3	H		H			
CO4	L	M				
CO5	L			M		

Course Topic(s)

Unit 1 : Image Processing Fundamentals

Advantages, Applications, Limitations of DIP; Components of an image processing system, Digital image representation, light, hue, saturation and intensity, grey scale and colour images, colour models; Basic relationship between pixels, image sampling and quantization

Unit 2: Image Transforms, Image Restoration

Two dimensional orthogonal transforms - DFT, FFT, Walsh, Slant, Hadamard, Haar transform, KLT, DCT, wavelets; Image degradation: Spatial domain, frequency domain; Degradation model for continuous function, continuous impulse function, restoration approaches: unconstrained restoration, constrained restoration, Lagrange multiplier, minimum mean square error filtering, constrained least square filtering, inverse filtering, removal of blur caused by uniform linear motion, Wiener filter, Geometric mean filter, Geometrical transformations

Unit 3: Image Enhancement

Image enhancement in the Spatial Domain, background, basic grey level transformations, histogram processing, enhancement using arithmetic/logic operations, basic of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods, image enhancement in the frequency domain -background, introduction to Fourier transform and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filters, implementation

Unit 4 : Image Segmentation

Detection of discontinuities, edge linking and boundary detection, threshold, region-based segmentation, segmentation by morphological watersheds, use of motion in segmentation

Unit 5: Image Representation

Image representation, Boundary representation using chain codes, Polygonal approximation, signatures, skeleton, patters, recognition based on decision theoretic methods

Text Book(s):

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, 3rd Edition, 2013

Reference(s):

1. Anil. K. Jain, Fundamentals of Digital Image Processing, PHI, 2001
2. William K. Pratt, Digital image processing: PIKS Scientific Inside, Wiley, 4th Edition, 2012

INT18R406	REAL TIME SYSTEMS	L	T	P	C
		3	0	0	3
Prerequisite	Operating systems. (CSE18R273)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Explain and apply the fundamental concepts and terminology of real-time systems. • Explain and address the fundamental problems of real-time systems. • Analyze real-time systems designs. • Design a real-time system. • Identify and assess the relevant literature and research trends of real-time systems				
Course Outcome(s)					
CO1	Understand the basics and importance of real-time systems				
CO2	Implement a high-level analysis document based on requirements specifications				
CO3	Implement a high-level design document based on analysis documentation				
CO4	Implement a test plan based on requirements specification				
CO5	Implement a validation plan based on all documentation				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M		H			
CO2	H	M	M			M
CO3	H					M
CO4			H			
CO5		H	M	M		M

Course Topic(s)

UNIT 1: INTRODUCTION

Introduction-Issues in real time computing-Architecture of Real time Systems and Embedded Systems – Operating Systems issues – Performance Measures – Estimating Program runtimes.

UNIT 2: TASK ASSIGNMENT AND SCHEDULING

Classical uniprocessor Scheduling algorithms - uniprocessor Scheduling of IRIS Tasks – Tasks Assignment -Mode charges -Fault tolerant scheduling.

UNIT 3: PROGRAMMING LANGUAGES AND TOOLS

Desired language characteristics based on ADA – Data typs – Control Structures – Packages – Exception Handling – Overloading – Multitasking – Timing specification – Task Scheduling – Just-intime Compilation – Runtime support.

UNIT 4 : REAL TIME DATA BASES

Basic networking principles – Real time databases –Real time Vs general purpose data base-Transaction processing – Concurrency control – Disk scheduling algorithms – Serialization and Consistency-Data base for hard real time systems.

UNIT 5: FAULT TOLERANCE, RELIABILITY AND SYNCHRONIZATION

Fault types – Fault detection and containment – Redundancy – Data diversity – Reversal checks – Obtaining parameter values – Reliability models for hardware redundancy – Software error models – Clocks – Fault tolerant synchronization – Synchronization in software.

TEXT BOOK

1. Krishna C.M., Kang G.Shin, "Real -Time Systems", McGraw-Hill, International Editions, 2010.

REFERENCES

1. Raymond J.A. Buhr, Donald L. Bailey, "An Introduction To Real Time Systems", Prentice Hall International, 1999.
2. Stuart Bennett, "Real Time computer control-An Introduction", PHI, 2004.

INT18R407	INTERNET OF THINGS	L	T	P	C
		3	1	0	4
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To learn about the fundamentals of Internet of Things • To build a small low cost embedded system using Arduino/ Raspberry Pi or equivalent boards • To apply the concept of Internet of Things in real world scenario				
Course Outcome(s)					
CO1	Design a portable IoT using Arduino/Equivalent boards and relevant protocols				
CO2	Develop web services to access/control IoT devices				
CO3	Analyze the various components of IoT				
CO4	Analyze applications of IoT in real time scenario				
CO5	Deploy an IoT application and connect to the cloud				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H	H	H		
CO2		H				H
CO3	H	M	H			
CO4	H	M	H			
CO5		M	H			H

Course Topic(s)

UNIT 1: FUNDAMENTALS OF IOT

Introduction-Characteristics - Physical design - Protocols-Logical design - Enabling technologies - IoT levels-Domain specific IoTs - IoT vs M2M

UNIT 2: IOT DESIGN METHODOLOGY

IoT systems management - IoT design methodology-Specifications - Integration and Application Development

UNIT 3: IOT COMPONENTS

Sensors and activators - Communication modules - Zigbee-RFID-Wi-Fi-Power sources.

UNIT 4: BUILDING IOT WITH HARDWARE PLATFORMS

Platform - Arduino/Intel Galileo/Raspberry Pi- Physical device - Interfaces - Programming - APIs/Packages - Web services.

UNIT 5 : CASE STUDIES AND ADVANCED TOPICS

Various Real time applications of IoT-Connecting IoT to cloud-Cloud storage for IoT-Data Analytics for IoT- Software & Management Tools for IoT.

TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

REFERENCES

1. Manoel Carlos Ramon, ―Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers‖, Apress, 2014.

NETWORK MANAGEMENT

INT18R356	NETWORK DESIGN SECURITY AND MANAGEMENT	L	T	P	C
		3	0	1	3.5
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To know about System Level Security, Vulnerabilities & threats • To understand the concepts of Encryption Algorithms & Techniques, Authentication functions, Protocols & Tools, • To analyze the Security principles based on OSI Architecture, Wireless Security, Network design including LAN and WAN & Network Management				
Course Outcome(s)					
CO1	Understand the basic concepts of network design				
CO2	Illustrate the process of network design				
CO3	Apply authentication techniques to provide secure communication				
CO4	Analyze public cryptosystems for the quality of security				
CO5	Understand the concepts of various Network Management Services				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	M	H				
CO3	M			M		H
CO4	H	L				
CO5			H			

Course Topic(s)

UNIT 1: INTRODUCTION

Overview of Design process - Process Components, System description, Service Description, Service, Performance Characteristics, Network Supportability. Requirement Analysis – User requirement, Application requirement, Device requirement, Network requirement.

UNIT 2: DESIGN CONCEPTS

Design Concepts – Objectives, process, Service provider Evaluation, Network Layout, Trace Traceability, Design Metrics.

UNIT 3: SECURITY PROBLEM AND CRYPTOGRAPHY

Security attacks – services – and mechanism – Conventional encryption model – Steganography – classical encryption techniques – simplified DES – block Cipher principles – The DES standards – Principles of Public key cryptosystems – RSA algorithm – Key management – Hellman key exchange – Authentication requirements and functions – Authentication codes Hash functions Kerberos. Practical: DES, RSA, Hellman algorithms

UNIT 4: NETWORK SECURITY

Transport level Security- Web Security, SSL, TLS, HTTPS, SSH- Wireless network security-E

Mail security-PGP, S/ MIME, DKIM, IP Security, Intrusion detection – password management. Malicious software– Viruses and related Threats – Virus Counter measures , worms, DDoS attacks– Firewall Design Principles – Trusted Systems. Practical: PGP, S/ MIME, DKIM

UNIT 5: NETWORK MANAGEMENT

Network management – requirements and systems – Network monitoring architecture – Performance monitoring – Fault monitoring – Account monitoring – Configuration control – Security control – SNMP background and concepts – structure of management information – SNMP protocol – Basic concepts – specifications – Transport level support Groups. Practical: Network Monitoring

TEXT BOOKS

1. "Network Analysis, Architecture, and Design" (3rd Edition), James McCabe, Morgan Kaufmann Publishers, 3rd edition, 2011
2. William Stallings, "Cryptography and Network Security", 6th Edition, Pearson Education, March 2013.
3. William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Pearson education Asia, 2009.

REFERENCES

1. Charles P. Pfleeger, "Security in Computing", Prentice Hall, 3rd Edition 2003.
2. Bruce Schneier, "Applied Cryptography", JohnWiley & Sons Inc, 2nd edition, 2007.
3. Mani Subramanian, "Network management – Principle and practice", Pearson education India, 2010.

INT18R308	INFORMATION SECURITY	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Apply the basic security algorithms and policies required by computing system. • Predict the vulnerabilities across any computing system and hence be able to design a security solution for any computing system.				
Course Outcome(s)					
CO1	To introduce the concepts and models of security in computing.				
CO2	To design and implement symmetric and asymmetric cryptosystems.				
CO3	To explain the security standards followed at the network level and at the application level.				
CO4	To estimate the level of security risk faced by an organization and the counter measures to handle the risk.				
CO5	To know about the software security development model.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H	M		
CO2	H			M		H
CO3	M		M	H		
CO4		M	L	M		
CO5			H	M		

Course Topic(s)

UNIT 1: SECURITY - AN OVERVIEW

Basics of Security - CIA Triad - Threats, Attacks and Controls - Security Models- Bell-LaPadula model - Biba Integrity model - Chinese Wall model - Malicious Logic - Viruses, Worms, Logic Bombs - Basics of Cryptography - Mathematics for Cryptography - Modulo Arithmetic - Euclidean and extended Euclidean Theorem - Chinese Remainder Theorem - Euler and Fermat theorem - Classical Cryptosystems - Substitution and Transposition.

UNIT 2: ADVANCED CRYPTOGRAPHY

DES and AES - Public Key Cryptography - RSA and ElGamal algorithms - Authentication and Key Exchange - Biometric authentication - Diffie Hellman and Needem Schroeder algorithms - Elliptic Curve Cryptosystems - Digital Signatures - Message Digest - Certificates - Directories and Revocation of keys and certificates.

UNIT 3: SECURITY STANDARDS

Public Key Infrastructure - Kerberos - X.509 - IPSec - Virtual Private Networks - E-Mail Security - PGP and PEM - Web Security - Secured DNS - SSL, TLS and SET - CoBIT Framework - Compliances - Credit Card Applications - GLBA.

UNIT 4: SECURITY PRACTICES

Vulnerability Analysis - Flaw Hypothesis Methodology, NRL taxonomy and Aslam‘s model - Auditing - Anatomy of an Auditing System - Design of Auditing Systems - Posteriori Design - Auditing mechanisms - Risk Analysis and Management - Disaster Recovery Planning/Incident Response Planning.

UNIT 5: SECURE DEVELOPMENT

Secure Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls - Secured Software Development Life Cycle - Evaluation of Security Systems- Case Studies-Legal and Ethical Issues- Cybercrime and computer crime - Intellectual property-Copyright, patent, trade secret - Hacking and Intrusion privacy-Identity theft.

TEXT BOOKS:

1. Charles Pfleeger, Shari Lawrence Pfleeger, Devin N Paul, ―Security in Computing ‖, Pearson, 2007.
2. William Stallings, ―Cryptography and Network Security – Principles and Practices‖, Pearson Education, Sixth Edition, 2013.

REFERENCES:

1. Wade Trappe, Lawrence C Washington, ―Introduction to Cryptography with Coding and Theory‖, Second Edition, Pearson, 2007.
2. Wenbo Mao, ―Modern Cryptography Theory and Practice‖, Pearson, 2004.
4. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata Mc Graw Hill Ltd. 2014.

INT18R357	MOBILE NETWORKS	L	T	P	C
		3	0	1	3.5
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	This Course Describes about routing mechanisms for both Adhoc and Sensor Networks				
Course Outcome(s)					
CO1	Understand the basics of radio access and networks				
CO2	Learn to simulate wireless networks and analyze the simulation results				
CO3	Describe the concepts of ad hoc networks, design and implementation issues, and available solutions				
CO4	Apply knowledge of wireless sensor networks to various application areas				
CO5	Demonstrate advanced knowledge of networking and wireless networking				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H	M				
CO3	M	H				M
CO4			H			H
CO5	H	M				

Course Topic(s)

UNIT 1: MULTIPLE RADIO ACCESS

Medium Access Alternatives: Fixed-Assignment for Voice Oriented Networks Random Access for Data Oriented Networks, Handoff and Roaming Support, Security and Privacy.

UNIT 2: WIRELESS BROADBAND NETWORKS TECHNOLOGY & PLATFORMS

Wireless broadband fundamentals and Fixed Wireless Broadband Systems - Platforms- Enhanced Copper- Fibre Optic and HFC - 3G Cellular- Satellites - ATM and Relay Technologies

UNIT 3: AD HOC NETWORKS

Characteristics and Applications of Ad hoc Networks - Routing – Need for routing and routing classifications - Table Driven Routing Protocols - Source Initiated On-Demand Routing Protocols - Hybrid Protocols – Zone Routing - Fisheye Routing - LANMAR for MANET with group mobility - Location Added Routing, Distance Routing Effects - Micro discovery and Power Aware Routing. Practical : Routing Protocols

UNIT 4: SENSOR NETWORKS

Wireless Sensor Networks - DARPA Efforts –Classification - Fundamentals of MAC - Flat routing – Directed Diffusion-SPIN - COGUR - Hierarchical Routing - Cluster base routing - Scalable Coordination – LEACH – TEEN - APTEEN and Adapting to the dynamic nature of Wireless Sensor Networks. Practical : MAC protocols

UNIT 5: ADVANCED WIRELESS NETWORKS

Wireless. Broadband Network Applications - Teleservices Model and Adaptive QoS Parameters - Modelling of Wireless - Broadband Applications – Multi component Model - Residential High speed Internet Wireless Broadband Satellite Systems - Next Generation Wireless Broadband Networks – 3G, Harmonized 3G, 3G CDMA, Smart Phones and 3G Evolution. Practical :Multi component models

TEXT BOOK

1. John R. Vacca, "Wireless Broadband Networks Handbook 3G, LMDS and Wireless Internet", Tata McGraw-Hill, 2001.

REFERENCES

1. Agrawal D.P., and Qing-An zeng, "Introduction to Wireless and Mobile Systems", Thomson Learning, 3rd Edition, 2010.
2. Martyn Mallick, "Mobile and Wireless Design Essentials, Wiley publication, 2003.
3. Kavesh Pahlavan and Prashant Krishnamurty, "Principles of Wireless Networks – A unified Approach", Prentice Hall PTR, 2002

INT18R309	WIRELESS APPLICATION PROTOCOL	L	T	P	C
		3	0	0	3
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To learn the basic concepts of mobile internet • To introduce the web technologies for developing simple web applications. • To make students to understand about services of WAP and to learn WAP programming languages used for WAP service implementation. • To teach the concepts for deploying WAP services • To understand about wireless telephony applications and its enhancements				
Course Outcome(s)					
CO1	Understand the basic concepts of mobile internet , services and service providers of mobile internet.				
CO2	Learn about the web technologies used for developing web applications and components.				
CO3	Analyze about the WAP services and to learn programming language used for developing WAP services.				
CO4	Analyzing how WAP services are linked with internet and about internet protocols.				
CO5	Learn about wireless telephony applications, design considerations for applications.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H	H		
CO2	M		H			
CO3	H	M	L	M		
CO4	H	M	L			
CO5		H				M

Course Topic(s)

UNIT 1: MOBILE INTERNET

Introduction, Mobile Data – connectivity – Key services for mobile internet – Mobile Internet access and application service provides - Content providers and Developer.

UNIT 2: MOBILE INTERNET STANDARD

Current Web technologies for wireless application - origin and overview of WAP components of wap standard - Network Infrastructure services supporting Wap clients Design Principles Tools and software editors and emulators.

UNIT 3: IMPLEMENTING WAP SERVICES

WML Basic and Document model - content generation - Binary WML - enhanced WML - WML script - rules of script standard libraries - user interface design guidelines.

UNIT 4: ADVANCED WAP

Tailoring content to client - Techniques using HTTP 1.1 - WAP Push - Push Access Protocol - Push Technology - MIME media types for push messages - Proxy gateway; Data base driven

WAP - ASP and WAP - Object model - Activex data objects (ADO) - End-to-End WAP services - Security domains - linking WAP and internet.

UNIT 5: WIRELESS TELEPHONY APPLICATIONS

WTA architecture - client Framework - Server and security - Design considerations Application creation Toolbox - WTA enhancements – Technology - Bluetooth and voice XML - Telematics inter connectivity.

TEXT BOOK

1. Sandeep Signal et al, “Writing Applications for Mobile Internet”, Pearson Education, 2001.

REFERENCE

1. “Wireless Protocols - A beginner’s Guide” BulBrook, Tata McGraw Hill PCL, 2001.

INT18R408	HIGH PERFORMANCE NETWORKS	L	T	P	C
		3	1	0	4
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To facilitate the students on the basis of ATM and Frame relay concepts and explain the various types of LAN's and to know about their applications. • To learn about network security in many layers and network management • To study the types of VPN and tunneling protocols for security. • To develop a comprehensive understanding of multimedia networking.				
Course Outcome(s)					
CO1	Implement different operations in communication networks				
CO2	Understand the flow control and congestion control during packet transmission				
CO3	Understand switching in ATM and Frame Relay networks				
CO4	Study about the differnet queuing methods				
CO5	Know the different protocols towards Quality of Service				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H		M		M
CO2	M		H			
CO3	M		H			
CO4			H			
CO5	M			M		

Course Topic(s)

UNIT 1: HIGH SPEED NETWORKS

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11

UNIT 2: CONGESTION AND TRAFFIC MANAGEMENT

Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT 3: TCP AND ATM CONGESTION CONTROL

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.

UNIT 4: INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ,

PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT 5: PROTOCOLS FOR QOS SUPPORT

RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.

TEXT BOOK

1. William Stallings, "High Speed Networks And Internet", Pearson Education, Second Edition, 2010.

REFERENCES

1. Warland & Pravin Varaiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. Irvan Pepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN Architecture", Cisco Press, Volume 1 and 2, 2003.

INT18R455	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	1	3.5
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	To develop a fundamental understanding of Cryptography and network security proper practices, policies, technologies and standards.				
Course Outcome(s)					
CO1	Explain the foundations of cryptography and network security.				
CO2	Identify common security vulnerability attacks in different networking environment				
CO3	Evaluate the risks and threats to digital communication system				
CO4	Demonstrate the detailed knowledge of the role of encryption to protect the data				
CO5	Explain the fundamental concepts of different digital signature schemes				
CO6	Identify the appropriate cryptographic scheme and security mechanism for different computing environment and information systems				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2			H			
CO3	M	H				H
CO4	H		H	H		
CO5			H	M		

Course Topic(s)

UNIT 1: INTRODUCTION

OSI Security Architecture - Classical Encryption techniques – Block Cipher Principles – Data Encryption Standard- Basic concepts in number theory and finite fields – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES. Practical: DES

UNIT 2: PUBLIC KEY CRYPTOGRAPHY

Number Theory- Public Key Cryptography and RSA-Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Confidentiality using Symmetric Encryption and Asymmetric Encryption. Practical: RSA, Diffie Hellman

UNIT 3: CRYPTOGRAPHIC AND DATA INTEGRITY ALGORITHMS

Applications of cryptographic hash functions- Simple Hash Functions- Requirements and security- Secured Hash Algorithm- Message Authentication requirements and functions – Message Authentication Codes – Security of MACs – HMAC- Digital Signatures – ElGamal Digital signature scheme- Schnorr Digital signature scheme - Digital Signature Standard. Practical: Secured Hash Algorithm

UNIT 4: NETWORK AND INTERNET SECURITY

Transport level Security- Web Security, SSL, TLS, HTTPS, SSH- Wireless network security-E Mail security-PGP, S/ MIME, DKIM, IP Security. Practical: PGP

UNIT 5: SYSTEM LEVEL SECURITY

Intrusion detection – password management. Malicious software– Viruses and related Threats –

Virus Counter measures , worms, DDoS attacks– Firewall Design Principles – Trusted Systems. Practical: password management

TEXT BOOK

1. William Stallings, “Cryptography and Network Security”, 6th Edition, Pearson Education, March 2013.

REFERENCES

1. Bruce Schneier, “Applied Cryptography”, second edition, John Wiley & Sons, New York, 2007.
2. Chris Brenton, “Mastering Network Security”, BPB Publication, New Delhi, 2002.
3. Behrouz A Forouzan , “Cryptography and Network Security”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2014.

COMPUTING TECHNIQUES

INT18R358	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	1	3.5
Prerequisite	Computer Architecture and Organization (CSE18R174)				
Course Category	Program Core				
Course Type	Theory with Practice				
Objective(s)	• To expose students to both the abstraction and details of file systems. • To introduce concepts related to distributed computing systems. • To focus on performance and flexibility issues related to systems design decisions. • To expose students to current literature in distributed systems.				
Course Outcome(s)					
CO1	Understand various models of distributed systems				
CO2	Aware of distributed file systems				
CO3	Identify the needs of distributed systems implementation				
CO4	Construct work flows as such in distributed systems				
CO5	Design distributed systems				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M		M			
CO2			H			
CO3	M		H			M
CO4	H	H		H		
CO5	H	H		M		M

Course Topic(s)

UNIT 1: INTRODUCTION

Characterization of Distributed Systems- Examples of distributed systems - Challenges-System Models-Physical models-Architectural models - Fundamental models - Introduction to inter-process communications-External data representation and marshalling- Multicast communication-Network virtualization -Overlay networks – Practical : MPI and World Wide Web, Remote Method Invocation program

UNIT 2: DISTRIBUTED OBJECTS AND FILE SYSTEM

Introduction - Distributed objects - From objects to components- Case studies: Enterprise JavaBeans and Fractal - Introduction to DFS - File service architecture - Sun network file system - The Andrew File System- Introduction to Name Services- Name services and DNS - Directory and directory services Practical : The Global Name Service, The X.500 Directory

Service.

UNIT 3: DISTRIBUTED OPERATING SYSTEM SUPPORT

The operating system layer – Protection - Process and threads - Communication and invocation - Operating system architecture - Virtualization at the operating system level - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical Clocks - Global states - Distributed debugging. Practical : CORBA using Java program, Java deadlock program

UNIT 4: TRANSACTION AND CONCURRENCY CONTROL – DISTRIBUTED TRANSACTIONS

Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery. Practical: Concurrency control using DBMS

UNIT 5: DISTRIBUTED SYSTEM DESIGN AND DISTRIBUTED MULTIMEDIA SYSTEMS

Introducing the case study: Google- Overall architecture and design philosophy- Underlying communication paradigms- Data storage and coordination services- Distributed computation services- Introduction to distributed multimedia systems- Characteristics of multimedia data - Quality of service management - Resource management- Stream adaptation- Practical : Tiger, BitTorrent and End System Multicast.

TEXT BOOK

1. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Addison Wesley, May 2011.

REFERENCES

1. A.S.Tanenbaum, M.Van Steen, “Distributed systems: principles and paradigms”, Pearson Prentice Hall, 3rd Edition, 2007.
2. Mukesh Singhal, “Advanced Concepts In Operating Systems”, McGraw-Hill Series in Computer Science, Ohio State University, Columbus 2001.

INT18R456	FORMAL LANGUAGE AND AUTOMATA	L	T	P	C
		3	0	1	3.5
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Professional Elective				
Course Type	Theory with Practice				
Objective(s)	• To introduce students about the mathematical foundations of computation including automata theory, the theory of formal languages and grammars, the notions of algorithm, decidability, complexity, and computability, • To enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.				
Course Outcome(s)					
CO1	Design the Finite Automata, Deterministic Finite Automata and Non Deterministic Finite Automata				
CO2	Understand the Regular languages and expressions to given a problem				
CO3	Apply the context free grammar (CFG) to describe programming languages and evaluate the equivalence of push down automata and CFG.				
CO4	Design the Turing machine for different languages and simple computations				
CO5	Analyze the Undecidable problem in regular expression and Turing machine				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H	M			
CO2	H					
CO3			M	M	M	H
CO4		H				
CO5	H		M			

Course Topic(s)

UNIT 1: AUTOMATA

Introduction to formal proof – Additional Forms of Proof – Inductive Proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions.

UNIT 2: REGULAR EXPRESSIONS AND LANGUAGES

Regular Expression –Finite Automata and Regular Expressions – Properties of Regular languages: Pumping Lemma for Regular Languages and Applications – Closure Properties of Regular Languages- Equivalence and Minimization of Automata

UNIT 3: CONTEXT-FREE GRAMMAR AND PUSH DOWN AUTOMATA

Context-Free Grammar (CFG) – Application- Parse Trees – Ambiguity in Grammars and Languages – Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG - Deterministic Pushdown Automata

UNIT 4: PROPERTIES OF CFL AND TURING MACHINE

Normal Forms for CFG – Pumping Lemma for CFL –Applications Properties of CFL –Turing Machines – Programming Techniques for TM: Multiple Stacks, Subroutines-Extensions to the Basic Turing Machine

UNIT 5: UNDECIDABILITY

A language that is not Recursively Enumerable (RE) – An Undecidable problem that is RE – Undecidable Problems about Turing Machine – Post_s Correspondence Problem - The classes P and NP - NP complete-Complements of Languages in NP

PRACTICE COMPONENTS

. Create the Deterministic Finite Automata using JFLAP simulator
2. Create the Non-Deterministic Finite Automata using JFLAP simulator
3. Construct a regular expression using JFLAP. Use Convert→Convert FA to RE.
4. Construct a Grammar using JFLAP.
5. Convert regular expressions to FA
6. Create Regular Grammar and convert to Finite Automaton
7.Create a PDA that accepts strings that contains the language L = {axcb2x | where x ≥ 0} using the alphabet Σ = {a,b,c}.
8. Create each PDA with at least five test results with the following languages over alphabet: □= {a,b}
a) L = {anbn | where n > 0}
b) L = {anbncn | where n > 0}
9. Construct PDA for any given grammar.

TEXT BOOK

1. Hopcroft J.E,Motwani R and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Third Edition, 2006.

REFERENCE BOOKS

1. Martin J, "Introduction to Languages and the Theory of Computation", Third Edition, TMH, 2003
2. Lewis H. R and Papadimitriou C.H , "Elements of The theory of Computation", United States Edition, 1997.

INT18R409	COMPUTER FORENSICS	L	T	P	C
		3	0	0	3
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Describe the origin of computer forensics and the relationship between law enforcement and industry. • Describe electronic evidence and the computing investigation process • Execute an investigation strategies, FAT file system, manual and automated analysis tools, working as an expert witness. • Demonstrate an understanding of a code of ethics and conduct related to the information security and digital forensics professions. • Identify standards of professionalism an ethical behavior for information security and digital forensics professional and apply these standards successfully to ethical dilemmas				
Course Outcome(s)					
CO1	Understand of the role of computer forensics in both the business and private world.				
CO2	Identify some of the current techniques and tools for forensic examinations.				
CO3	Describe and identify basic principles of good professional practice for a forensic computing practitioner.				
CO4	Apply some forensic tools in different situations.				
CO5	Demonstrate an understanding of issues related to privacy and determine how to address them technically and ethically.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H		H			
CO3						
CO4	H		M	M		H
CO5	H	M				

Course Topic(s)

UNIT 1: NETWORK LAYER SECURITY &TRANSPORT LAYER SECURITY

IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec.Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

UNIT 2: E-MAIL SECURITY & FIREWALLS

PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions.

UNIT 3: FORENSICS METHODS

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding

Computer Investigation – Data Acquisition.

UNIT 4: EVIDENCE COLLECTION AND FORENSICS TOOLS

Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT 5: ANALYSIS AND VALIDATION

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.

TEXT BOOKS

1. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.

REFERENCES

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005
2. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 2008.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

INT18R410	CLOUD COMPUTING	L	T	P	C
		3	1	0	4
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To impart fundamental concepts in the area of cloud computing. • To impart knowledge in developing applications of cloud computing				
Course Outcome(s)					
CO1	Understanding the systems, protocols and mechanisms to support cloud computing				
CO2	Develop applications for cloud computing				
CO3	Understanding the hardware necessary for cloud computing				
CO4	Design and implement a novel cloud computing application				
CO5	Knowledge in various Cloud vendors and their products				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2				M	M	H
CO3	M	L	H			
CO4		H		M	M	H
CO5	M		H			

Course Topic(s)

UNIT 1: INTRODUCTION

Overview – applications - intranet and cloud - examples: Amazon, Google, Microsoft, IBM – Benefits and Limitations of cloud computing - Google app engine – EMC - NETAPP - Microsoft Azure - Amazon(EC2, S3,SQS) - open stack -cloud computing services

UNIT 2: HARDWARE AND ARCHITECTURE

Clients-Security-Network-Services. Accessing the cloud: Platforms-web applications-web APIs-web browsers. Cloud storage: overview-providers. Standards: application-client-infrastructure-service.

UNIT 3: SOFTWARE AS SERVICE

Overview- Driving forces-company offerings-industries. Software plus services: Overview-mobile device integration-providers-Microsoft Online.

UNIT 4: DEVELOPING APPLICATIONS

Google – Microsoft – IntuitQuickBase - Cast Iron Cloud - Bungee Connect –Development (App engine, Azure, open stack etc.) - trouble shooting and application management.

UNIT 5: LOCAL CLOUDS AND THIN CLIENTS

Virtualization-server solutions-thin clients. Cloud Migration: cloud services for individuals-enterprise cloud- methods for migration-analyzing cloud services.

TEXT BOOKS

1. Anthony T.Velte, Toby Velte, “Cloud Computing a practical approach”, Mcgraw Hill, 2010.
2. M.S.V.Janakiram, “Demystifying the Cloud – An introduction to Cloud Computing”,

version 1.1, 2010.

REFERENCE BOOKS

1. Mark C. Chu-Carroll, "Code in the Cloud- Programming Google App Engine", The Pragmatic Bookshelf Raleigh, North Carolina Dallas, Texas, 2011.
2. Breslin "Cloud Computing: Principles and Paradigms", Wiley Press, New York, USA, 2008.

INT18R411	GREEN COMPUTING	L	T	P	C
		3	0	0	3
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	This course covers fundamental principles of energy management faced by designers of hardware, operating systems, and data centers. We will explore basic energy management option in individual components such as CPUs, network interfaces, hard drives, memory. We will further present the energy management policies at the operating system level that consider performance vs. energy saving tradeoffs. Finally we will consider large scale data centers where energy management is done at multiple layers from individual components in the system to shutting down entries subset of machines. We will also discuss energy generation and delivery and well as cooling issues in large data centers				
Course Outcome(s)					
CO1	Understand the concepts of technologies that conform to low-power computation				
CO2	Understand green (power-efficient) technologies for components of one single computer, such as CPU, memory and disk, and appreciate cutting edge designs for these components including memory and Registers				
CO3	Have a basic understanding of a variety of technologies applied in building a green system (especially green data centers), including networks, Virtual Machine (VM) management and storage systems				
CO4	Use a range of tools to help monitor and design green systems				
CO5	Analyze the various tools to greening the organization				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H	L		
CO2	H	M				
CO3	H	M			L	
CO4			H			
CO5	H	M				

Course Topic(s)

UNIT 1:ION

Inroduction - Need for Green Computing – Green computing Background – Understanding the World of Green IT: Win-Win-Winning with Green IT – Making the Business Case of Green IT – Green Journeys in Action.

UNIT 2: GETTING A RUNNING START

Getting to know the Standards and Metrics – Assessing your current Energy use and Needs – Go Green in 12 months: Putting Together a plan – Techniques for managing Power consumption

UNIT 3: GREENING THE DATA CENTER

Laying the foundation for green data management – maximizing data center efficiency – Bottom up Electrical Efficiency Improvement - Racking up green servers – cooling your data center – Building a Green Storage System – Grooming the Network for green – Using Virtualization –

computer power using Benchmarking – Evaluation of Power Benchmarks

UNIT 4: GREENING THE OFFICE

Moving to Green Screens and Computing Machines – Reducing Desktop Energy Waste – Pursuing the Less-Paper Office – Evaluation Green Gadgetry – Experimental methodology

UNIT 5: GREENING THE ORGANIZATION

Greening the Facility – e-Waste Not, e-Want Not – Virtually There: Collobration Technologies for a Greener World - Ten Organizations that can help with Green IT objectives – Ten creative computer Recycling Tips – Ten tips for a Green Home Office.

TEXT BOOK

1. Carol Baroudi , Jeffery Hill , Arnold Reinhold , Jhana Senxian, " Green IT for dummies", Wiley Publishing Inc, 2009.

REFERENCE

1. Mujtaba Talebi, "Computer Power Consumption benchmarking for green computing", ceangage learning, April 2008.

INT18R412	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3
Prerequisite	Data structures and algorithms (INT18R271)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To gain knowledge about social networks, its structure and social network data sources • To learn the analysis and mining techniques for Social networks • To study about the semantic technologies for social network analysis • To gain knowledge on Visualization of Social networks and its applications				
Course Outcome(s)					
CO1	Learn current web developments in Social Web				
CO2	Understand various mining techniques for social networks				
CO3	Model and represent knowledge for Semantic Web				
CO4	Design extraction and mining tools for Social networks				
CO5	Develop personalized visualization for Social networks				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H	M		
CO2	M		M	M		
CO3		M				M
CO4		H				
CO5				M	M	H

Course Topic(s)

UNIT 1: SOCIAL NETWORK ANALYSIS

Definition and Features - The Development of Social Network Analysis - Basic graph theoretical Concepts of Social Network Analysis – ties, density, path, length, distance, betweenness, centrality, clique - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks.

UNIT 2: SOCIAL NETWORK PROFILES

Introduction – types of commercial social network profiles (CSNP) - Quantitative and Qualitative Analysis of CSNPs – Analysis of social networks extracted from log files - Data Mining Methods Related to SNA and Log Mining - Clustering Techniques – Case study.

UNIT 3: SEMANTIC TECHNOLOGY FOR SOCIAL NETWORK ANALYSIS

Introduction to ontology-based knowledge representation - - Ontology languages for the Semantic Web – RDF and OWL - Modeling Social network data - State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships.

UNIT 4: SOCIAL NETWORK MINING

Detecting and discovering Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection – divisive, spectral and modularity optimization algorithms - Applications of Community Mining Algorithms - Overview of tools for Detecting Communities - Understanding and Predicting Human Behavior for Social

Communities.

UNIT 5: VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Visualization of Social Networks - Node-Edge Diagrams - Random Layout - Force-Directed Layout - Tree Layout - Matrix Representations - Hybrid Representations - Visualizing Online Social Networks - Applications - Covert Networks – Community Welfare - Collaboration Networks - Co-Citation Networks.

TEXT BOOKS

1. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition 2007.
2. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.

REFERENCES

1. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", Springer, 1st edition, 2011.
2. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved User Modelling", IGI Global snippet, 2009.
3. John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

INT18R413	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To learn the concepts behind IR • To understand the operation of web search • To learn the algorithms related to text classification, indexing and searching				

Course Outcome(s)

CO1	Learn use an open source search engine framework and explore its capabilities
CO2	Know the various modeling and evaluation techniques
CO3	Learn to represent documents in different ways and discuss its effect on similarity
CO4	Learn Calculations and on search
CO5	Design and implement an innovative feature in a search engine

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H		H			
CO2			H	M	H	L
CO3	H		H			
CO4		M				
CO5		H		M	M	H

Course Topic(s)

UNIT 1: INTRODUCTION

Information Retrieval – Early Developments – The IR Problem – The User‘s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the web changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

UNIT 2: MODELING AND RETRIEVAL EVALUATION

IR models – Classic Information Retrieval – Alternative Set Theoretic Models – Alternative Algebraic Models – Alternative Probabilistic Models – Other Models – Hypertext Models – Web based Models – Retrieval Evaluation – Cranfield Paradigm – Retrieval Metrics – Reference Collections – User-based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback – Clicks – Implicit Feedback Through Local Analysis – Global Analysis – Documents: Languages & Properties – Queries: Languages & Properties.

UNIT 3: TEXT CLASSIFICATION, INDEXING AND SEARCHING

A Characterization of Text Classification – Unsupervised Algorithms – Supervised Algorithms – Feature Selection or Dimensionality Reduction – Evaluation metrics – Organizing the classes – Indexing and Searching – Inverted Indexes –Signature Files – Suffix Trees & Suffix Arrays – Sequential Searching – Multi-dimensional Indexing.

UNIT 4: WEB RETRIEVAL AND WEB CRAWLING

The Web – Search Engine Architectures – Search Engine Ranking – Managing Web Data – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation - Structured Text Retrieval.

UNIT 5: TYPES OF IR AND APPLICATIONS

Parallel and Distributed IR –Data Partitioning – Parallel IR – Cluster-based IR – Distributed IR - Multimedia Information Retrieval – Challenges – Content Based Image Retrieval – Audio and Music Retrieval – Retrieving and Browsing Video – Fusion Models – Segmentation – Compression - Enterprise Search –Tasks – Architecture of Enterprise Search Systems – Enterprise Search Evaluation - Library Systems – Digital Libraries

TEXT BOOKS

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, "Modern Information Retrieval: The Concepts and Technology behind Search", Second Edition, ACM Press Books, 2011.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", The MIT Press, 2010.

REFERENCES

1. C. Manning, P. Raghavan, and H. Schütze, "Introduction to Information Retrieval", Cambridge University Press, 2008.
2. Bruce Croft, Donald Metzler and Trevor Strohman, "Search Engines: Information Retrieval in Practice", First Edition, Addison Wesley, 2009.

INT18R414	Parallel and Distributed Computing	L	T	P	C
		3	0	0	3
Prerequisite	Distributed Systems (INT18R358)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To understand the need and fundamentals of parallel computing paradigms • To learn the nuances of parallel algorithm design • To understand the programming principles in parallel and distributed computing architectures • To learn few problems that are solved using parallel algorithms				
Course Outcome(s)					
CO1	Apply parallel and distributed computing architectures for any given problem				
CO2	Apply problem solving (analysis, design, and development) skills to distributed applications				
CO3	Develop applications by incorporating parallel and distributed computing architectures				
CO4	Develop applications by incorporating fault tolerance				
CO5	Convert a sequential algorithm to a parallel one				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H				H
CO2	M	H		M		H
CO3	H		M	M		M
CO4	M	H		M	M	H
CO5		H				

Course Topic(s)

UNIT 1: INTRODUCTION TO PARALLEL COMPUTING

Scope of Parallel Computing – Parallel Programming Platforms – Implicit Parallelism – Limitations of Memory System Performance – Control Structure of Parallel Platforms – Communication Model of Parallel Platforms – Physical Organization of Parallel Platforms – Communication Costs in Parallel Machines – Impact of Process - Processor Mapping and Mapping Techniques.

UNIT 2: PARALLEL ALGORITHM DESIGN

Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads – Parallel Algorithm Models – Basic Communication Operations – One-to-All Broadcast and All-to-One Reduction – All-to-All Broadcast and Reduction – All-Reduce and Prefix Sum Operations – Scatter and Gather – All-to-All Personalized Communication- Circular Shift – Improving the Speed of some Communication Operations

UNIT 3: PROGRAMMING USING MESSAGE PASSING AND SHARED ADDRESS SPACE

Principles of Message Passing Programming – Building Blocks – Send and Receive Operations – MPI – Message Passing Interface – Topologies and Embedding – Overlapping Communication with Computation – Collective Communication and Computation Operations – Groups and Communicators – POSIX thread API – OpenMP: a Standard for Directive based Parallel Programming – Applications of Parallel Programming - Matrix-Matrix Multiplication – Solving Systems of Equations – Sorting Networks - Bubble Sort Variations – Parallel Depth First Search

UNIT 4: DISTRIBUTED COMPUTING PARADIGM

Paradigms for Distributed applications – Basic algorithms in Message passing Systems – Leader Election in Rings – Mutual Exclusion in Shared Memory

UNIT 5: FAULT TOLERANT DESIGN

Synchronous Systems with Crash Failures – Byzantine Failures – Impossibility in Asynchronous Systems - Formal Model for Simulation – Broadcast and Multicast – Specification of a Broadcast Service – Implementing a Broadcast Service – Multicast in Groups – Distributed Shared Memory – Linearizable – Sequentially Consistent Shared Memory – Algorithms

TEXT BOOK

1. Ananth Grama, Anshul Gupta, George Karypis and Vipin Kumar, ―Introduction to Parallel Computing‖, Second Edition, Pearson Education, 2009.
2. Haggit Attiya and Jennifer Welch, ―Distributed Computing – Fundamentals, Simulations and Advanced Topics‖, Second Edition, Wiley, 2012.

REFERENCES

1. Norman Matloff, ―Parallel Computing for Data Science – With Examples in R, C++ and CUDA‖, Chapman and Hall/CRC, 2015.
2. Wan Fokkink, ―Distributed Algorithms: An Intuitive Approach‖, MIT Press, 2013.
3. M.L. Liu, ―Distributed Computing – Principles and Applications‖, First Edition, Pearson Education, 2011.

INT18R415	GRAPH THEORY	L	T	P	C
		3	1	0	4
Prerequisite	Data Structures and Algorithms (INT18R271)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	This course comprehends the graphs as a modeling and analysis tool in computer science & Engineering. It introduces the structures such as graphs & trees and techniques of counting and combinations, which are needed in number theory based computing and network security studies in Computer Science.				
Course Outcome(s)					
CO1	Able to precise and accurate mathematical definitions of objects in graph theory.				
CO2	Apply mathematical definitions to identify and construct examples				
CO3	Able to Validate and critically assess a mathematical proof.				
CO4	Analyze the use of combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.				
CO5	Identify the reason from definitions to construct mathematical proofs.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1 INTRODUCTION

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.

UNIT 2 TREES, CONNECTIVITY & PLANARITY

Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.

UNIT 3 MATRICES, COLOURING AND DIRECTED GRAPH

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

UNIT 4 PERMUTATIONS & COMBINATIONS

Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

UNIT 5 GENERATING FUNCTIONS

Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions

TEXT BOOKS:

1. Narsingh Deo, Graph Theory: With Application to Engineering and Computer Science, Prentice Hall of India, 2003.
2. Grimaldi R.P., Discrete and Combinatorial Mathematics: An Applied Introduction, Addison Wesley, 1994.

REFERENCES:

1. Clark J. & Holton D.A., A First Look at Graph Theory, Allied Publishers, 1995.
2. Mott J.L., Kandel A. & Baker T.P., Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India, 1996.
3. Liu C.L., Elements of Discrete Mathematics, McGraw Hill, 1985.
4. Rosen K.H., Discrete Mathematics And Its Applications, McGraw Hil, 2007

AI STREAM

INT18R310	BIO INFORMATICS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Exposed to the need for Bioinformatics technologies • Be familiar with the modeling techniques • Learn microarray analysis • Exposed to Pattern Matching and Visualization				
Course Outcome(s)					
CO1	Learn the structural bioinformatics				
CO2	Understand the concept of data warehousing and data mining in bioinformatics				
CO3	Examine different models in bio informatics				
CO4	Demonstrate the various patterns of DNA				
CO5	Learn to analyze image and data extraction in informatics database				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M					
CO3					H	
CO4	H	M				M
CO5			M			

Course Topic(s)

UNIT 1: INTRODUCTION

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT 2: DATAWAREHOUSING AND DATAMINING IN BIOINFORMATICS

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT 3: MODELING FOR BIOINFORMATICS

Hidden markov modeling for biological data analysis – Sequence identification –Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

UNIT 4: PATTERN MATCHING AND VISUALIZATION

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT 5: MICROARRAY ANALYSIS

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs.

TEXT BOOK

1. Yi-Ping Phoebe Chen (Ed), "BioInformatics Technologies", First Indian Reprint, Springer Verlag, 2007.

REFERENCES

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
2. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005.

INT18R312	NEURAL NETWORKS AND FUZZY LOGIC	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• Introduce students to the various neural network and fuzzy systems models. • Reveal different applications of these models to solve engineering and other problems. • Introduce the theory and applications of artificial neural network and fuzzy systems to engineering applications with emphasis on image processing and control. • Discuss neural networks and fuzzy systems, architectures, algorithms and applications, including Back-propagation, BAM, Hopfield network, Competitive Learning, Fuzzy inference methods and expert systems				
Course Outcome(s)					
CO1	Identify different neural network architectures, their limitations and appropriate learning rules for each of the architectures				
CO2	Design and implement a neural network simulation (with two modes of operation: learning and processing) using a high-level language C++				
CO3	Demonstrate knowledge and understanding of fuzzy system as applied in engineering and science				
CO4	Learn the power and usefulness of artificial neural networks in several applications including speech synthesis, diagnostic problems, business and finance, robotic control, signal processing, computer vision and many other problems that fall under the category of pattern recognition				
CO5	Develop models for different applications using fuzzy system and MatLab				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2		H				
CO3	H		H		M	
CO4	H		H			
CO5		M				

Course Topic(s)

UNIT 1: INTRODUCTION TO NEURAL NETWORKS

Introduction - Humans and Computers - Organization of the Brain - Biological Neuron - Biological and Artificial Neuron Models - Characteristics of ANN - Models of ANNs - McCulloch-Pitts Model - Feed forward & feedback networks - learning rules - Hebbian learning rule - perception learning rule - delta learning rule - Widrow-Hoff learning rule - correction learning rule - Winner –lake all learning rule - etc.

UNIT 2: FEED FORWARD NEURAL NETWORKS

Classification model - Features & Decision regions - training & classification using discrete

perception - algorithm - single layer continuous perception networks for linearly separable classifications - linearly non- separable pattern classification - Delta learning rule for multi-perception layer - Generalized delta learning rule -Back-propagation training - learning factors - Examples.

UNIT 3: ASSOCIATIVE MEMORIES

Paradigms of Associative Memory - Pattern Mathematics - Hebbian Learning - General Concepts of Associative Memory - Bidirectional Associative Memory (BAM) Architecture - BAM Training Algorithms - Storage and Recall Algorithm - BAM Energy Function - Hopfield networks - Basic Concepts - Training & Examples - SOM-UN supervised learning of clusters - winner-take-all learning - recall mode, Initialization of weights - seperability limitations del - Historical Developments - Potential Applications of ANN.

UNIT 4: CLASSICAL SETS

Introduction to classical sets – properties - Operations and relations -Fuzzy sets –Membership – Uncertainty – Operations – properties - fuzzy relations – cardinalities - membership functions - Overview of Classical Sets - Membership Function - a-cuts - Properties of a-cuts – Decomposition – Theorems - Extension Principle

UNIT 5: UNCERTAINTY BASED INFORMATION

Information & Uncertainty - Non specificity of Fuzzy & Crisp sets - Fuzziness of Fuzzy Sets – Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods - Neural network applications - Process identification – control - fault diagnosis - Fuzzy logic applications - Fuzzy logic control and Fuzzy classification.

TEXT BOOKS

1. S. Rajasekharan and G. A. Vijayalakshmi pai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publication, 2011.
2. John Yen and Reza Langan, “Fuzzy Logic: Intelligence, Control and Information”, Pearson Education, 2011.

REFERENCES

1. Simon Haykin, “Neural Networks- A comprehensive foundation”, Pearson Education, 2005.
2. S.N.Sivanandam, S.Sumathi,S. N. Deepa “Introduction to Neural Networks using MATLAB 6.0”, TMH, 2006.
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.

INT18R313	MACHINE LEARNING	L	T	P	C
		3	1	0	4
Prerequisite	Data Structures and Algorithms (INT18R271)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To introduce students to the basic concepts and techniques of Machine Learning. • To have a thorough understanding of the Supervised and Unsupervised learning techniques • To study the various probability based learning techniques • To understand graphical models of machine learning algorithms				
Course Outcome(s)					
CO1	Distinguish between, supervised, unsupervised and semi-supervised learning				
CO2	Choose the appropriate machine learning strategy for any given problem				
CO3	Suggest supervised, unsupervised or semi-supervised learning algorithms for any given problem				
CO4	Design systems that use the appropriate graph models of machine learning				
CO5	Modify existing machine learning algorithms to improve classification efficiency				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1		H	H			
CO2	M	H				
CO3			L	H		
CO4	H	M			L	M
CO5	H		H	M		

Course Topic(s)

UNIT 1 : INTRODUCTION

Learning – Types of Machine Learning –Supervised Learning – The Brain and the Neuron– Design a Learning System –Perspectives and Issues in Machine Learning–Concept Learning Task –Concept Learning as Search –Finding a Maximally Specific Hypothesis –Version Spaces and the Candidate Elimination Algorithm –Linear Discriminants –Perceptron –Linear Separability –Linear Regression

UNIT 2: LINEAR MODELS

Multi-layer Perceptron – Going Forwards –Going Backwards: Back Propagation Error –Multi-layer Perceptron in Practice –Examples of using the MLP –Overview –Deriving Back-Propagation –Radial Basis Functions and Splines –Concepts –RBF Network –Curse of Dimensionality–Interpolations and Basis Functions –Support Vector Machines

UNIT 3 : TREE AND PROBABILISTIC MODELS

Learning with Trees –Decision Trees –Constructing Decision Trees –Classification and Regression Trees –Ensemble Learning –Boosting –Bagging –Different ways to Combine Classifiers –Probability and Learning –Data into Probabilities –Basic Statistics –Gaussian Mixture Models –Nearest Neighbor Methods –Unsupervised Learning –K means Algorithms –

Vector Quantization –Self Organizing Feature Map

UNIT 4: DIMENSIONALITY REDUCTION AND EVOLUTIONARY MODELS

Dimensionality Reduction –Linear Discriminant Analysis –Principal Component Analysis –Factor Analysis –Independent Component Analysis –Locally Linear Embedding –Isomap –Least Squares Optimization –Evolutionary Learning –Genetic algorithms –Genetic Offspring: -Genetic Operators –Using Genetic Algorithms –Reinforcement Learning –Overview –Getting Lost Example –Markov Decision Process

UNIT 5: GRAPHICAL MODELS

Markov Chain Monte Carlo Methods–Sampling –Proposal Distribution –Markov Chain Monte Carlo –Graphical Models –Bayesian Networks –Markov Random Fields –Hidden Markov Models –Tracking Methods

TEXTBOOKS:

1.Stephen Marsland, ―Machine Learning –An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

2.Tom M Mitchell, ―Machine Learning‖, First Edition, McGraw Hill Education, 2013.

REFERENCES:

1.Peter Flach, ―Machine Learning: The Art and Science of Algorithms that Make Sense of Data‖, First Edition, Cambridge University Press, 2012.

2.Jason Bell, ―Machine learning –Hands on for Developers and Technical Professionals‖, First Edition, Wiley, 2014

3.Ethem Alpaydin, ―Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)‖, Third Edition, MIT Press, 2014

INT18R314	SOFT COMPUTING	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To give students knowledge of soft computing theories fundamentals, • To learn the fundamentals of non-traditional technologies and approaches to solving hard real-world problems. • To learn and apply artificial neural networks, fuzzy sets and fuzzy logic, and genetic algorithms in problem solving and use of heuristics based on human experience				
Course Outcome(s)					
CO1	Learn the importance of tolerance of imprecision and uncertainty for design of robust and low- cost intelligent machines.				
CO2	Acquire soft computing fundamentals and design systems for solving various real-world problems.				
CO3	Integrate the knowledge of neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning, rough sets, chaos, hybrid approaches				
CO4	Learn about fuzzy sets, fuzzy logic , neural networks and form appropriate rules for inference systems				
CO5	Learn about genetic algorithms and other random search procedures for global optimum in self-learning situations				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3				M	H	
CO4	H	M		H	H	M
CO5			H			

Course Topic(s)

UNIT 1 : NEURAL NETWORKS -I

(Introduction and Architecture) Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetro-Associative Memory.

UNIT 2 : NEURAL NETWORKS -II

(Back Propagation Networks) Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perception Model; Back Propagation Learning Methods, Effect of Learning Rule Co-Efficient ;Back Propagation Algorithm, Factors Affecting Back Propagation Training, Applications.

UNIT 3: FUZZY LOGIC -I

(Introduction) Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and

Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion.

UNIT 4 : FUZZY LOGIC –II

(Fuzzy Membership, Rules) Membership Functions, Interference in Fuzzy Logic, Fuzzy If -Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Industrial Applications

UNIT 5: GENETIC ALGORITHM

Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, Genetic Representations, (Encoding) Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Applications

TEXTBOOKS:

1.S. Rajasekaran and G.A. Vijayalakshmi Pai, ―Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications‖, Prentice Hall of India, 2003.

2.N.P.Padhy,‖Artificial Intelligence and Intelligent Systems‖, Oxford University Press, 2005.

3.J.S.R. Jang, C.T. Sun and E. Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Pearson Education, 2004.

REFERENCES:

1.Siman Haykin, ―Neural Networks ‖, Prentice Hall of India, 1999

2.Timothy J. Ross, ―Fuzzy Logic with Engineering Applications‖, Third Edition, Wiley India, 2010

3. S.Y.Kung, ―Digital Neural Network‖, Prentice Hall International, 1993.

4.Aliev.R.A and Aliev,R.R, ― Soft Computing and its Application‖, World Scientific Publishing Company, 2001

INT18R416	SPEECH AND LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To learn the fundamentals of natural language processing • To appreciate the use of CFG and PCFG in NLP • To understand the role of semantics and pragmatics				

Course Outcome(s)	
CO1	To tag a given text with basic Language features
CO2	To design an innovative application using NLP components
CO3	To implement a rule based system to tackle morphology/syntax of a language
CO4	To design a tag set to be used for statistical processing for real-time applications
CO5	To compare and contrast use of different statistical approaches for different types of NLP applications

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	M	M			
CO2	M					M
CO3			M			
CO4	H	H				M
CO5			H			

Course Topic(s)

UNIT 1 : INTRODUCTION

Words-Regular Expressions and Automata -Words and Transducers -N-grams -Part-of-Speech –Tagging -Hidden Markov and Maximum Entropy Models.

UNIT 2: SPEECH

Speech–Phonetics -Speech Synthesis -Automatic Speech Recognition -Speech Recognition: -Advanced Topics -Computational Phonology

UNIT 3: SYNTAX

Formal Grammars of English -Syntactic Parsing -Statistical Parsing -Features and Unification -Language and Complexity.

UNIT 4: SEMANTICS AND PRAGMATICS

The Representation of Meaning -Computational Semantics -Lexical Semantics -Computational Lexical Semantics -Computational Discourse

UNIT 5: APPLICATIONS

Information Extraction -Question Answering and Summarization -Dialogue and Conversational Agents -Machine Translation

TEXTBOOKS:

1.Daniel Jurafsky,―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech‖, Pearson Publication, 2014.

2.Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with

Python‖, First Edition, O‘Reilly Media, 2009.

REFERENCES:

1.Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.
2.Richard M Reese, ―Natural Language Processing with Java‖, O‘Reilly Media,2015.
3.Nitin Indurkhya andFred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010.

INT18R417	DEEP LEARNING	L	T	P	C
		3	1	0	4
Prerequisite	Nil				
Course Category	Professional Elective				
Course Type	Theory				
Objective(s)	• To present the mathematical, statistical and computational challenges of building neural networks • To study the concepts of deep learning • To introduce dimensionality reduction techniques • To enable the students to know deep learning techniques to support real-time applications • To examine the case studies of deep learning techniques				
Course Outcome(s)					
CO1	Understand basics of deep learning				
CO2	Implement various deep learning models				
CO3	Realign high dimensional data using reduction techniques				
CO4	Analyze optimization and generalization in deep learning				
CO5	Explore the deep learning applications				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: INTRODUCTION

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates

UNIT 2: DEEP NETWORKS

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks-Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning

UNIT 3: DIMENTIONALITY REDUCTION

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization

UNIT 4: OPTIMIZATION AND GENERALIZATION

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization-Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience

UNIT 5: CASE STUDY AND APPLICATIONS

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint Detection-BioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

REFERENCES:

1. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
2. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
3. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

OPEN ELECTIVE

INT18R315	WEB PROGRAMMING	L	T	P	C
		3	0	0	3
Prerequisite	**Nil**				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	• To learn the theoretical and practical concepts of web programming. • To introduce the programming languages for developing simple web applications. • To make students to understand about the architecture of web server and deployment of web site • To teach methodologies useful for the implementation of dynamic web applications • To efficiently design and implement web applications using server side programming languages				
Course Outcome(s)					
CO1	Understand the programming concepts of HTML, DHTML, CSS, JavaScript, XML and other Web technologies				
CO2	Understand Java programming concepts and utilize Java Graphical User Interface program writing.				
CO3	Build Java Application for distributed environment. Design and Develop multi-tier applications.				
CO4	Utilize professional level platforms (ASP, JSP, Servlets) to produce software systems/websites that meet specified user needs and constraints.				
CO5	Understand database basics related to develop dynamic web applications and Apply XML for designing web pages.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H		L	
CO2	M			H		
CO3					H	
CO4	H	M		M		M
CO5			L		H	

Course Topic(s)

UNIT 1: INTRODUCTION

World Wide Web – History of the World Wide Web, World Wide Web Consortium – HTML – Dynamic HTML – Object model and collections, Event model, Filters and Transitions.

UNIT 2: JAVA SCRIPT

Introduction – Simple program, Memory concepts, Arithmetic, Decision making - Equality and Relational operators – Control statements – Control structures, Operators – Functions – Programmer defined functions, JavaScript global functions, Recursion – Arrays – References

and Reference parameters, Passing arrays to functions, Multidimensional arrays – Objects – Object types, Cookies.

UNIT 3: XML

Introduction, Structuring data, XML namespaces, Document Type Definitions (DTDs) and Schemas, Document type definitions, W3C XML schema documents, XML vocabularies, Document Object Model (DOM), DOM methods, Simple API for XML (SAX), Extensible Style sheet Language (XSL), Simple Object Access Protocol (SOAP).

UNIT 4: PERL, CGI AND PHP

Introduction, String processing and Regular expressions, Viewing Client/Server environment variables, Form processing and Business logic, Verifying a username and password, Connecting to a database, Cookies, Operator precedence chart.

UNIT 5: JAVA PROGRAMMING

Classes – Constructors, Garbage collection - Overloading methods – Overriding methods - Exception handling - Multithreading – Creating a thread, Synchronization, Inter thread communication - Streams – Byte streams, Character streams.

TEXT BOOKS:

1. 1. Harvey Deitel, Abbey Deitel, “Internet and World Wide Web: How To Program” 5th Edition.
2. Herbert Schildt, “Java – The Complete Reference, 7th Edition”. Tata McGraw- Hill.

REFERENCES:

1. John Pollock, “Javascript – A Beginners Guide”, 3rd Edition –- Tata McGraw-Hill.
2. Keyur Shah, “Gateway to Java Programmer Sun Certification”, Tata McGraw Hill, 2002.

INT18R316	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	• Prepare the students to understand and practice Big Data Analytics using Hadoop Ecosystem and prepare them for a Career in Analytics as a Hadoop Developer, Hadoop Administrator, Data Scientist.				
Course Outcome(s)					
CO1	Understand the key issues on big data, characteristics, data sources and the associated applications in intelligent business and scientific computing.				
CO2	Acquire fundamental enabling techniques and scalable algorithms in big data analytics.				
CO3	Interpret business models and scientific computing paradigms, and apply software tools for Big data analytics.				
CO4	Achieve adequate perspectives of big data analytics in marketing, financial services, health services, social networking, astrophysics exploration, and environmental sensor applications, etc.				
CO5	Select visualization techniques and tools to analyze big data and create statistical models and understand how to handle large amounts of data.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3				L		
CO4	H	M				M
CO5			M			

Course Topic(s)

UNIT 1: INTRODUCTION TO BIG DATA

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT 2: MINING DATA STREAMS

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

UNIT 3: HADOOP

History of Hadoop- The Hadoop Distributed File System –Components of Hadoop -Analyzing The Data with Hadoop-Scaling Out-Hadoop Streaming-Design of HDFS-Java interfaces to HDFS-Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a

Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort–Task execution-Map Reduce Types and Formats

UNIT 4: HADOOP ENVIRONMENT

Setting up a Hadoop Cluster -Cluster specification -Cluster Setup and Installation -HadoopConfiguration-Security in Hadoop -Administering Hadoop –HDFS -Monitoring-Maintenance-Hadoop benchmarks-Hadoop in the cloud

UNIT 5: FRAMEWORKS

Applications on Big Data Using Pig and Hive –Data processing operators in Pig –Hive services –HiveQL –Querying Data in Hive -fundamentals of HBase and ZooKeeper -IBM InfoSphere-. Visualizations -Visual data analysis techniques, interaction techniques.

TEXT BOOKS:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

REFERENCES:

3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics", John Wiley & sons, 2012.
2. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.

INT18R317	INFORMATION THEORY & CODING	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	• To introduce to the students the concept of information and entropy of Information. • To know the concept of compression of information, error control of Information, and securing information through cryptography. • Describe the mathematical foundation of compression, error control and security of information.				
Course Outcome(s)					
CO1	Understand the basic information and entropy.				
CO2	Analyze source coding compression, decoding and error control methods as applied in communication system.				
CO3	Understand different types coding techniques.				
CO4	Understand the basic number theory of coding techniques.				
CO5	Analysis the various algorithms techniques.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H		H		
CO3					M	
CO4	H	M			H	M
CO5			H			

Course Topic(s)

UNIT 1: INFORMATION THEORY & SOURCE CODING

Introduction to Information Theory- Entropy & Types of Entropy Source Coding, Prefix Coding, Channel Capacity

UNIT 2: COMPRESSION ALGORITHMS

Optimal Compression- Compression Algorithms, Huffman Coding, Adaptive Huffman Compression, Dictionary Based Compression, Speech Compression, Sliding Window Compression, LZW,RLE, Lossy & Lossless Compression Schemes, Image Compression – GIF,JPEG

UNIT 3: ERROR CONTROL CODING TECHNIQUES

Types of Codes - Error Checking & Correcting Codes, Linear Block Codes, Cyclic Codes, BCH Codes, Convolution Codes

UNIT 4: BASIC NUMBER THEORY

Modular Arithmetic, Solving ax+by=d, Congruence's, Chinese Remainder Theorem Modular Exponentiation, Fermat's Little and Euler Theorem, Prime Number Generation, Random Number Generation, Primitive Roots, Legendre and Jacobi Symbols, Discrete Probability, Discrete Logarithms

UNIT 5: CRYPTOGRAPHIC TECHNIQUES

Security Goals, Threats and Attack on Information-Classic Cryptography-Symmetric Key Cryptography – Stream Ciphers, Block Cipher, Stream Cipher, DES, Triple DES,AES-Public and Private Key Cryptography – RSA, Diffie-Hellman-Hash Function – MD5,SHA-1,Digital Signature

TEXTBOOKS

1. Ranjan Bose, “Information Theory, Coding and Cryptography”, Tata McGrawHill , Second Edition.2012

2. R Avudaiammal, “Information Coding Techniques”, Tata McGrawHill , Second Edition.2009

REFERENCES

1.Mark Nelson, “Data Compression Book”, BPB Publication 2nd edition 2002.

2.Watkinson J, “Compression in Video and Audio”, Focal Press, London, 2005.

INT18R318	INTRODUCTION TO INFORMATION SECURITY	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	It covers Information Security, Vulnerabilities & threats, attacks, Risk Analysis, logical design and physical design				
Course Outcome(s)					
CO1	Understand the importance of information security and models to develop secure information system.				
CO2	Learn about various kinds of issues, threats, attacks involved while securing information				
CO3	Analyze the risks involved in information security				
CO4	Design and develop an information security system				
CO5	Learn the various technologies, tools and techniques used to ensure security.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			L
CO2	H	H				H
CO3			L	H	L	
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: INTRODUCTION

History, Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT 2: SECURITY INVESTIGATION

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

UNIT 3: SECURITY ANALYSIS

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

UNIT 4: LOGICAL DESIGN

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT 5: PHYSICAL DESIGN

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

TEXT BOOK

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", 4th Edition,Vikas Publishing House, New Delhi, 2011.

REFERENCES

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", 6th edition vol-5, CRC Press LLC, 2011.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed 6th edition –Network security secrets and solutions", Tata McGraw-Hill, 2009.
3. Matt Bishop, "Computer Security Art and Science", Addison-Wesley Professional, 2003.

INT18R319	CYBER FORENSICS	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	• To understand the fundamentals of Computer Forensics and computing Investigations. • To recognize the legal underpinnings and critical laws affecting forensics. • To apply the tools and methods to uncover hidden information in digital systems. • To learn about current licensing and certification requirements to build the career in digital forensic.				
Course Outcome(s)					
CO1	Understand of the role of computer forensics				
CO2	Identify some of the current techniques and tools				
CO3	Describe and identify basic principles of good professional practice for a forensic computing practitioner				
CO4	Demonstrate an understanding of issues related to privacy and determine how to address them technically and ethically.				
CO5	Apply some forensic tools in different situations.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	H	M				
CO3			H	H		
CO4				H		
CO5	H	M				H

Course Topic(s)

UNIT 1: NTRODUCTION

The Scope of Computer Forensics - Windows Operating and File Systems –Handling Computer Hardware – Anatomy of Digital Investigation.

UNIT 2: INVESTIGATIVE SMART PRACTICES

Forensics Investigative Smart Practices – Time and Forensics – Incident closure

UNIT 3: LAWS AND PRIVACY CONCERNS

Laws Affecting Forensic Investigations – Search Warrants and Subpoenas – Legislated Privacy Concerns – The admissibility of Evidence – First Response and Digital Investigator

UNIT 4: DATA ACQUISITION AND REPORT WRITING

Data Acquisition – Finding Lost Files – Document Analysis – Case Management and Report Writing – Building a Forensics Workstation

UNIT 5: TOOLS AND CASE STUDIES

Tools of the Digital Investigator - Licensing and Certification – Case Studies: E-mail Forensics – Web Forensics – Searching the Network – Excavating a Cloud – Mobile device Forensics.

TEXTBOOKS:

1. Michael Graves, “Digital Archaeology: The Art and Science of Digital Forensics”, Addison-Wesley Professional, 2014.
2. Darren R. Hayes, “Practical Guide to Computer Forensics Investigation”, Pearson, 2015.
3. Albert J. Marcella and Frederic Guillossou, “Cyber Forensics: From Data to Digital Evidence “ Wiley, 2015.

REFERENCE:

1. Bill Nelson, Amelia Phillips and Christopher Steuart, “Guide to Computer Forensics and Investigations”, Fourth Edition, Cengage Learning, 2013**.**

INT18R320	ESSENTIALS OF INFORMATION TECHNOLOGY	L	T	P	C
		3	0	0	3
Prerequisite	NIL				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	To know the concept of Internet, Networks and its working principles and understand the various applications related to Information Technology.				

Course Outcome(s)	
CO1	Understand the concept of website design and types of server.
CO2	Know about scripting languages.
CO3	Identify the concepts of Internet, Networks and its working principles.
CO4	Understand the concept of mobile communication.
CO5	Understand various applications related to Information Technology.

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: WEB ESSENTIALS

Creating a Website - Working principle of a Website - Browser fundamentals - Authoring tools - Types of servers: Application Server - Web Server - Database Server

UNIT 2: SCRIPTING ESSENTIALS

Need for Scripting languages - Types of scripting languages - Client side scripting - Server side scripting - PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - PHP and MySQL - PHP and HTML - Cookies - Simple PHP scripts

UNIT 3: **NETWORKING ESSENTIALS**

Fundamental computer network concepts - Types of computer networks - - Network layers - TCP/IP model - Wireless Local Area Network - Ethernet - WiFi - Network Routing - Switching - Network components.

UNIT 4: MOBILE COMMUNICATION ESSENTIALS

Cell phone working fundamentals - Cell phone frequencies & channels - Digital cell phone components - Generations of cellular networks - Cell phone network technologies / architecture - Voice calls & SMS.

UNIT 5: APPLICATION ESSENTIALS

Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications.

TEXT BOOKS:

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5" Third Edition, O'REILLY, 2014.
2. James F. Kurose, “Computer Networking: A Top-Down Approach”, Sixth Edition, Pearson, 2012.

REFERENCES:

1. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson, 2012. 2. R. Kelly Rainer , Casey G. Cegielski , Brad Prince, “Introduction to Information Systems”, Fifth Edition, Wiley Publication, 2014. 3. it-ebooks.org

INT18R321	INTERNET AND JAVA	L	T	P	C
		3	0	0	3
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	To learn the basics of Internetworking, Routing, World Wide Web, Java Programming with simple case studies.				

Course Outcome(s)

CO1	Understand the concept of Internetworking with TCP/IP
CO2	Learn routing for high speed multimedia traffic
CO3	Learn the fundamentals in WWW, HTML and XML.
CO4	Understand Java for Networking application
CO5	Understand the basic concepts in E-com, Network operating system and Web design.

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	H	M			
CO2	M	H	H	M		
CO3					M	
CO4	H	M		H		M
CO5			L		H	

Course Topic(s)

UNIT 1: INTERNETWORKING WITH TCP / IP

Review of network technologies, Internet addressing, Address resolution protocols (ARP / RARP), Routing IP datagrams, Reliable stream transport service (TCP) TCP / IP over ATM networks, Internet applications - E-mail, Telnet, FTP, NFS, Internet traffic management.

UNIT 2: INTERNET ROUTING

Concepts of graph theory, Routing protocols, Distance vector protocols (RIP), Link state protocol (OSPP), Path vector protocols (BGP and IDRP), Routing for high speed multimedia traffic, Multicasting, Resource reservation (RSVP), IP switching.

UNIT 3: WORLD WIDE WEB

HTTP protocol, Web browsers netscape, Internet explorer, Web site and Web page design, HTML, Dynamic HTML, CGI, Java script.

UNIT 4: INTRODUCTION TO JAVA

The java programming environment, Fundamental Programming structures, Objects and Classes, Inheritance, Event handling, Exceptions and Debugging, Multithreading , RMI.

UNIT 5: JAVA PROGRAMMING

Networking with Java, Swing: Applets and Applications, Menu's & Tool Bars, Java and XML – Creating packages, Interfaces, JAR files & Annotations, Javabeans, JDBC.

TEXTBOOKS

1. Douglas E.Comer, "Internetworking with TCP/IP", Vol. I: 5th edition, Pearson Education, 2007 (Unit – I &II)
2. Robert W.Sebesta, "Programming the worldwide web", 3/e, Pearson Education, 2007.

3. Steven Holzner et. al, “Java 2 Programming” , Black Book, Dreamtech Press, 2006.

REFERENCES

1. Cay S.Hortsmann, Gary Cornwell, “Core Java 2”, Vol I, Pearson Education, 7/e, 2005.
2. W. Richard Stevens, “ TCP/IP Illustrated, The Protocol” , Vol I , Pearson Education, 1st Edition, 2006.
3. Behrouz A. Farouzon , “TCP/IP Protocol Suite, 3rd edition , Tata McGraw Hill, 2007

INT18R322	R PROGRAMMING	L	T	P	C
		3	0	0	3
Prerequisite	Nil				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	The student will be able to learn • Understand what R is and what it can be used for • Why would you choose R over another tool • Troubleshoot software installs (keep your fingers crossed) • Gain familiarity with using R from within the RStudio IDE • Get to know the basic syntax of R functions • Be able to install and load a package into your R library				
Course Outcome(s)					
CO1	Familiarize themselves with R and the RStudio IDE				
CO2	Understand and use the various forms of data with R				
CO3	Access online resources for R and import new function packages into the R workspace				
CO4	Import, review, manipulate and summarize data-sets in R				
CO5	Get insight into the capabilities of the language as a productivity tool for data manipulation and statistical analyses.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT I: INTRODUCTION

Getting R, R Version, 32-bit versus 64-bit, The R Environment, Command Line Interface, RStudio, Revolution Analytics RPE, R Packages: Installing Packages, Loading Packages, Building a Package R Basics: Basic Math, Variables, Data Types, Vectors, Calling Functions, Function Documentation, Missing Data Advanced Data Structures: data frames, Lists, Matrices, Arrays

UNIT II: R DATA

Reading Data into R: Reading CSVs, Excel Data, Reading from Databases, Data from Other Statistical Tools, R Binary Files, Data Included with R, Extract Data from Web Sites Statistical Graphics: Base Graphics, ggplot2

UNIT III: R FUNCTIONS & STATEMENTS

Writing R Functions: Hello, World!, Function Arguments, Return Values, do.call Control Statements: if and else, switch, ifelse, Compound Tests Loops: for Loops, while Loops, Controlling Loops

UNIT IV: DATA MANIPULATION

Group Manipulation: Apply Family, aggregate, plyr, data.table Data Reshaping: cbind and rbind, Joins, reshape2 Manipulating Strings: paste, sprint, Extracting Text, Regular

UNIT V: R STATISTICS & LINEAR MODELING

Probability Distributions: Normal Distribution, Binomial Distribution, Poisson Basic Statistics: Summary Statistics, Correlation and Covariance, T-Tests 200, ANOVA Linear Models: Simple Linear Regression, Multiple Regression Generalized Linear Models: Logistic Regression, Poisson Model Diagnostics: Residuals, Comparing Models, Cross-Validation, Bootstrap, Stepwise Variable Selection

TEXT BOOK(S):

1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Pearson Edu. Inc., 2nd Edition, 2017

REFERENCES:

1. Christian Heumann, Michael Schomaker and Shalabh, Introduction to Statistics and Data Analysis-With Exercises, Solutions and Applications in R, Springer, 2016
2. Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit Liquet, The R Software-Fundamentals of Programming and Statistical Analysis, Springer 2013
3. Alain F. Zuur, Elena N. Ieno, Erik H.W.G. Meesters, A Beginner's Guide to R (Use R) Springer 2009

INT18R418	PROGRAMMING WITH C++ AND JAVA	L	T	P	C
		3	0	0	3
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	• To get a clear understanding of object-oriented concepts. • To understand object oriented programming through C++. • To demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance. • To make the student to become aware of the Internet Principles, Basic Web Concepts, Mark up & Scripting Languages. • To equip the student with the techniques of CGI, Socket and Server side programming for online communication and computing				

Course Outcome(s)	
CO1	Understand the object-oriented concepts. To understand object oriented programming through C++.
CO2	Understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code.
CO3	Understand Java programming concepts and utilize Java Graphical User Interface in program writing.
CO4	Understand database basics related to develop dynamic web applications and Apply XML for designing web pages.
CO5	Utilize professional level platforms (ASP, JSP, Servlets) to produce software systems/websites that meet specified user needs and constraints.Evaluate the software system/websites produced for usability, efficiency and accuracy.

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			L
CO2		H		H		
CO3						M
CO4	H	M				L
CO5			H	L		L

Course Topic(s)

UNIT 1: INTRODUCTION TO OOP, CLASS & OBJECTS

Object Oriented Programming Paradigm- Basic Concepts of OOP- Benefits of OOP- Object Oriented Languages- Features of OOP- How OOP Differ from Procedure Oriented Programming-applications of OOP-a Simple C++ Program- structure of C++ Program-basic Data Types in C++- Operators in C++ - Scope Resolution Operator- Member Dereferencing Operators- memory 31 SE-Engg&Tech-SRM-2013 management operators- Introduction of Classes-Inline member functions-Objects - Arrays of Objects- Objects as Function Arguments-Static data member and static member functions – Constructors- Parameterized Constructors-

Default Argument constructors - Copy Constructors- Destructors – Friend functions.

UNIT 2: POLYMORPHISM, TEMPLATES & EXCEPTION HANDLING

Introduction to Operator overloading- Rules for Operator overloading- overloading of binary and unary operators-Introduction to inheritance–Types of inheritance- Abstract Classes- new Operator and delete Operator- Pointers to Objects- this Pointer- Virtual Functions- Pure Virtual Functions- Introduction to Class Templates- Function Templates-Member Function Templates- Basics of Exception Handling- Types of exceptions- Exception Handling Mechanism- Throwing and Catching Mechanism- Rethrowing an Exception- Specifying Exceptions.

UNIT 3: JAVA PROGRAMMING

An overview of Java – Data Types – Variables and Arrays – Operators – Control Statements – Classes – Objects – Methods – Inheritance – Packages – Abstract classes – Interfaces and Inner classes – Exception handling – Introduction to Threads – Multithreading – String handling – Streams and I/O – Applets.

UNIT 4: WEBSITES BASICS, HTML 5, CSS 3, WEB 2.0

Web 2.0: Basics-RIA Rich Internet Applications – Collaborations tools – Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.

UNIT 5: CLIENT SIDE AND SERVER SIDE PROGRAMMING

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,- Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat WebServer;- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

TEXTBOOKS:

1. Deitel and Deitel and Nieto, “Internet and World Wide Web – How to Program”, Prentice Hall, 5thEdition,2011.

2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional, 2011.

REFERENCES:

1.Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999.

2. Chris Bates, “Web Programming – Building Intranet Applications”, 3rd Edition, Wiley Publications, 2009.

3. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.

INT18R419	NETWORK PROTOCOLS	L	T	P	C
		3	0	0	3
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	It understands the networking concepts and Multiple protocols types.				
Course Outcome(s)					
CO1	Understand the existing network architecture models and analyzes their performance.				
CO2	Understand the multiple layers of the protocol.				
CO3	Understand the high speed network protocols and design issues.				
CO4	Learn Network Security Technologies and Protocols.				
CO5	To study various protocols in wireless LAN, MAN.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M			H		M
CO3				H		
CO4	H	M		M		M
CO5			H			

Course Topic(s)

UNIT 1: FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS

Network Communication Architecture and Protocols - OSI Network Architecture seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model - Other Network Architecture Models: IBM SNA.

UNIT 2: **ROUTED AND ROUTING PROTOCOLS**

Application Layer Protocols-Presentation Layer Protocols- Session Layer Protocols - Transport Layer Protocols - Network Layer Protocols - Data Link Layer Protocols - Routing Protocols - Multicasting Protocols - MPLS.

UNIT 3: SDN AND NETWORK MANAGEMENT PROTOCOLS

Overview of ISDN − Channels − User access – Protocols Network management requirements − Network monitoring − Network control − SNMP V1, V2 and V3 − Concepts, MIBs − Implementation issues-RMON.

UNIT 4: SECURITY AND TELEPHONY PROTOCOLS

Network Security Technologies and Protocols - AAA Protocols - Tunneling Protocols - Security Protocols- Private key encryption − Data encryption system, public key encryption − RSA − Elliptic curve cryptography − Authentication mechanisms− Web security -Secured Routing Protocols - IP telephony -Voice over IP and VOIP Protocols –Signaling Protocols- Media/CODEC.

UNIT 5: NETWORK ENVIRONMENTS AND PROTOCOLS

Wide Area Network and WAN Protocols - Frame relay - ATM - Broadband Access Protocols -

PPP Protocols - Local Area Network and LAN Protocols - Ethernet Protocols - Virtual LAN Protocols - Wireless LAN Protocols - Metropolitan Area Network and MAN Protocol - Storage Area Network and SAN Protocols.

TEXT BOOK

1. Javvin, "Network Protocols" , Javvin Technologies Inc , second edition, 2005
2. William Stallings, "Cryptography and Network Security", PHI, 2000.
3. Mani Subramanian, "Network Management−Principles and Practices", Addison Wesley, 2000.

REFERENCES

1. William Stallings, "SNMP, SNMPV2, SNMPV3 and RMON1 and 2", 3rd Edition, Addison Wesley, 1999.
2. William Stallings, "Data and Computer Communications" 5th Edition, PHI, 1997.

INT18R420	HIGH SPEED NETWORKS	L	T	P	C
		3	0	0	3
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	To highlight the features of different technologies involved in High Speed Networking and their performance.				
Course Outcome(s)					
CO1	Students will get an introduction about ATM and Frame relay.				
CO2	Enable to know techniques involved to support real-time traffic and congestion control.				
CO3	Understand the concept of traffic management.				
CO4	Understand different services in network.				
CO5	Students will be provided with different levels of quality of service (Q.S) to different applications.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: HIGH SPEED NETWORKS

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFi and WiMax Networks applications, requirements – Architecture of 802.11.

UNIT 2: CONGESTION AND TRAFFIC MANAGEMENT

Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT 3: TCP AND ATM CONGESTION CONTROL

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT 4: INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT 5: PROTOCOLS FOR QOS SUPPORT **9 Hours**

RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP – Protocol Architecture – Data Transfer Protocol– RTCP.

TEXTBOOKS

1. William Stallings, "High speed networks and internet", Second Edition, Pearson Education, 2002.

REFERENCES:

1. Warland, Pravin Varaiya, "High performance communication networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., , 2001.
2. Irvan Pepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York., 2010

INT18R421	INTRODUCTION TO STORAGE MANAGEMENT	L	T	P	C
		3	0	0	3
Prerequisite	Database Management Systems (INT18R371)				
Course Category	Open Elective				
Course Type	Theory				
Objective(s)	• Understand Storage Area Networks characteristics and components. • Describe the challenges associated with data center networking and the need for switch network convergence. • Storage Area Networks including storage architectures, logical and physical components of a storage infrastructure, managing and monitoring the data center.				
Course Outcome(s)					
CO1	Identify and describe challenges in data storage and data management.				
CO2	Discuss different types of logical and physical components of a storage infrastructure.				
CO3	Understand benefits of the different network storage options for different application environments.				
CO4	Identify and analyzes the common threats in each domain.				
CO5	Know about the virtualization Techniques.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	H	H			
CO2	H	M				
CO3				L		
CO4	M			M		M
CO5	M	H	H			

Course Topic(s)

UNIT 1: INTRODUCTION TO STORAGE TECHNOLOGY

Review data creation and the amount of data being created and understand the value of data to business - challenges in data storage and data management - Solutions available or data storage - Core elements of a data center infrastructure - role of each element in supporting business activities.

UNIT 2: STORAGE SYSTEMS

Hardware and software components of the host environment - Key protocols and concepts used by each component - Physical and logical components of a connectivity environment Major physical disk - access characteristics - and performance implications

UNIT 3: NETWORKED STORAGE

Evolution of networked storage – Architecture – Components - and topologies of FC-SAN, NAS, and IP-SA Benefits of the different networked storage options -Understand the need for long-term archiving solutions

UNIT 4: DATA CENTER

List reasons for planned/unplanned outages and the impact of downtime - impact of downtime - Differentiate between business continuity (BC) and disaster recovery (DR) - RTO and RPO -

Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures - Architecture of backup/recovery and the different backup/recovery topologies- key management tasks in a data center.

UNIT 5: VIRTUALIZATION

Virtualization technologies – block-level and file-level virtualization technologies and Processes

TEXT BOOK

1. EMC, EMC Education Services, Lastemc, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", John Wiley and Sons, 2010.

REFERENCES

1. Robert Spalding, **"**Storage Networks: The Complete Reference". Tata McGraw Hill, Osborne, 2003
2. Marc Farley, "Building Storage Networks", 2nd Edition, Tata McGraw Hill, Osborne, 2001.
3. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2002.

HONOURS ELECTIVES

INT18R422	ADVANCED NETWORKS	L	T	P	C
		3	1	0	4
Prerequisite	Computer Networks (CSE18R371)				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• To explain QoS requirements and compare different approaches to QoS. • To appreciate need for high speed networks • To identify reliability issues and provide solutions				
Course Outcome(s)					
CO1	Gain an understanding of advanced networks concept.				
CO2	Describe the principles behind the enhancement in networking				
CO3	Know the recent development in networks				
CO4	Know the optical network design				
CO5	Know the virtualization.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: INTERNETWORKING

IPv6 - Design issues - Scalability - Addressing - Headers - Routing - Auto configuration - Transition from IPv4 to IPv6 - Interoperability - QoS in IPv6 - Multicast support - ICMPv6 - Security in IPv6

UNIT 2: QUALITY OF SERVICE

QoS taxonomy - Resource allocation - Scheduling - Queuing disciplines - Delay Analysis Integrated services - Differentiated services - RSVP.

UNIT 3: **MPLS AND VPN**

MPLS Architecture - MPLS to GMPLS - Traffic engineering with MPLS - QoS -Network recovery and restoration with MPLS – VPN L2 – VPN L3 .

UNIT 4: **OPTICAL NETWORKS**

Photonic Packet switching - WDM network design - Introduction to optical networks -optical layer - SONET/SDH - Optical packet switching - Client layers - Signaling protocols and network operation

UNIT 5: SOFTWARE DEFINED NETWORKING

Introduction to SDN - Network Function Virtualization - Data Plane- Control Plane - SDN software stack - Data center Traffic Management

TEXT BOOKS:

1. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Fifth Edition, Elsevier/Morgan Kaufmann Publishers, 2011.
2. Bruce S. Davie, Adrian Farrel, ―MPLS: Next Steps‖, Morgan Kaufmann Publishers, 2011.
3. Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki, "Optical Networks A Practical Perspective " ,Third Edition, Morgan Kaufmann,2010.

EFERENCES:

1. William Stallings, “High-speed networks and internets ", Second Edition Pearson Education India, 2002.
3. Ying-Dar Lin , Ren-Hung Hwang , Fred Baker , "Computer Networks: An Open Source Approach", McGraw-Hill Higher Education, 2011.

INT18R423	**AGENT BASED INTELLIGENT SYSTEMS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Prerequisite	Artificial Intelligence (INT18R311)				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• The structure of agents • The learning mechanisms of agents • The communication and cooperation within agents • The design of agents				
Course Outcome(s)					
CO1	Implement a computational agent with various searching techniques				
CO2	Apply the reasoning mechanisms of proposition and predicate logic to agents				
CO3	Use the learning mechanisms for an artificial agent.				
CO4	Execute different communication and co-operation methodologies in a multi-agent setup.				
CO5	Know about the agents design.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1			H			
CO2	M	H				
CO3			M	H	H	
CO4	H	M				M
CO5			M	M		

Course Topic(s)

UNIT 1: INTRODUCTION

Agents as a paradigm for software engineering - Agents as a tool for understanding human societies- Intelligent Agent: Agents and Objects - Agents and Expert Systems - Agents as Intentional Systems - Abstract Architectures for Intelligent Agents - How to Tell an Agent What to Do

UNIT 2: LEARNING IN AGENTS

Proportional case - Handling variables and qualifiers - Dealing with intractability - Reasoning with horn clauses - Procedural control of reasoning - Rules in production – Reasoning with Higher order Logics.

UNIT 3: **COMMUNICATION AND COOPERATION IN AGENTS**

Software tools for ontology - OWL - XML - KIF - Speech acts - Cooperative Distributed Problem Solving - Task Sharing and Result Sharing - Result Sharing - Combining Task and Result Sharing - Handling Inconsistency - Coordination - Multi agent Planning and Synchronization

UNIT 4: **DEVELOPING INTELLIGENT AGENT SYSTEMS**

Situated Agents: Actions and Percepts - Proactive and Reactive Agents: Goals and Events - Challenging Agent Environments: Plans and Beliefs - Social Agents - Agent Execution Cycle - Deciding on the Agent Types - Grouping functionalities - Review Agent Coupling - Acquaintance Diagrams - Develop Agent Descriptors

UNIT 5: **APPLICATIONS**

Agent for workflow and business process management- Mobile agents - Agents for distributed systems - agents for information retrieval and management - agents for electronic commerce - agent for human- computer interface - agents for virtual environments - agents for social simulation**.**

TEXT BOOKS:

1. Michael Wooldridge, "An Introduction to Multi Agent Systems", Second Edition, John Wiley and Sons, 2009.

2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Pearson Education, 2009.

3. Lin Padgham, Michael Winikoff, "Developing Intelligent Agent Systems: A Practical Guide", Wiley publications, 2005

REFERENCES:

1 Ronald Brachman, Hector Levesque , "Knowledge Representation and Reasoning", The Morgan Kaufmann Series in Artificial Intelligence 2004

2. Arthur B. Markman, "Knowledge Representation", Lawrence Erlbaum Associates,1998

INT18R424	**COMPUTATIONAL LINGUISTICS**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Prerequisite	Programming for Problem Solving (CSE18R171)				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• Learn about the statistical modeling and classification for NLP • Learn the basic techniques of information retrieval • Know about the basics of text mining • Learn the generic issues in speech processing and applications relevant to natural language generation				
Course Outcome(s)					
CO1	Develop applications related to speech processing.				
CO2	To know about the basic techniques of information retrieval.				
CO3	Develop applications related to text mining.				
CO4	Know about the generic issues in speech processing.				
CO5	Develop applications relevant to natural language generation				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H				
CO2	M	H				
CO3				H		
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: NATURAL LANGUAGE PROCESSING

Linguistic background - spoken language input and output technologies - Written language input - Mathematical methods - Statistical modeling and classification - Finite state methods: Grammar for NLP - Parsing - Semantic interpretation: Semantics and logical form - Ambiguity Resolution - Other strategies for semantic interpretation - Word Sense Disambiguation - Named Entity Recognition

UNIT 2: **INFORMATION RETRIEVAL**

Information Retrieval architecture - Indexing - Storage - Compression techniques - Retrieval approaches - Evaluation - Search Engines - Commercial search Engine features - comparison - Performance measures - Document processing - NLP based Information Retrieval - Information Extraction - Vector Space Model

UNIT 3: **TEXT MINING**

Categorization : Extraction based Categorization - Clustering - Hierarchical clustering - Flat Clustering - Document classification and routing - Finding and organizing answers from text search - Categories and clusters for organizing retrieval results - Text Categorization - Efficient summarization using lexical chains - Pattern extraction

UNIT 4: **GENERIC ISSUES**

Multilinguality - Multilingual Information Retrieval and Speech Processing - Multimodality- Text and Images - Modality Integration - Transmission and storage - Speech coding - Evaluation

of systems - Human factors and user acceptability.

UNIT 5: **APPLICATIONS**

Machine translation - Transfer metaphor - Interlingua and statistical approaches - Discourse processing - Dialog and conversational agents - Natural language generation - Surface Realization and discourse planning

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin, " Speech and Language Processing", Pearson Education, 2009.
2. Ronald Cole, J.Mariani, et.al, "Survey of the state of the art in human language Technology", Cambridge University Press, 1997.
3. Michael W.Berry, " Survey of Txt Mining: Clustering, Classification and Retrieval", Springer Verlag, 2004.

REFERENCES:

1. James Allen, "Natural Language Understanding", Second Edition, Pearson Education, 2008.
2. Gerald J.Kowalski, Mark. T. Maybury, " Information Storage and Retrieval systems" , Kluwer Academic Publishers, 2000.
3. Tomek Strzalkowski, " Natural Language Information Retrieval", Kluwer Academic Publishers, 2009.

INT18R425	**E-LEARNING TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Prerequisite	Nil				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• To gain knowledge about modern technology for learning. • To be acquainted with e-Learning Tools. • To learn technologies involved in e-learning application development. • To become aware of the current business potential of e-learning based business				
Course Outcome(s)					
CO1	Work with technologies involved in e-Learning Applications				
CO2	Design and Develop e-Learning Application				
CO3	Know about the E-Learning tools.				
CO4	Develop web based E-learning methods.				
CO5	Know about the learning methodology.				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	H	L	H			
CO2	M	H		H		
CO3			L	M		
CO4	M	M				M
CO5			H	M		

Course Topic(s)

UNIT 1: INTRODUCTION

Definition – Benefits – Challenges & opportunities- Developing E-learning-E-learning approachesE-learning components-Synchronous and asynchronous e-learning-Quality of e-learning-Blended learning- ROI metrics & evaluation – E-Learning cycle – Learning strategy – Business drivers – Elearning strategy.

UNIT 2: DESIGN

Identifying and organizing course content-Needs analysis- Analyzing the target audienceIdentifying course content-Defining learning objectives-Defining the course sequence-Defining instructional, media, evaluation and delivery strategies-Defining instructional methods, Defining the delivery strategy, Defining the evaluation strategy. Instructional design – Design issues – Types of learning engagements – Blended learning – Team – Infra structure – Vendor relationships.

UNIT 3: CREATING INTERACTIVE CONTENT

Multi-channel delivery – Learner support – Developing curriculum – E-learning standards – Content development process- Creating storyboards-Structure of an interactive e-lesson Techniques for presenting content-Integrating media elements-Courseware development Authoring tools-Types of authoring tools-Selecting an authoring tool.

UNIT 4: **WEB BASED TRAINING**

Definition – Need for web based training – Choosing an approach - Kind of courses –

Technical standards – Metaphors – Course framework – registration – Running the course – resources – Feedback – Access - Collaborative learning- Moodle and other open-source solutions - E-learning methods.

UNIT 5: **LEARNING METHODOLOGY**

Organizing learning sequences – Common lesson structures – Creating building blocks – Designing learning sequences – Learning activities – Test and exercise learning – Planning tests – Selecting questions – Sequencing test questions – Feedback – Improve testing – Prevent cheating.

TEXT BOOKS:

1. Clark, R. C. and Mayer, R. E. , " eLearning and the Science of Instruction". PHI 3rd edition, 2011

2. Means, B., Toyama, Y., and Murphy, R. "Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies", 2010

REFERENCES:

1 Crews, T. B., Sheth, S. N., and Horne, T. M "Understanding the Learning Personalities of Successful Online Students" Educause Review. Jan/Feb 2014.

2. Madhuri Dubey,‖Effective "E-learning Design,Development and Delivery",University Press 2011.

INT18R426	HETEROGENEOUS COMPUTING	L	T	P	C
		3	1	0	4
Prerequisite	Computer Architecture and Organization (CSE17R174)				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• To learn about the development of massively parallel systems • To learn about the challenges in heterogeneous processing systems • Learn to program heterogeneous systems • Learn to provide effective parallel solutions for GPGPU architectures				
Course Outcome(s)					
CO1	Identify parallelism in an application				
CO2	Choose the right parallel processing paradigm for a given problem				
CO3	Devise solutions for an application on a heterogeneous multi-core platform				
CO4	Program using CUDA and Open MP				
CO5	Know about the effective parallel solutions for GPGPU architectures				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			
CO2	M	H				
CO3						
CO4	H	M				M
CO5			H			

Course Topic(s)

UNIT 1: PARALLEL COMPUTING BASICS

Importance of parallelism – Processes, tasks and threads - Modifications to von-Neumann model – ILP, TLP - Parallel hardware – Flynns classification – Shared memory and distributed memory architectures - Cache Coherence - Parallel software – Performance – Speedup and scalability – Massive parallelism - GPUs - GPGPUs

UNIT 2: SHARED MEMORY PROGRAMMING WITH OpenMP

OpenMP program structure - OpenMP Clauses and directives – Scheduling primitives – Synchronization primitives – Performance issues with caches - Case study – Tree Search

UNIT 3: PROGRAMMING GPUS

GPU architectures - Data parallelism - CUDA Basics – CUDA program structure - Threads, Blocks, Grids - Memory handling

UNIT 4: **PROGRAMMING WITH CUDA**

Parallel patterns – Convolution – Prefix sum – Sparse matrix-vector multiplication – Imaging case study

UNIT 5: **OTHER GPU PROGRAMMING PLATFORMS**

Introduction to Open CL – Open ACC – C++AMP – Thrust – Programming Heterogeneous clusters – CUDA and MPI

TEXT BOOKS:

1. Peter Pacheco, ―Introduction to parallel programming‖, Morgan Kauffman, 2011.
2. David B. Kirk, Wen-mei W. Hwu, ―Programming massively parallel processors‖, Morgan

Kauffman, 2013, 2nd Edition

REFERENCES:

1. Shane Cook, ―CUDA Programming – A developers guide to parallel computing with GPUs‖, Morgan Kauffman, 2013.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, ― Heterogeneous computing with OpenCL‖, Morgan Kauffman, 2012.

INT18R427	**PATTERN RECOGNITION**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Prerequisite	Data Warehousing and Mining (INT18R353)				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• To know about supervised and unsupervised Learning. • To study about feature extraction and structural pattern recognition. • To explore different classification models. • To learn about fuzzy pattern classifiers and perception				
Course Outcome(s)					
CO1	Classify the data and identify the patterns				
CO2	Extract feature set and select the features from given data set.				
CO3	Learn about feature extraction and structural pattern recognition				
CO4	Know about the different classification models				
CO5	Know about fuzzy pattern classifiers and perception				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			L
CO2	M					M
CO3			M		H	
CO4	H	M	L			M
CO5			H		M	H

Course Topic(s)

UNIT 1: PATTERN CLASSIFIER

Overview of Pattern recognition – Discriminant functions – Supervised learning – Parametric estimation – Maximum Likelihood Estimation – Bayesian parameter Estimation – Problems with Bayes approach– Pattern classification by distance functions – Minimum distance pattern classifier.

UNIT 2: CLUSTERING

Clustering for unsupervised learning and classification – Clustering concept – C Means algorithm – Hierarchical clustering – Graph theoretic approach to pattern Clustering – Validity of Clusters.

UNIT 3: **FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION**

KL Transforms – Feature selection through functional approximation – Binary selection - Elements of formal grammars - Syntactic description - Stochastic grammars - Structural representation.

UNIT 4: **HIDDEN MARKOV MODELS AND SUPPORT VECTOR MACHINE**

State Machines – Hidden Markov Models – Training – Classification – Support vector Machine – Feature Selection.

UNIT 5: **RECENT ADVANCES**

Fuzzy logic – Fuzzy Pattern Classifiers – Pattern Classification using Genetic Algorithms – Case Study Using Fuzzy Pattern Classifiers and Perception.

TEXT BOOKS:

1. M. Narasimha Murthy and V.Susheela Devi, ―Pattern Recognition‖, Springer 2011. 2. S.Theodoridis and K.Koutroumbas, ―Pattern Recognition‖, 4th Edition., Academic Press, 2009

REFERENCES:

1.Robert J.Schalkoff, ―Pattern Recognition Statistical, Structural and Neural Approaches‖, John Wiley & Sons Inc., New York, 1992.
2. C.M.Bishop,―Pattern Recognition and Machine Learning‖, Springer, 2006.
3. R.O.Duda, P.E.Hart and D.G.Stork, ―Pattern Classification‖, John Wiley, 2001.
4. Andrew Webb, ―Stastical Pattern Recognition‖, Arnold publishers, London, 1999.

INT18R428	**VISUALIZATION TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**
Prerequisite	Artificial Intelligence (INT18R311)				
Course Category	Honours Elective				
Course Type	Theory				
Objective(s)	• To learn about the importance of data visualization. • To know the different types of visualization techniques. • To create various visualizations				
Course Outcome(s)					
CO1	Compare various visualization techniques.				
CO2	Design creative visualizations				
CO3	Apply visualization over different types of data.				
CO4	Study about types of visualization.				
CO5	Create various visualizations				

Mapping of COs with ABET SOs

CO\SO	SO1	SO2	SO3	SO4	SO5	SO6
CO1	M	H	H			H
CO2	M	H		M	M	
CO3	H					M
CO4	H	M		L	H	M
CO5			H			H

Course Topic(s)

UNIT 1: INTRODUCTION

Introduction – Issues – Data Representation – Data Presentation – Common Mistakes in design.

UNIT 2: FOUNDATIONS FOR DATA VISUALIZATION

Visualization stages – Experimental Semiotics based on Perception Gibson_s Affordance theory – A Model of Perceptual Processing – power of visual perception-Types of Data-visualization and data objects.

UNIT 3: **COMPUTER VISUALIZATION**

Non-Computer Visualization – Computer Visualization: Exploring Complex Information Spaces – Fisheye Views – Applications – Comprehensible Fisheye views – Fisheye views for 3D data – Interacting with visualization

UNIT 4: **MULTIDIMENSIONAL VISUALIZATION**

One Dimension – Two Dimensions – Three Dimensions – Multiple Dimensions – Trees – Web Works – Data Mapping: Document Visualization – Workspaces.

UNIT 5: **CASE STUDIES**

Small interactive calendars – Selecting one from many – Web browsing through a key hole – Communication analysis – Archival analysis

TEXT BOOKS:

1. Colin Ware, ―Information Visualization Perception for Design‖ Margon Kaufmann Publishers, 2004, 2nd edition.

2. Robert Spence ―Information visualization – Design for interaction‖, Pearson Education, 2 nd Edition, 2007

3. Stephen Few, ―Information Dashboard Design-The Effective Visual Communication of Data‖: O'Reilly Media Publisher,1st Edition 2006

REFERENCES:

1.Stuart.K.Card, Jock.D.Mackinlay and Ben Shneiderman, ―Readings in Information Visualization Using Vision to think‖, Morgan Kaufmann Publishers. 2008

KALASALINGAM
ACADEMY OF RESEARCH & EDUCATION
(DEEMED TO BE UNIVERSITY)

Under sec. 3 of UGC Act 1956. Accredited by NAAC with "A" Grade

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