MODEL CURRICULUM

FOR

UNDERGRADUATE DEGREE COURSES

IN

COMPUTER SCIENCE & ENGINEERING

DEPARTMENT (AI/ML)

(2022 Onwards)

SAI SCHOOL OF ENGINEERING AND TECHNOLOGY

SRI SAI UNIVERSITY, PALAMPUR

HIMACHAL PRADESSH-176081

www.srisaiuniversity.org

SCHEME OF NEW COURSE

BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE & ENGINEERING

AI/ML

SEMESTER-WISE CREDIT DISTRIBUTION

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical(Lab)/week	1 credit

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES

Sl. No	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	HSMC-201	English	2	0	2	2	2
2	HSMC-401	Management-I (Organizational Behaviour/ Finance & Accounting)	3	0	0	3	4
					Total Credits:	**5**	

BASIC SCIENCE COURSE [BSC]

Sl. No	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	PH-101A	Physics-I (Semiconductor, Waves and Optics)	3	1	3	5.5	1
2	AMCSE-101	Mathematics-I (Calculus and Linear Algebra)	3	1	0	4	1
3	AMCSE- 201	Mathematics-II (Probability and Statistics)	3	1	0	4	2
4	CH-201	Chemistry-I	3	1	3	5.5	2
5	AMCSE-301	Mathematics-III (Differential Calculus)	3	0	0	3	3
					Total Credits:	**22**	

ENGINEERING SCIENCE COURSE [ESC]

Sl. No	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	BEE-101	Basic Electrical Engineering	3	1	2	5	1
2	ME-101P	Engineering Graphics & Design	1	0	4	3	1
3	ME-201P	Workshop/Manufacturing Practices	1	0	4	3	2
4	ECE-302	Digital System Design	3	0	0	3	3
5	CSE-501	Web and Internet Technology	3	0	4	5	5

Total Credits:	**19**	

PROFESSIONAL CORE COURSES [PCC]

Sl. No	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	CSE 201	Programming for Problem Solving	3	0	2	4	2
2	CSE-301	Data Structure & Algorithms	3	0	4	5	3
3	CSE-303	Object oriented Programming	3	0	4	5	3
4	CSE-401	Discrete Mathematics	3	1	0	4	4
5	CSE-402	Computer Organization and Architecture	3	0	2	4	4
6	CSE-403	Operating Systems	3	0	4	5	4
7	CSE-404	Design and Analysis of Algorithms	3	0	2	4	4
8	CSE-502	Database Management Systems	3	0	4	5	5
9	CSE-503	Formal Language and Automata Theory	3	0	0	3	5
10	CSE-504	Software Engineering	3	0	0	3	5
11	CSE-601	Programming in Java	3	0	4	5	6
12	CSE-602	Computer Graphics	3	0	4	5	6
					Total Credits	**52**	

IBM COLLABORATED COURSE IN AI/ML

Sl. No	Code No.	Course Title	Hours per week			Total Credits	Semester
			Lecture	Tutorial	Practical		
1	**CSE -101**	Introduction to Python Programming	3	0	4	5	1
2	**CSE -202**	Introduction to AI/ML	3	0	0	3	2
3	**CSE-304**	Machine Learning	3	0	2	4	3
4	**CSE-405**	Deep Learning	3	0	2	4	4
5	**CSE-508**	Computational Linguistics and Natural Language Processing	3	0	2	4	5
6	**CSE-614**	Pattern Recognition and Anomaly Detection	3	0	2	4	6
7	**CSE-714**	Application of Machine Learning in Industries	3	0	2	4	7
8	**PROJCSE-802**	Project	0	0	12	6	8
					Total Credits:	**34**	

PROFESSIONAL ELECTIVE [PEC]

Sl. No	Course Title	Hours per week			Total Credits	Semester
		Lecture	Tutorial	Practical		
1	Elective – I	3	0	0	3	5
2	Elective-II	3	0	0	3	6
3	Elective-III	3	0	0	3	6
4	Elective-IV	3	0	0	3	7
				Total Credits	**12**	

OPEN ELECTIVE COURSES [OEC]

Sl. No	Course Title	Hours per week			Total Credits	Semester
		Lecture	Tutorial	Practical		
1	Open Elective – I	3	0	0	3	6
2	Open-Elective-II	3	0	0	3	7
3	Open-Elective-III	3	0	0	3	8
4	Open-Elective-IV	3	0	0	3	8
				Total Credits:	**12**	

LIST OF PROFESSIONAL ELECTIVES

ELECTIVE- I

ECE-404	Signals & Systems
ECE-601	Digital Signal Processing
CSE-507	Introduction to Emerging Technologies
CSE-506	Signals and Networks

ELECTIVE- II

CSE-603	Computer Networks
CSE-604	Computational Geometry
CSE-605	Neural Networks and Deep Learning
ECEL-03	Information Theory and Coding

ELECTIVE- III

CSE-607	Compiler Design
ECEL-18	Embedded Systems
CSE-608	Cloud Computing
CSE-609	Soft Computing

ELECTIVE- IV

CSE-702	Distributed Systems
CSE-703	Ad-Hoc and Sensor Networks
CSE-704	Internet-of-Things
CSE-713	Advanced Web Development

LIST OF OPEN ELECTIVES

OPEN ELECTIVE- I

CSE-611	System Programming
CSE-612	Introduction to Philosophical Thoughts
CSE-613	Multimedia Technology

OPEN ELECTIVE- II

CSE-710	Cyber Law and Ethics
CSE-711	Soft Skills and Interpersonal Communication
CSE-712	Management Information System

OPEN ELECTIVE- III

CSE-805	Linux Administration and Shell Programming
CSE-806	History of Science and Engineering
CSE-807	Comparative Study of Literature

4-YEAR CURRICULUM STRUCTURE FOR IBM COLLABORATED COURSE

AI/ML IN BACHELOR OF TECHNOLOGY (COMPUTER SCIENCE AND ENGG)

Total Credits (4-Year Course): 164

It is a Graduate (UG) Programme of 4 years duration (8 semesters).

Semester I (First year] Curriculum

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
PH-101A	Basic Science Course	Physics-I (Semiconductor, Waves and Optics)	3	1	0	40	60	100	4
PH-101A (P)	Basic Science Course	Physics-I (Semiconductor, Waves and Optics) Laboratory	0	0	3	30	20	50	1.5
ME-101P	Engineering Science Course	Engineering Graphics & Design	1	0	4	40	60	100	3
AMCSE-101	Basic Science Course	Mathematics-I (Calculus & Linear Algebra)	4	0	0	40	60	100	4
BEE-101	Engineering Science Course	Basic Electrical Engineering	3	1	0	40	60	100	4
BEE-101(P)	Engineering Science Course	Basic Electrical Engineering Laboratory	0	0	2	30	20	50	1
CSE -101	**IBM Professional Core Course**	**Introduction to Python Programming**	**3**	**0**	**0**	**40**	**60**	**100**	**3**
CSE -101(P)	**IBM Professional Core Course**	**Introduction to Python Programming Laboratory**	**0**	**0**	**4**	**30**	**20**	**50**	**2**
TOTAL			**14**	**2**	**13**	**290**	**360**	**650**	**22.5**

Semester II (First year] Curriculum

Course Code	Course Type	Course Title	Load Allocations			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
AMCSE-201	Basic Science Course	Mathematics-II (Probability and Statistics)	4	0	0	40	60	100	4
CH-201	Basic Science Course	Chemistry-I	3	1	0	40	60	100	4
CH-201 (P)	Basic Science Course	Chemistry-I Laboratory	0	0	3	30	20	50	1.5
ME-201P	Engineering Science Courses	Workshop / Manufacturing Practices	1	0	4	60	40	100	3
HSMC-201	Humanities and Social Sciences including Management courses	English	3	0	0	40	60	100	3
ENV-AE021	Mandatory Courses	Environmental Sciences	3	0	0	-	-	-	0
CSE-201	Engineering Science Courses	Programming for Problem Solving	3	0	0	40	60	100	3
CSE-201P	Engineering Science Courses	Programming for Problem Solving Lab	0	0	2	30	20	50	1
CSE-202	**IBM Professional Core Course**	**Introduction to AI/ML**	**3**	**0**	**0**	**40**	**60**	**100**	**3**
		TOTAL	**20**	**1**	**9**	**320**	**380**	**700**	**22.5**

Semester III (Second year] Curriculum

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credi
			L	T	P	Internal	External		
ECE-302	Engineering Science Course	Digital System Design	3	0	0	40	60	100	3
CSE-301	Professional Core Courses	Data Structure & Algorithms	3	0	0	40	60	100	3
AMCSE-301	Basic Science Course	Mathematics-III (Differential Calculus)	4	0	0	40	60	100	4
ECE-302P	Engineering Science Course	Digital System Design Lab	0	0	2	30	20	50	1
CSE-301P	Professional Core Courses	Data Structure & Algorithms Lab	0	0	4	30	20	50	2
CSE-303	Professional Core Courses	Object Oriented Programming	3	0	0	40	60	100	3
CSE-303P	Professional Core Courses	Object Oriented Programming Laboratory	0	0	4	30	20	50	2
CSE-304	**IBM Professional Core Course**	**Machine Learning**	**3**	**0**	**0**	**40**	**60**	**100**	**3**
CSE-304(P)	**IBM Professional Core Course**	**Machine Learning Laboratory**	**0**	**0**	**2**	**30**	**20**	**50**	**1**
Total			**16**	**0**	**10**	**320**	**380**	**700**	**22**

Semester IV (Second year] Curriculum

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
CSE-401	Professional Core Courses	Discrete Mathematics	3	1	0	40	60	100	4
CSE-402	Professional Core Courses	Computer Organization & Architecture	3	0	0	40	60	100	3
CSE-403	Professional Core Courses	Operating Systems	3	0	0	40	60	100	3
CSE-404	Professional Core Courses	Design & Analysis of Algorithms	3	0	0	40	60	100	3
HSMC-401	Humanities & Social Sciences including Management Courses	Management-I (Organizational Behaviour/ Finance & Accounting)	3	0	0	40	60	100	3
CSE-403P	Professional Core Courses	Operating Systems Lab	0	0	4	30	20	50	2
CSE-404P	Professional Core Courses	Design & Analysis of Algorithms Lab	0	0	2	30	20	50	1
CSE-405	**IBM Professional Core Course**	**Deep Learning**	**3**	**0**	**0**	**40**	**60**	**100**	**3**
CSE-405(P)	**IBM Professional Core Course**	**Deep Learning Laboratory**	**0**	**0**	**2**	**30**	**20**	**50**	**1**
Total			**18**	**1**	**8**	**330**	**420**	**750**	**23**

Semester V (Third year] Curriculum

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
CSE-501	Engineering Science Course	Web and Internet Technology	3	0	0	40	60	100	3
CSE-502	Professional Core Courses	Database Management Systems	3	0	0	40	60	100	3
CSE-503	Professional Core Courses	Formal Language & Automata Theory	3	0	0	40	60	100	3
CSE-504	Professional Core Courses	Software Engineering	3	0	0	40	60	100	3
MC	Mandatory Courses	Constitution of India/ Essence of Indian Traditional Knowledge	3	0	0	-	-	-	0
CSE-501P	Engineering Science Course	Web and Internet Technology Lab	0	0	4	30	20	50	2
CSE-502P	Professional Core Courses	Database Management Systems Lab	0	0	2	30	20	50	1
CSE-508	**IBM OFFERED COURSE**	**Computational Linguistics and Natural Language Processing**	3	0	0	40	60	100	3
CSE-508P	**IBM OFFERED COURSE**	**Computational Linguistics and Natural Language Processing LABORATORY**	0	0	2	30	20	50	1
Total			**18**	**0**	**8**	**290**	**360**	**650**	**19**

Semester VI (Third year] Curriculum

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
CSE-601	Professional Core Courses	Programming in Java	3	0	0	40	60	100	3
CSE-602	Professional Core Courses	Computer Graphics	3	0	0	40	60	100	3
	Professional Elective Courses	Elective-I	3	0	0	40	60	100	3
PROJCSE-601	Project	Project-1	0	0	6	60	40	100	3
CSE-601P	Professional Core Courses	Programming in Java Lab	0	0	4	30	20	50	2
CSE-602P	Professional Core Courses	Computer Graphics Lab	0	0	4	30	20	50	2
CSE-614	**IBM OFFERED COURSE**	**Pattern Recognition and Anomaly Detection**	3	0	0	40	60	100	3
CSE-614P	**IBM OFFERED COURSE**	**Pattern Recognition and Anomaly Detection LABORATORY**	0	0	2	30	20	50	1
Total			**12**	**0**	**16**	**310**	**340**	**650**	**20**

*** The students will take 6-8 weeks summer training in Industry after Semester-6th.**

Semester VII (Fourth year] Curriculum

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
	Professional Elective Courses	Elective-II	3	0	0	40	60	100	3
	Professional Elective Courses	Elective-III	3	0	0	40	60	100	3
	Open Elective Courses	Open Elective-I	3	0	0	40	60	100	3
PROJCSE-701	Project	Project-II	0	0	12	100	50	150	6
ITCSE- 701	Professional Training	Industrial Training	-	-	-	60	40	100	2
CSE-714	**IBM OFFERED COURSE**	**APPLICATION OF MACHINE LEARNING IN INDUSTRIES**	3	0	0	40	60	100	3
CSE-714P	**IBM OFFERED COURSE**	**APPLICATION OF MACHINE LEARNING IN INDUSTRIES LABORATORY**	0	0	2	30	20	50	1
Total			**12**	**0**	**14**	**350**	**350**	**700**	**21**

Semester VIII (Fourth year] Curriculum

Course Code	Type of Course	Course Title	Hours per Week			Marks Distribution		Total Marks	Credits
			L	T	P	Internal	External		
	Professional Elective Courses	Elective-IV	3	0	0	40	60	100	3
	Open Elective Courses	Open Elective-II	3	0	0	40	60	100	3
	Open Elective Courses	Open Elective-III	3	0	0	40	60	100	3
PROJCSE-802	**IBM OFFERED COURSE**	**PROJECT**	0	0	12	100	50	150	6
Total			**9**	**0**	**12**	**220**	**230**	**450**	**15**

B.Tech C.S.E

1st SEMESTER

L	T	P
3	1	0

PH-101 A: Physics-I (Semiconductor, Waves and Optics)

Course Objectives	• Learn the basics of wave motion. • Know about the behavior of light due to its wave nature. • Identify and understand different phenomena due to the interaction of light with light and matter. • Know about the semiconductor materials and laser content.
Course Outcomes	• Enable the students to analyze different phenomena due to the interaction of light with light and matter. • Train the students to use different optical instruments. • Develop the ability to apply it in solving simple problems in Quantum Mechanics (QM), structure of atoms, Laser, and electronic material. • Describe the properties of materials and application of semiconductor electronics

DETAILED CONTENT

Module 1: Faraday's law

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

Module2: Electronic material & Semiconductor

Free electron theory of metals, Density of states in 1D,2D and 3D, Bloch's theorem for particles in a periodic potential, Energy band diagram, kroning penny model, Energy band in solids, E-k diagr, Direct and indirect band gap, Types of electronic material, metal, semiconductor, and insulators, occupation probability, Fermi level, Effective mass.

Intrinsic and extrinsic semiconductor, Dependence of fermi level on carrier concentration and temperature (equilibrium carrier statistics), carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction.

Module 3: Wave nature of particles and the Schrodinger equation

Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

Module 4: Wave optics

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer,

Mach-Zehnder interferometer. Farunh offer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Module 5: Lasers

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Suggested Reference Books

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. Mechanics — JP Den Hartog
4. Engineering Mechanics - Dynamics, 7th ed. - JL Meri
5. A. Ghatak, Optics
6. O. Svelto, Principles of Laser
7. David Griffiths, Introduction to Electrodynamics

L	T	P
0	0	3

PH-101A (P): Physics-I (Semiconductor, Waves and Optics) Laboratory

List of Practical's

1) To determine the V-I characteristics of Solar cell.
2) To determine the wavelength of He-Ne Laser by using diffraction grating.
3) To determine the value of Plank's constant (h) using by stopping potential of different filters.
4) To study laser interference using Michelson's Interferometer.
5) To determine the V-I characteristics of PN junction diode.
6) To analyze the suitability of a given Zener diode as voltage regulator.
7) To determine the wavelength of sodium light by Newton's rings method.
8) To find energy band gap of the semiconductor material by using the four probe method.
9) To find out the intensity response of a LED.

L	T	P
3	1	0

AMCSE-101: Mathematics –I (Calculus & Linear Algebra)

Course Objectives	The objective of this course is to familiarize the prospective engineers with technique in basic calculus and linear algebra. It aim to equip the students with standard concept and tools at an intermediate to advanced level that will serve them towards tacking more advanced level of mathematics and application that they would find useful in their discipline.
Course Outcomes	The students will be able to:- • To apply differential and integral calculus to motion and curvature and to improper integral. • Apart from various application they will have a basic understanding of beta and gamma function. • Find essential tools of matrix and linear algebra including linear transformation, • To solve linear transformation problem, rank and kernel of a linear map.

DETAILED CONTENT

Module 1: Calculus: 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.

Module 2: Calculus:

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

Module 3: Matrices

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

Module 4: Vector spaces

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range
and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank-nullity theorem,
composition of linear maps, Matrix associated with a linear map.

Module 5: Vector spaces

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbases.Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.

L	T	P	
3	1		0

BEE- 101: Basic Electrical Engineering

Course Objectives	• Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context. • Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices. • To explain the working principle, construction, applications of DC machines, AC machines & measuring instruments. • Highlight the importance of transformers in transmission and distribution of electric power.
Course Outcomes	At the end of the course, the student will be able to • To understand and analyze basic electric and magnetic circuits. • To study the working principles of electrical machines. • Identify the type of electrical machine used for that particular application. • To introduce the components of low voltage electrical installations.

DETAILED CONTENTS

Module 1 : DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, realpower, reactive power, apparent power, power factor. Analysis of single-phase ac circuitsconsisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Threephase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Magnetic fields and magnetic circuits (6 hours)

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and BiotSavart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.BH characteristics,

Module4:Transformers &Electrical Machines (13 hours)

Transformers :Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Electrical Machines: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 5: Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types ofWires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries.Elementary calculations for energy consumption, power factor improvement and batterybackup.

Text Books

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

Reference Books

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press,2011.
2. AbhijitChakrabarti, SudiptaNatha&Chandan Kumar Chand, "Basic Electrical Engineering"Tata McGraw Hill, 2009.

L	T	P
0	0	2

BEE- 101P: Basic Electrical Engineering Laboratory

LIST OF EXPERIMENTS

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.

3. Verification of Kirchhoff's Current Law.
4. Verification of Kirchhoff's Voltage Law.
5. Study and verification of the Norton's theorem.
6. Study and verification of the Superposition theorem.
7. Study and verification of the Thevnin's theorem.
8. Study of the polarity test on single phase transformer.
9. Study of transformation ratio and turns ratio of single phase transformer.
10. Study of single phase induction motor.
11. .Study of running and reversing of single phase induction motor.
12. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.

Note: Students are expected to perform about 10 experiments from the following list.

ME- 101: Engineering Graphics & Design

L	T	P
1	0	4

Course Objectives	• Introduction to engineering design and its place in society • Exposure to the visual aspects of engineering design • Exposure to engineering graphics standards • Exposure to solid modeling • Exposure to computer-aided geometric design • Exposure to creating working drawings • Exposure to engineering communication
Course Outcomes	• To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability • To prepare you to communicate effectively • To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

DETAILED CONTENT

Traditional Engineering Graphics:
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.
Computer Graphics:
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

Module 1: Introduction to Engineering Drawing &Orthographic Projections

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module 2: Projections of Regular Solids , Sections and Sectional Views of Right Angular Solids

Those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional

orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 3: Isometric Projections, Overview of Computer Graphics

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions; listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids

Module 4: Customization & CAD Drawing, Annotations, layering & other functions

consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; Applying dimensions to objects, applying annotations to drawings; Setting up and use of layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models.Part editing and two-dimensional documentation of models.Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Module 5: Demonstration of a simple team design project that illustrates

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerance; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Suggested Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. &Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

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CSE 101 – Introduction to Python Programming

Course Objectives	• To understand why Python is a useful scripting language for developers. • To learn how to design and program Python applications. • To learn how to use lists, tuples, and dictionaries in Python programs. • To learn how to identify Python object types.
Course Outcomes	• understand and use variables. • work with common Python data types like integers, floats, strings, characters, lists, dictionaries, as well as pandas DataFrames. • use basic flow control, including for loops and conditionals. • read data from text files.

Unit 1. Python Basics

Introduction to programming languages, Python as a programming language, History of python, Python versions, Python installation, Environmental variables, Environmental variables in Windows operating system, Add python to Windows path, Executing python from the command line, Invoking python IDLE, Python documentation, Getting help, Dynamic types, Python reserved words, Naming conventions, Character set, Comments, Identifiers, Data types, Operators, Assigning values to variables, Type conversions, String methods, Simple output, Output formatting with "format", Simple input: Input function, Mutable vs immutable objects in python, Lists: Create and access, Lists: Modify and slice, Lists: Operations, Lists: Methods, Sets: Create and operations, Sets: Operators and methods, Sets: Frozenset, Sets: Methods, Tuples: Create and access, Tuples: Slice and alteration, Dictionaries: Create and access, Dictionaries: Modify and delete, Dictionaries: Methods, Copying collections: Shallow, Copying collections: Deep.

Unit 2. Language Concepts

Indenting requirements, Control statements, Decision making statement: If statement, If statement, If-else statement, Implementation, If-elif-else statement, Implementation, Decision making statement: Nested if-else statement, Nested if-else statement, Implementation, Iteration statements: While loop, While loop, Implementation, Iteration statements: While loop with else, While loop with else, Implementation, Iteration statements: For loop, For loop, Implementation, For loop range function with else, Implementation, For loop with object sequences, Nested for loops, Implementation, Break statement, Implementation, Continue statement, Implementation, Functions, Functions: Built in functions, Functions: User-defined functions, Calling a function, Returning a value from the function, Implementation, Scope or lifetime of variables, Creation and

usage of global variables, Creation and usage of nonlocal variables, Passing collections to a function, Variable number of arguments, Implementation, Keyword arguments, Optional parameters, Default parameters, Nested functions, Recursive functions, Advantage and disadvantage, Passing functions to a function, map() function, filter() function, Lambda functions.

Unit 3. OOP, Exceptions and I/O

Object-oriented programming concepts, Class and object, Abstraction and encapsulation, Inheritance, Polymorphism, Classes in Python, Creating objects: Instance methods, Implementation, Memory management, Constructors, Constructors with parameters, Optional parameters in constructor, Deleting attributes and objects, Special methods, Class variables, Inheritance, Accessing base class element in derived class, Single inheritance, Multi-level inheritance, Multiple inheritance, Method Resolution Order (MRO), Access modifiers, Polymorphism, Operator overloading, Method overloading, Method overriding, Python errors: Syntax errors, Built-in exceptions, Exception handling, Simple exceptions, Multiple exceptions, Using else and finally, Raise an exception, Assert statement, Data streaming and buffering: Serial data, I/O streams and buffers, Access modes, File open, File close, Exceptions in file, Writing to files, Reading from files, seek() and tell() methods, readline() and readlines() methods, Renaming and deleting files.

Unit 4. Modules and Regular Expressions

Modules, Modularization, Abstraction versus modularization, Modules in Python, Using modules in Python code, Import statement variances, Module search path, Loading and reloading of modules, dir() function, Python built-in modules: sys, Python built-in modules: math, Methods in module math, Python built-in modules: date time, Python built-in modules: random, Regular expressions, Special sequences, Character classes in RegEx, Regular expression methods, Implementation, re.split(), Implementation, re.sub(), Implementation, re.subn(), re.search(), re.compile(), Implementation, Match object, Implementation, Raw string with “r” or “R” prefix, RegEx quantifiers, RegEx greedy match, RegEx non-greedy match, Greedy vs non-greedy match, RegEx flags.

Unit 5. Data Structures, GUI and CGI

Abstract data structures, Primitive data structure, Non-primitive data structures, List comprehensions, Accessing elements, Performing operations, Comprehension using If, Comprehension If-else, Nested list comprehensions, Dictionary comprehensions, Accessing elements, Performing operations, Comprehension using zip(), Comprehension for lambda functions, Nested dictionary comprehensions or dictionaries with compound values, Processing lists in parallel, Time functionality: Big O notation, Case scenarios, Time complexity in python collections, GUI in Python, Components and events, GUI example, Widgets, Attributes for widgets, Label widget, Button widget, Image button, Entry widget, Combo box widget, Check button widget, Radio button widget, Canvas widget, Frame widget, Message box widget, Message widget, Menu widget, Methods, Menu button, Implementation, CGI basics, Configuring CGI, HTML form elements, Form structure, Python and CGI program, CGI scripts, HTTP headers and

environment variables, GET method, POST method, Complete CGI code, Advantages and disadvantages.

Unit 6. Python Applications

OS methods, Environment methods, Directory methods, File methods, Implementation, Implementation, Serialization and deserialization, The pickle module, Pickling and unpickling: Dictionary, Protocol formats, Picklable vs unpicklable types, Serializing attribute connections, Pickle exceptions, Networking fundamentals, Basic communication model, Network topologies, RING topology, STAR topology, MESH topology, TREE topology, Transmission mediums and modes, The client/server model, Client interaction with server, The socket module, The server-side, The client-side, Threaded server, Numpy: Overview, Numpy: Setup, Datatypes, Numpy: Basic operations, Binary operations, NumPy operations, Slicing and indexing, Broadcasting, Matrix operators, Iteration order in multi-dimensional array, Array values modification, External loop in multi-dimensional array, Broadcast iteration, Matplotlib, Plot methods in Matplotlib, Image design functions, Axis functions, Figure functions, Simple plots, Basic plots, Matplotlib options, Matplotlib: Multi plots, 3D plots, Data processing with pandas, Invalid value, Processing strings, Indexing and selecting data, iloc(): Integer based, Column name access, Group-by operations, Iterating through groups, Aggregation, Transformations, Filtration`.

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CSE 101P – Introduction to Python Programming Lab

Lab Exercises –

Exercise 1: Pythagorean Triplets

Exercise 2: Reverse a Given Number

Exercise 3: Check if a Number is an Armstrong Number

Exercise 4: Print "n" Natural Numbers

Exercise 5: Remove Vowels and Punctuation

Exercise 6: Count the number of strings

Exercise 7: Tuple Sorting

Exercise 8: List Generation

Exercise 9: Merge dictionaries

Exercise 10: Second lowest grade

Exercise 11: Convert a roman numeral to an integer

Exercise 12: Parenthesis Validity

Exercise 13: Calculate student Grades

Exercise 14: Create Address Book

Exercise 15: Implement Calculator

Exercise 16: Greatest Common Divisor (GCD)

Exercise 17: Expression Evaluation

Exercise 18: Dictionary Grouping

Exercise 19: Machine Value Conversion

Exercise 20: GUI using Tk Interface

Exercise 21: Calculator - GUI

Exercise 22: OS Module – System Services

Exercise 23: OS Module – File Services

Exercise 24: Socket programming

Exercise 25: Array operations – Numpy

Exercise 26: Charts – Matplotlib

Exercise 27: File Operation on Excel

B.Tech C.S.E

2nd SEMESTER

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CH-201: Chemistry-I

Course Objectives	• This syllabus aims at bridging the concepts and theory of chemistry with examples from fields of practical application, thus reinforcing the connection between science and engineering. • It deals with the basic principles of various branches of chemistry which are fundamental tools necessary for an accomplished engineer.
Course Outcomes	On completion of the course, the student will be able to: • The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications • Quantum theory is more than 100 years old and to understand phenomena at nanometer levels; one has to base the description of all chemical processes at molecular levels. The course will enable the student to: • Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. • Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques. • Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity. • List major chemical reactions that are used in the synthesis of molecules

DETAILED CONTENT

Module 1:Atomic and molecular structure

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations.Molecular orbitals of diatomic molecules and plots of the multicenter orbitals.Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pimolecular orbitals of butadiene and benzene and aromaticity.Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.Band structure of solids and the role of doping on band structures.

Module 2: Spectroscopic techniques and applications

Principles of spectroscopy and selection rules.Electronic spectroscopy.Fluorescence and its applications in medicine.Vibrational and rotational spectroscopy of diatomic molecules.Applications.Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques.Diffraction and scattering.

Intermolecular forces and potential energy surfaces

Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on these surfaces.

Module 3: Use of free energy in chemical equilibria

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Waterchemistry.Corrosion.Use of free energy considerations in metallurgy through Ellingham diagrams.

Module 4: Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

Module 5: Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Module 6: Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

Text/Reference Books:

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, byM. J. SienkoandR. A. Plane
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

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AMCSE-201: Mathematics-II (Probability and Statistics)

Course Objectives	The objective of this course is to familiarizes the students with statistical techniques. It aims to equip the students with standard concept and tools at an intermediate to advanced level that will serve them towards tackling various problem in the discipline.
Course Outcomes	The student will be able to:- • To understand the basic concept of probability and random variable. • To solve the problem based on discreate and continuous probability distribution. • To get basic idea of Statistics including measures of central tendency, correlation and regression. • To find the solution Binomial, Poisson and normal distribution. Also evaluation of statistical parameter for their distribution.

DETAILED CONTENT

Module 1: Basic Probability: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

Module 2:Continuous Probability Distributions: Continuous random varibales and their properties, distribution functions and densities, normal, exponential and gamma densities.

Module 3:Bivariate Distributions: Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Module 4: Basic Statistics: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation

Module 5: Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. 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 and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

Textbooks/References:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7.Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

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CSE- 201: Programming For Problem Solving

Course Objectives	• To learn the fundamentals of computers. • To understand the various steps in program development. • To learn the usage of structured programming approach in solving problems. • To impart basic knowledge about simple algorithms for arithmetic and logical *problems*.
Course Outcomes	The student will learn • To write algorithms and to draw flowcharts for solving problems. • To convert the algorithms/flowcharts to C programs. • To code and test a given logic in C programming language. • To use arrays, pointers, strings and structures to write C programs. • Searching and Sorting problems.

DETAILED CONTENT

Module 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

Module 2: **Arrays , Basics Algorithms**
Arrays (1-D, 2-D), Character arrays and Strings, Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Module 3: Function & Recursion
Functions (including using built in libraries), Parameter passing in functions, call by value,Passing arrays to functions: idea of call by reference.Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Module 4: Structure, Pointers

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)

Module 5:
File handling (only if time is available, otherwise should be done as part of the lab)

Textbooks/References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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CSE- 201P: Programming For Problem Solving Lab

Course Objectives	• Understand the basic concept of C Programming, Arrays, Strings, Functions, Pointers, and Structures. • Acquire knowledge about the basic concept of writing a program. • Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language. • Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions. • Role of Functions , recursion.
Course Outcomes	• Acquire knowledge about the basic concept of writing a program. • Understand the Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language. • Learn how to use of conditional expressions and looping statements to solve problems associated with conditions and repetitions. • Understand the Role of Functions involving the idea of modularity. • Understand the Concept of Array and pointers dealing with memory management. • Learn Structures and unions through which derived data types can be formed.

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

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ME-201P: Workshop/Manufacturing Practices

Course Objectives	• To expose the students to the principles of different manufacturing techniques and learn advanced operations of machining. • To understand Procedure or methodologies for conducting the casting and welding processes. • To understand working of various machine tools. • To understand innovative conceptual idea about latest manufacturing processes and their industrial applications.
Course Outcomes	On completion of this course, students will be • Able to apply knowledge of manufacturing processes and the skills to develop and manipulate the operating parameters for a given process. • Able to understand processing of plastic and ceramic materials. • Ability to understand the latest technologies in casting and welding processes will get increased. • Students will be able to come up with innovative conceptual idea about latest manufacturing processes and their industrial applications.

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. Electrical &Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic mounding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

(ii) Workshop Practice:(60 hours)[L : 0; T:0 ; P : 4 (2 credits)]

1. Machine shop (10 hours)
2. Fitting shop (8 hours)
3. Carpentry (6 hours)
4. Electrical & Electronics(8 hours)
5. Welding shop (8 hours (Arc welding 4 hrs + gas welding 4 hrs)

6. Casting (8 hours)
7. Smithy (6 hours)
8. Plastic moulding& Glass Cutting (6 hours)

Suggested Text/Reference Books:

1. HajraChoudhury S.K., HajraChoudhury 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.
2. Kalpakjian S. And Steven S. Schmid, " Manufacturing Engineering andTechnology" , 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, " Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., " Manufacturing Technology" , Vol. I and Vol. II, Tata McGrawHill House, 2017.

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HSMC-201: English

Course Objectives	• To enable the learner to communicate effectively and appropriately in real life situation. • To use English effectively for study purpose across the curriculum. • To develop interest in and appreciation of Literature. • To develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing,
Course Outcomes	After the completion of the course students will be able to: • Develop the students' abilities in grammar, oral skills, reading, writing and study skills. • Students will heighten their awareness of correct usage of English grammar in writing and speaking. • Students will improve their speaking ability in English both in terms of fluency and comprehensibility. • Students will give oral presentations and receive feedback on their performance. • Students will increase their reading speed and comprehension of academic articles. • Students will improve their reading fluency skills through extensive reading. • Students will enlarge their vocabulary by keeping a vocabulary journal. • Students will strengthen their ability to write academic papers, essays and summaries using the process approach.

DETAILED CONTENT

Module 1: Vocabulary Building

- The concept of Word Formation
- Root words from foreign languages and their use in English
- Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
- Synonyms, antonyms, and standard abbreviations.

Module 2: Basic Writing Skills

- Sentence Structures
- Use of phrases and clauses in sentences
- Importance of proper punctuation
- Creating coherence

- Organizing principles of paragraphs in documents
- Techniques for writing precisely

Module 3: Identifying Common Errors in Writing

- Subject-verb agreement
- Noun-pronoun agreement
- Misplaced modifiers
- Articles
- Prepositions
- Redundancies
- Clichés

Module 4: Nature and Style of sensible Writing

- Describing
- Defining
- Classifying
- Providing examples or evidence
- Writing introduction and conclusion

Module 5: Writing Practices

- Comprehension
- Précis Writing
- Essay Writing

Module 6: Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Suggested Readings:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

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CH - 201(P): Chemistry – I Laboratory

Laboratory Outcomes:

The chemistry laboratory course will consist of experiments illustrating the principle of chemistry relevant to the study of science and engineering.

The students will learn to:

1. Estimate rate constants of reactions from concentration of reactants/products as a function of time.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
3. Synthesize a small drug molecule and analyze as salt sample.

List of Laboratory Experiments:

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity.
2. Thin layer chromatography.
3. Exchange column for removal of hardness of water.
4. Determination of chloride content of water.
5. Colligative properties using freezing point depression.
6. Determination of the rate constant of a reaction.
7. Determination of cell constant and conductance of solutions.
8. Potentiometry- determination of redox potentials and emfs.
9. Synthesis of a polymer/drug.
10. Saponification/acid value of an oil.
11. Chemical analysis of a salt.
12. Lattice structures and packaging of spheres.
13. Models of potential energy surfaces.
14. Chemical oscillations – iodine clock reaction.

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ENV-AE-021: Environmental Sciences

Course Objectives	• To identify, formulate and solve environmental problems by utilizing the concept of environmental studies. • To avoid environmental pollution & Global Problems. • To understand human activities which are causing environmental degradation and the measures to be taken to avoid this problem. • To create awareness among people about protection of wild life & forests. • Conservation of natural resources, ecological balance and biodiversity to achieve sustainable development. • Understanding of environmental policies and regulations.
Course Outcomes	The student would be able to • Get the information about ecosystem and also about its functions like Food chain, Ecological pyramids etc., • Get the knowledge about the different types of resources like land, water, mineral and energy and also about the effects of environment by the usage of these resources. • Gain the knowledge about the ecosystem diversity, its values and also about the importance of the endemic species and different techniques involved in its conservation • Gain the knowledge about the different types of pollutions and their control technologies,Waste water treatment, Bio medical waste management etc., • Get the complete information about EIA- Environmental Impact Assessment,Sustainable developmental activities, environmental policies and regulations, awareness amongpeople about protection of wild life, forest and other natural resources.

DETAILED CONTENT

Module 1: The Multidisciplinary nature of environmental studies
Definition, scope and importance, Need for public awareness.

Module 2: Natural Resources Renewable and non-renewable resources:

a) Natural resources and associated problems

- Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.

- Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, case studies.
- Energy Resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, case studies Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.

c) Equitable use of resources for sustainable life styles.

Module 3: Eco Systems

- Concept of an eco-system
- Structure and function of an eco-system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco systems
- Forest ecosystem
- Grass land ecosystem
- Desert ecosystem.
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)

Module 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, national and local level.
- India as a mega diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitats loss, poaching of wild life, man wildlife, conflicts.
- Endangered and endemic spaces of India.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Module 5: Environmental Pollution

Definition Causes, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes

Role of an individual in prevention of pollution
Pollution case studies
Disaster management: Floods, earth quake, cyclone and land slides

Module 6: Social issues and the Environment

- Form unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water shed management
- Resettlement and rehabilitation of people; its problems and concerns, case studies
- Environmental ethics: issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environment protection Act
- Air (prevention and control of pollution) Act
- Water (prevention and control of pollution) Act
- Wildlife protection act
- Forest conservation act
- Issues involved in enforcement of environmental legislations
- Public awareness

Module 7: Human population and the environment

- Population growth and variation among nations
- Population explosion- family welfare program
- Environment and human health
- Human rights
- Value education
- HIV / AIDS
- Women and child welfare
- Role of information technology in environment and human health
- Case studies

Module 8: Field work

Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills lopes, etc (field work equal to 5 lecture works)

Text Books:

- Textbook of Environmental studies, ErachBharucha, UGC
- Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

Other Suggested Readings:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd.Bikaner.
- BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net(R)
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc.480p
- Clark R.S., Marine Pollution, Clanderson Press Oxford(TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001,Environmental Encyclopedia, Jaico Publ. House, Mumabai,1196p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay(R)
- Heywood, V.H &Waston, R.T. 1995. Global Biodiversity Assessment.Cambridge Univ. Press1140p.
- Mhaskar A.K., Matter Hazardous, Techno-Science Publication(TB)
- Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co.(TB)
- Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,574p
- Townsend C., Harper J, and Michael Begon, Essentials of Ecology,Blackwell Science(TB)
- Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, CompliancesandStadards, Vol I and II, Enviro Media(R)
- Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication(TB)
- Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA499p

CSE -202: Introduction to AI /ML

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Course Objectives	• To adapt, contribute and innovate new technologies and systems in the key domains of Artificial Intelligence and Machine Learning. • Focus on exploring supervised, unsupervised and reinforcement learning and apply them to a range of AI problems. • Make use of AI and ML techniques for industrial applications in the areas of Autonomous Systems, IOT, Cloud Computing, Robotics, Natural Language Processing and emerging areas.
Course Outcomes	• Identify problems where artificial intelligence techniques are applicable. • Apply selected basic AI techniques; judge applicability of more advanced techniques. • Participate in the design of systems that act intelligently and learn from experience.

Detailed Content

Unit 1. Introduction to Artificial Intelligence

History of artificial intelligence, The birth of artificial intelligence, AI Winters, Todays' AI, Historical milestones in the development of AI, Great contributors, People who have influenced AI, Differences between strong AI and weak AI, Artificial Intelligence definitions, Emergence of AI – Technological advances, Machine Learning ---> Deep Learning --->AI, Functions of AI, Characteristics of artificial intelligence, Applications of AI, AI in health care, Industry 4.0, AI in manufacturing, AI in education sector, AI in business, AI in Finance Sector, AI in Law, AI in society, Cognitive science and AI, Cognition
and process of Cognition, Disciplines in Cognitive science, Multidisciplinary subject, Linguistics, Artificial intelligence as Cognitive science, Methods in Cognitive science, Watson.

Unit 2. Logical approach to AI and knowledge-based system

Introduction to knowledge representation systems, Knowledge representation using logic, Propositional logic, Semantics of propositional logic, Properties of propositional logic statements, Tautologies and logical implication, Resolution, Conjunctive normal form, Resolution is valid, Resolution algorithm, Knowledgebase systems, Structure of a knowledge based system, Recap of artificial intelligence, Components of expert systems, Expert systems development, Wumpus world, Logic, A simple knowledge base, Exploring the Wumpus world, Semantic net, Inference in semantic networks, Semantic networks: Types and components, Types of relationships in semantic network, Frames, Frames: Some examples, Non-monotonic logic, Circumscription, Default logic.

Unit 3. Probabilistic approach to AI

Probability, Basic concepts, Probability of an event, Example on Sample Space, counting rules, Event relations, Conditional Probabilities, Defining Independence, The Law of Total Probability, Bayes' Rule, Examples. Random Variables, Discrete Random Variable, Probability Distributions, Probability Mass Function, Probability Density Function, Expectations of Random Variables,

Medians of Random Variables, The variance of a Random Variable, Chebyshev's Inequality, Quantiles of Random Variables, Jointly Distributed Random Variables, Marginal Probability Distributions, Independence and Covariance, Bayesian Networks, Merits of Bayesian Networks, Construction of a Bayesian Network, Representation in Bayesian Networks, Benefits of Bayesian Networks, Why learn Bayesian networks? Constructing Bayesian networks, Example from medical diagnostics, Software for Bayesian networks, Gaussian Bayesian Networks, Linear Gaussian BN to joint Gaussian, Theorem: From Gaussian to Bayesian networks, Noisy OR-Gate model, Promedas: A clinical diagnostic decision support system, Organization of PROMEDAS development.

Unit 4. Evolutionary Intelligence

Biological background - The cell, Chromosome, genes and genomes, Reproduction, Natural selection,

Inspiration - Evolution, Classes of search techniques, Introduction - Genetic algorithm, Vocabulary, Pseudo code - Genetic Algorithm, Roulette Wheel's Selection Pseudo Code, Population/Representation, Representation example, Crossover, Mutation, Evaluation and deletion, The traveling salesman problem, Representation, cross over and mutation, TSP Example - 30 cities, Ant colony and artificial ants for TSP, Pheromone trails, Ant colony optimization algorithms, Particle swarm optimization – Introduction, Kennedy and Eberhart's (1995) refined algorithm, A (partial) example in two dimensions, Algorithm termination, Financial applications, An automatic stock trading system using Particle Swarm Optimization, PSO based methodology, Trading decision, Considering the GA technology, Some GA application types.

Unit 5. Neural networks, Natural language understanding

Introduction, Artificial Neural Network, Appropriate problems for neural network learning, Characteristics of the problems, Basic understanding of neural networks, A single neuron, Activation Functions, Architectures of neural networks, Feedforward neural network, Single-Layer feedforward architecture, Multiple-Layer feedforward architecture, Types of feedforward networks, Multi-layer perceptron, Training MLP: The back-propagation algorithm, Step 1: Forward propagation, Step 2: Back

propagation and weight updation, Process of learning in neural network, Recurrent or feedback architecture, Mesh Architectures, GRADIENT-DESCENT (training examples, η), Stochastic GRADIENTDESCENT(training examples, η), Multilayer networks and Backpropagation algorithm, The

Backpropagation algorithm, Natural language processing, Classical NLP, Feed-forward networks, Recurrent neural networks and recursive networks, Features for NLP problems, Framenet Vs. Wordnet, Features for text, Features for word relations, NGRAM features, Some terminologies.

Unit 6. Introduction to Machine Learning

Motivation for Machine Learning, Applications, Machine Learning, Learning associations, Classification, Regression, The Origin of machine learning, Uses and abuses of machine learning, Success cases, How do machines learn, Abstraction and knowledge representation, Generalization, Factors to be considered, Assessing the success of learning, Metrics for evaluation of classification method, Steps to apply machine learning to data, Machine learning process, Input data and ML algorithm, Classification of machine learning algorithms, General ML architecture, Group of algorithms, Reinforcement learning, Supervised learning, Unsupervised learning, Semi-Supervised learning, Algorithms, Ensemble learning, Matching data to an appropriate algorithm.

Unit 7. Learning deterministic models

Supervised Learning, Regression, Linear regression, Multiple linear regression, A multiple regression analysis, The analysis of variance for multiple regression, Examples for multiple

regression, Overfitting, Detecting overfit models: Cross validation, Cross validation: The ideal procedure, Parameter estimation, Logistic regression, Decision trees: Background, Decision trees, Decision trees for credit card promotion, An algorithm for building decision trees, Attribute selection measure: Information gain, Entropy, Decision Tree: Weekend example, Occam's Razor, Converting a tree to rules, Unsupervised learning, Semi-Supervised learning, Clustering, K – means clustering, Automated discovery, Reinforcement learning, Multi-Armed Bandit algorithms, Influence diagrams, Risk modelling, Sensitivity analysis, Casual learning.

B.Tech C.S.E

3rd SEMESTER

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ECE- 302: Digital System Design

Course Objectives	• To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. • To impart how to design digital circuits. • This is course deals with fundamental concepts of digital electronics necessary many other courses, like embedded systems, VLSI and computer architecture, etc. to be studied in coming semesters.
Course Outcomes	At the end of this course students will demonstrate the ability to: • Design and analyze combinational logic circuits • Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder • Design & analyze synchronous sequential logic circuits • Use HDL tools for digital logic design and simulation.

DETAILED CONTENT

Module 1.Boolean Algebra:
Review of Boolean Algebra and DeMorgan'sTheorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables,Binary codes, CodeConversion.

Module 2.Combinational Logic Design:
MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display,Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter andALU.

Module 3. Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggeredFF, Rippleand Synchronous counters, Shift registers, Finite state machines, Design ofsynchronous FSM,Algorithmic State Machines charts. Designing synchronous circuits like Pulsetrain generator, Pseudo-Random Binary Sequence generator, Clock generation.

Module 4. Logic Families and Semiconductor Memories:
TTL NAND gate, Specifications, Noise margin,Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing,Memory elements, Conceptof Programmable logic devices like FPGA.Logic implementationusing Programmable Devices.

Module 5. VLSI Design flow:
Design entry: Schematic, FSM & HDL, different modeling styles in VHDL,Data typesand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and SimulationVHDL constructs and codes for combinational and sequential circuits.

Text Books

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", 2ndedition ,2006.

Reference Books

1. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
2. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition2012.

CSE- 301: Data Structure & Algorithms

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Course Objectives	• To introduce the basic concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms. • To understand importance of data structures in context of writing efficient programs. • To develop skills to apply appropriate data structures in problem solving.
Course Outcomes	• Learn the basic types for data structure, implementation and application. • Know the strength and weakness of different data structures. • Use the appropriate data structure in context of solution of given problem. • Develop programming skills which require to solve given problem • Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms • Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.

DETAILED CONTENT

Module 1: Introduction

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Module 2: Stacks and Queues

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Module 3: **Linked Lists**

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: All operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis, Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms andanalysis.

Module 4: Sorting and Hashing

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods,Hashing.

Module5: Graph

Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested Books:

1. "Classic Data Structures", Samanta and Debasis, 2nd edition, PHIpublishers.
2. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, ComputerSciencePress.
3. "Data Structures with C (Schaum's Outline Series)", Seymour Lipschutz, 1st edition,McGrawHillEducation.

Reference Books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley PublishingCompany.
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

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CSE- 303: Object Oriented Programming

Course Objectives	• To learn the basics concept used in OOP. • To describe the various benefits provided by OOP. • To explain the programming applications of OOP.
Course Outcomes	• Able to create simple programs using classes and objects in C++. • Implement Object Oriented Programming Concepts in C++. • Develop applications using stream I/O and file I/O. • Implement simple graphical user interfaces. • Implement Object Oriented Programs using templates and exceptional handling concepts.

DETAILED CONTENT

Module 1: Introduction

Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & function components, recursive functions, user - defined types, function overloading, inline functions, Classes & Objects – I: classes, Scope resolution operator, passing objects as arguments, returning objects, and object assignment.

Module 2: Classes & Objects –II

Constructors, Destructors, friend functions, Parameterized constructors, Static data members, Functions, Arrays of objects, Pointers to objects, this pointer, and reference parameter, Dynamic allocation of objects, Copy constructors, Operator overloading using friend functions, overloading.

Module 3: Inheritance

Base Class, Inheritance and protected members, Protected base class inheritance, Inheriting multiple base classes, Constructors, Destructors and Inheritance, Passing parameters to base class constructors, Granting access, Virtual base classes.

Module 4: Virtual functions, Polymorphism

Virtual function, calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, Abstract classes, Using virtual functions, Early and late binding.

Module5: Exception Handling

Basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, I/O System Basics, File I/0: Exception handling fundamentals, Exception handling

options. C++ stream classes, Formatted I/O, fstream and the File classes, Opening and closing a file, Reading and writing text files.

Suggested Books:

1. E. Balagurusamy, Object Oriented Programming with C++, Tata McGraw Hill.

Reference Books:

1. Stanley B.Lippmann, JoseeLajoie: C++ Primer, 4th Edition, Addison Wesley,2012.
2. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill,2011.

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AMCSE- 301: Mathematics-III (Differential Calculus)

Course Objectives	The objective of this course is to introduce and develop a clear understanding of the fundamental concept of differential calculus such as sequences and series, limit and continuity, differentiation, integration (double and triple), ordinary differential equations along with their applications. In particular, this course enables students to acquire skill of finding areas and volumes.
Course Outcomes	On completion of this course the student will be able to:- • To check whether the sequences and series convergent or divergent. • To find the maximum and minimum values of the function using differentiation. • To find Gradient, Curl and divergence. • To use Green, Gauss and Stock Theorem. • To solve ordinary, differential equations of 1^{st} order as well as higher order..

DETAILED CONTENT

Module 1: Sequences and series

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions.

Module 2: Multivariable Calculus

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Module 3: Multivariable Calculus

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

Module 4: First order 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.

Module 5: Ordinary differential equations of higher orders

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
7. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
8. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
9. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
10. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
11. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.

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ECE- 302P: Digital System Design Lab

List of Experiments

1. To verify the Truth-tables of all logic gates.
2. To realize and verify the Half & full adder circuits using logic gates.
3. To realize Half& full subtractor circuits using logic gates.
4. To realize 4-bit binary-gray & gray-binary converters.
5. To realize comparator circuit for two binary numbers of 2-bit each.
6. To realize Full adder & full subtractor circuits using 8x3encoder.
7. To design Full adder & full subtractor circuits using 8x3 demultiplexer.
8. To design and verify the Truth tables of all flip-flops.
9. To design Mod-7 synchronous up-down counter.
10. To write VHDL program for combinational & sequential circuits from S. No. 2 to 7
11. To write VHDL program for universal shift-register operations.

CSE- 301P: Data Structure & Algorithms Lab

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Course Objectives	• The objective of this lab is to teach students various data structures and to explain them algorithms for performing various operations on these data structures. This lab complements the data structures course. • Students will gain practical knowledge by writing and executing programs in C using various data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees
Course Outcomes	Upon the completion of Data Structures practical course, the student will be able to: • Understand the applications of data structures. • Design and analyze the time and space efficiency of the data structure. • Identity the appropriate data structure and algorithm design method for given specified problem. • Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals.

LIST OF EXPERIMENTS

Task 1: Write a program to insert a new element at end as well as at a given position in an array.

Task 2: Write a program to delete an element from a given whose value is given or whose position is given.

Task 3: Write a program to find the location of a given element using LinearSearch.

Task 4: Write a program to find the location of a given element using BinarySearch.

Task 5: Write a program to implement push and pop operations on a stack using linear array.

Task 6: Write a program to convert an infix expression to a postfix expression using stacks.

Task 7: Write a program to evaluate a postfix expression using stacks.

Task 8: Write a recursive function for Tower of Hanoi problem.

Task 9: Write a program to implement insertion and deletion operations in a queue using linear array.

Task 10: Write a menu driven program to perform following insertion operations in a single linked list:

- Insertion atbeginning

- Insertion atend
- Insertion after a givennode
- Traversing a linkedlist

Task 11: Write a menu driven program to perform following deletion operations in a single linked list:

- Deletion at beginning
- Deletion at end
- Deletion after a given node

Task 12: Write a program to implement push and pop operations on a stack using linked list.

Task 13: Write a program to implement push and pop operations on a queue using linked list.

Task 14: Write a program to sort an array of integers in ascending order using bubble sort.

Task 15: Write a program to sort an array of integers in ascending order using selection sort.

Task 16: Write a program to sort an array of integers in ascending order using insertion sort.

Task 17: Write a program to sort an array of integers in ascending order using quick sort.

Task 18: Write a program to traverse a Binary search tree in Pre-order, In-order and Post-order.

Task 19: Write a program to traverse graphs using BFS.

Task 20: Write a program to traverse graphs using DFS.

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CSE- 303P: Object Oriented Programming Lab

Course Objectives	• To learn the basics concept used in OOP. • To describe the various benefits provided by OOP. • To explain the programming applications of OOP.
Course Outcomes	• Able to create simple programs using classes and objects in C++. • Implement Object Oriented Programming Concepts in C++. • Develop applications using stream I/O and file I/O. • Implement simple graphical user interfaces. • Implement Object Oriented Programs using templates and exceptional handling concepts.

LIST OF EXPERIMENTS

Task 1: Write a program that uses a class where the member functions are defined inside a class.

Task 2: Write a program that uses a class where the member functions are defined outside a class.

Task 3: Write a program to demonstrate the use of static data members.

Task 4: Write a program to demonstrate the use of const data members.

Task 5: Write a program to demonstrate the use of zero argument and parameterized constructors.

Task 6: Write a program to demonstrate the use of dynamic constructor.

Task 7: Write a program to demonstrate the use of explicit constructor.

Task 8: Write a program to demonstrate the use of initializer list.

Task 9: Write a program to demonstrate the overloading of increment and decrement operators.

Task 10: Write a program to demonstrate the overloading of memory management operators.

Task 11: Write a program to demonstrate the typecasting of basic type to class type.

Task 12: Write a program to demonstrate the typecasting of class type to basic type.

Task 13: Write a program to demonstrate the typecasting of class type to class type.

Task 14: Write a program to demonstrate the multiple inheritances.

Task 15: Write a program to demonstrate the runtime polymorphism.

Task 16: Write a program to demonstrate the exception handling.

Task 17: Write a program to demonstrate the use of class template.

Task 18: Write a program to demonstrate the reading and writing of mixed type of data.

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` **CSE-304: Machine Learning**

Course Objectives& Outcomes	• Understand the history of machine learning and the advantages and drawbacks of using it. • Learn how machines work. • Have knowledge of the different types of machine learning approaches • Understand the concept of supervised learning, regression, and its variants, along with real world problems solved using regression. • Have an insight into the testing of significance and the significance of ordinary least square. • Have knowledge of logistic regression analysis and multiple regression. • Understand and leverage the regression model building

Unit 1. Introduction to machine learning

Introduction, Motivation for machine learning, Applications, Machine learning, Classification, Regression, The origin of machine learning, Time line of machine learning techniques, Uses and abuses of machine learning, How do machines learn, Abstraction and knowledge representation, Generalization, Assessing the success of learning, Steps to apply machine learning to data, Input data and ML algorithm, Machine learning methods, Unsupervised learning, Semi-supervised learning, Clustering, What are we looking for? Classification of machine learning algorithms, General ML architecture, Reinforcement learning, Supervised learning, Unsupervised learning, Semi-supervised learning, Regularization algorithms, Clustering algorithms, Deep learning algorithms, Ensemble learning, Matching data to an appropriate algorithm.

Unit 2. Simple linear regression and Multiple regression and model building

Introduction, Supervised learning, Regression, Regression examples, Regression models, Steps in regression analysis, Linear regression, Simple linear regression, Least squares estimation, Least squares regression-Line of best fit, Illustration, Direct regression method, Maximum likelihood estimation, Matrix approach, Regression assumptions and model properties, Coefficient of determination (R-squared), Example, Testing for significance, Testing hypothesis in simple linear regression, Illustration, Checking model adequacy, Over-fitting, Detecting over-fit models: Cross validation, Cross validation: The ideal procedure, Logistic regression.

Introduction, Ordinary least squares estimation for multiple linear regression, Multiple linear regression model building, Partial correlation and regression model building, Multiple linear regression model, Interpretation of multiple linear regression coefficients-Partial regression coefficients, Standardized regression coefficients, Missing data, Validation of multiple regression model, Coefficient of multiple determination (R-Squared), Adjusted R-squared, Statistical significance of individual variables in multiple linear regression: t-Test.

Unit 3. Classification & Classification Algorithms and Clustering Techniques

Preamble: Machine learning, To classify faces and expressions, Introduction, ML classifier, Classification and general approach, Classification algorithms, Instance based learning, K-Nearest neighbour, Decision trees, Attribute selection measure: Information gain, ID3 algorithm, Decision tree: weekend example, Converting a tree to rules, Bayesian algorithms, Ensemble, Stories of success, Why ensemble works? Ensemble of classifiers, Bagging, Boosting, Random forests, Neural networks, Activation functions, Feedforward neural network, multi-layer perceptron, Backprop algorithm, Recurrent or feedback architecture, Perceptron rule, Gradient-descent (training examples, η), Multilayer networks and back propagation algorithm, Support vector machine, Classification model evaluation and selection, ROC curves, Cost Benefit Analysis (CBA).

Clustering, Clustering algorithms, More common clustering situation, Statistics associated with cluster analysis, General applications of clustering, Clustering as a pre-processing tool, Hard vs. soft clustering, Similarity and dissimilarity between objects, Type of data in clustering analysis, Binary variables, Nominal variables, Ordinal variables, Major clustering approaches, Types of clusters, Cluster centroid and distances, Hierarchical clustering, Hierarchical Agglomerative Clustering (HAC), Hierarchical Agglomerative Clustering: Linkage method, Hierarchical Agglomerative Clustering: Variance and Centroid method, Cluster distance measures, Single link agglomerative clustering, Complete-link clustering, Average-link clustering, Other agglomerative clustering methods, Distance between two clusters, Hierarchical clustering: Time and Space requirements, K - means clustering, Importance of choosing initial centroids, The K-medoids clustering method, PAM (Partitioning Around Medoids), CLARA (Clustering Large Applications), CLARANS (Randomized CLARA), Density based clustering methods, DBSCAN: Density Based Spatial Clustering of Applications with Noise, When DBSCAN Does NOT Work Well, External criteria for clustering quality, Different aspects of cluster validation, Measures of cluster validity, Measuring cluster validity via correlation, Using similarity matrix for cluster validation, Internal measures: SSE, Framework for cluster validity, Internal measures: Cohesion and Separation, Internal measures: Silhouette coefficient.

Unit 4. Information Retrieval

Information retrieval: introduction, Information retrieval process, Information retrieval architecture, how do we represent document? Information retrieval models, Similarity metric, Term weighting, Retrieval in vector space model, constructing inverted index (word counting), Stop words removal, Stemming, Text document clustering, Agglomerative vs. divisive, Impact of cluster distance measure, Buckshot clustering, Issues related to cosine similarity, Validity of document clusters, Text datasets, Experimental evaluation.

B.Tech C.S.E

IV SEMESTER

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CSE- 401: Discrete Mathematics

Course Objectives	The objective of this course is to prepare the students to develop mathematical foundations to understand and create mathematically arguments require in learning mathematically and computer science courses. Also in the course basic concepts of graph theory such as- trees, graphs, vertex colouring, edge colouring etc. are introduced.
Course Outcomes	At the end of the course, the students will be able to:- • Construct mathematical arguments using logical connectives and quantifiers. • Understand how lattice and Boolean algebra are used as tools and mathematical models in the study of networks. • Learn how to work with some of the discrete structures like set, relations, functions etc. • Understand the importance of the concept coloring. • Learn how to use truth tables.

DETAILED CONTENT

Module 1:

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernsteintheorem.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem ofArithmetic.

Module 2:

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Module 3:

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques:** Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof ofNecessityandSufficiency.

Module 4:

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and ConjunctiveNormal Form

Module 5:

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortestdistances.

Suggested books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw –Hill
2. Susanna S. Epp, Discrete Mathematics with Applications,4th edition, Wadsworth Publishing Co.Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw –Hill.

Suggested Reference books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application to Computer Science", TMG Edition,TataMcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, MarcLipson,
3. Discrete Mathematics, Tata McGraw -Hill

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CSE- 402: Computer Organisation & Architecture

Course Objectives	• Discuss the basic concepts and structure of computers. • Understand concepts of register transfer logic and arithmetic operations. • Explain different types of addressing modes and memory organization. • Learn the different types of serial communication techniques. • Summarize the Instruction execution stages.
Course Outcomes	• Understand the theory and architecture of central processing unit. • Analyze some of the design issues in terms of speed, technology, cost, performance. • Design a simple CPU with applying the theory concepts. • Use appropriate tools to design verify and test the CPU architecture. • Learn the concepts of parallel processing, pipelining and interprocessor Communication. • Understand the architecture and functionality of central processing unit. • Exemplify in a better way the I/O and memory organization. • Define different number systems, binary addition and subtraction, 2's complementrepresentation and operations with this representation.

DETAILED CONTENT

Module 1:

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some commonCPUs.

Data representation: signed number representation, fixed and floatingpoint representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating pointarithmetic.

Module 2:

Introduction to x86 architecture.

CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypotheticalCPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral Devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privilegedand non-privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O deviceinterfaces – SCII, USB

Module 3:

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.
Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Module 4:

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. Block size, mapping functions, replacement algorithms, write policies.

Suggested books:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy,Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill HigherEducation.

Suggested referencebooks:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, PearsonEducation.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, PearsonEducation.

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CSE- 403: Operating Systems

Course Objectives	• Students will learn how Operating System is Important for Computer System. • To make aware of different types of Operating System and their services. • To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. • To know virtual memory concepts. • To learn secondary memory management
Course Outcomes	• Understands the different services provided by Operating System at different level. • They learn real life applications of Operating System in every field. • Understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock. • They will learn different memory management techniques like paging, segmentation and demand paging etc.

DETAILED CONTENT

Module 1:

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.

Module 2:

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.

Module 3:

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.

Module 4:

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

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).

Module 5:

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

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.

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

Suggested books:

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

Suggested reference books:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, MarcoCesati, O'Reilly and Associates.

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CSE- 404: Design and Analysis of Algorithms

Course Objectives	• To develop proficiency in problem solving and programming. • To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity. • To get a good understanding of applications of Data Structures.
Course Outcomes	• Ability to decide the appropriate data type and data structure for a given problem. • Ability to select the best algorithm to solve a problem by considering various problem characteristics, such as the data size, the type of operations, etc. • Ability to compare algorithms with respect to time and space complexity

DETAILED CONTENT

Module 1:

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

Module 2:

Fundamental Algorithmic Strategies: Brute-Force, Greedy, Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

Module 3:

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

Module 4:

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Module 5:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

Suggested books:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

Suggested reference books

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms—A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

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HSMC- 401: Management –I (Organizational Behaviour/Finance & Accounting)

Course Objectives	• To learn the basic concepts of Organizational Behaviour and its applications in contemporary organizations. • To understand how individual, groups and structure have impacts on the organizational effectiveness and efficiency. • To appreciate the theories and models of organizations in the workplace. • To creatively and innovatively engage in solving organizational challenges. • To learn and appreciate different cultures and diversity in the workplace.
Course Outcomes	• To understand the conceptual framework of the discipline of OB and its practical applications in the organizational set up. • To deeply understand the role of individual, groups and structure in achieving organizational goals effectively and efficiently. • To critically evaluate and analyze various theories and models that contributes in the overall understanding of the discipline. • To develop creative and innovative ideas that could positively shape the organizations. • To accept and embrace in working with different people from different cultural and diverse background in the workplace..

DETAILED CONTENT

Module 1:

Introduction to Organizational Behaviour: Concept of Organizational Behaviour (OB)- Importance of Organizational Behaviour2¬ Key Elements of Organizational Behaviour, Role of Managers in OB- Interpersonal Roles-Informational Roles- Decisional Roles, Foundations or Approaches to Organizational Behaviour, Challenges and Opportunities for OB

Introduction to Organization Design: Meaning of Organization Design and Structure, Basic elements of Organization Structure, Types of Organization Design.

Module 2:

Introduction to Interpersonal Behaviour: Nature and meaning of Interpersonal Behaviour, Concept of Self, Transaction Analysis (TA), Benefits and uses of Transactional Analysis, Johari Window Model

Learning: Learning and Learning Cycle, Components of Learning, Theories of Learning

Introduction to Personality: Definition and Meaning of Personality - Importance of Personality, Determinants of Personality, Theories of Personality, Personality Traits Influencing OB

Module 3:

Introduction to Emotions: Nature and Meaning of Emotions - Characteristics of Emotions, Theories of Emotions, Emotions in the Context of OB

Motivation: Definition and Meaning, Theories of Motivation, Application of theories in

Organizational Scenario
Leadership: Definition and Meaning, Theories of Leadership, Contemporary Business Leaders
Organizational Stress: Definition and Meaning, Sources of Stress, Types of Stress, Impact of Stress on Organizations, Stress Management Techniques.

Module 4:
Introduction to Organizational Communication: Meaning and Importance of Communication, Functions , process, types, Interpersonal Communication, Organizational Communication, Tips for Effective Communication
Introduction to Organization Culture: Meaning and Nature of Organization Culture - Origin of Organization Culture, Functions of Organization Culture, Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity
Organizational Conflict: Definition and Meaning, Sources of Conflict, Types of Conflict, Conflict Management Approaches
Power and Politics: Power and its Two Faces, Sources of Power, Organizational Politics
Introduction to Groups and Teams: Meaning and Importance of Groups, Reasons for Group Formation, Types of Groups, Stages of Group Development, Meaning and Importance of Teams, Types of Teams, Creating an Effective Tea
Organization Change and Development: Definition and Meaning, Need for Change, Strategies to Overcome Resistance, Process of Change, Meaning and Definition of OD, OD Interventions

Suggested References:

1. Organizational Behaviour-Robbins, Judge & Sanghi, Pearson Education Publication.
2. Organizational Behaviour- McShane & Glinow, McGraw Hill Publication.

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CSE- 403P: Operating System Lab

Course Objectives	• This course will introduce the basic principles in Operating System and Providing error detection methods. • It will cover all the management modules present in the OS like process • management, Memory management, File management, Disk management, Network management, I/O management.
Course Outcomes	• Know how data is transmitted and checking of errors. • Inter process communication including shared memory, pipes and • messages Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing) • Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention • Program for FIFO, LRU, and OPTIMAL page replacement algorithm.

LIST OF EXPERIMENTS

Task 1: Installation Process of various operating systems.

Task 2: Implementation of CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority.

Task 3: Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine.

Task 4: Commands for files & directories: cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing files using cat. File comparisons. Disk related commands: checking disk free spaces. Processes in linux, connecting processes with pipes, background processing, managing multiple processes. Background process: changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep. Printing commands, grep, fgrep, find, sort, cal, banner, touch, file. File related commands ws, sat, cut,grep.

Task 5: Shell Programming: Basic of shell programming, various types of shell, Shell Programming in bash, conditional & looping statement, case statements, parameter

passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks, report printing.

Task 6: Implementation of Bankers algorithm for the purpose of deadlock avoidance.

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CSE- 404P: Design and Analysis of Algorithms Lab

Course Objectives	• To analyze worst-case running time of algorithms and understand fundamental algorithmic problems. • To understand how asymptotic notation is used to provide a rough classification of algorithms, how a number of algorithms for fundamental problems in computer science and engineering work and compare with one another. • To introduce the methods of designing and analyzing algorithms • To study about various designing paradigms of algorithms for solving real world problems.
Course Outcomes	• To analyze the complexities of various problems in different domains. • To prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains. • To understand methods for analyzing the efficiency and correctness of algorithms (such as exchange arguments, recurrence, induction, and average case analysis) • To compare, contrast, and choose appropriate algorithmic design techniques to present an algorithm that solves a given problem. • To Identify and analyze criteria and specifications appropriate to new problems. • To develop the efficient algorithms for the new problem with suitable designing techniques. • To know the appropriate algorithmic design technique to specific problems.

LIST OF EXPERIMENTS

Task 1: Code and analyze solutions to following problem with given strategies:

- Knap Sack using greedy approach
- Knap Sack using dynamic approach

Task 2: Code and analyze to find an optimal solution to matrix chain multiplication using dynamic Programming.

Task 3: Code and analyze to find an optimal solution to TSP using dynamic programming.

Task 4: Implementing an application of DFS such as:

- to find the topological sort of a directed a cyclic graph

- to find a path from source to goal in amaze.

Task 5: Implement an application of BFS such as:

- to find connected components of an undirected graph
- to check whether a given graph is bipartite.

Task 6: Code and analyze to find shortest paths in a graph with positive edge weights using Dijkstra's algorithm.

Task 7: Code and analyze to find shortest paths in a graph with arbitrary edge weights using Bellman Ford algorithm.

Task 8: Code and analyze to find shortest paths in a graph with arbitrary edge weights using Flyods' algorithm.

Task 9: Code and analyze to find the minimum spanning tree in a weighted, undirected graph using Prims' algorithm

Task 10: Code and analyze to find the minimum spanning tree in a weighted, undirected graph using Kruskals' algorithm.

Task 11: Coding any real world problem or TSP algorithm using any heuristic technique.

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CSE 405: Deep Learning

Course Objectives & Outcomes	• Understand the difference between deep learning and machine learning. • Gain knowledge on the evolution of AI and ML: historical epochs • Explain the relevance of deep learning. • Understand and leverage the various learning methodologies and the usage of multiple algorithms. • Illustrate the nuances in selecting the algorithms for ANN. • Identify how to work with Perceptron. • Make use of various networks to design ANN. • Apply multiple methodologies to create, design, and evaluate ANNs. • Explain scalars, vectors, matrices, and tensors. • Gain knowledge on tensor operations and visualization techniques. • Illustrate how visualizing works in deep learning and all the concepts related thereto.

DETAILED SYLLABUS

Unit 1. The Fundamentals of Deep Learning & Learning Process and Different Models in Neural Networks

How is deep learning different from other machine learning, AI vs ML vs DL, Deep learning capabilities, Other approaches to artificial intelligence, what is special about deep learning? Relevance of deep learning.

Supervised learning, Unsupervised learning, Memory based learning, Memory based learning techniques, Hebbian learning, Hebbian learning modifications: Mathematical models, Competitive learning, Error-correction learning, Boltzmann learning, Learning tasks: Pattern association, Learning tasks: Pattern recognition and function approximation, Learning tasks: Control and filtering, Learning tasks: Beamforming, Memory, Adaptations, Statistical nature of the learning process, Statistical learning theory, Probably approximately correct model of learning, Adaptive filtering problems, Unconstrained optimization techniques, Linear least-squares filters, Least-mean-square algorithms, Learning curves, Learning rate annealing techniques, Perceptron, Perceptron convergence theorem, MLP concepts, Backpropagation algorithm, XOR problem, Heuristics for making backpropagation algorithm perform better, Output representation and decision rules, Feature detection, Backpropagation and differentiation, Hessian matrix, Generalization, Approximations of functions, Cross-validations, Network pruning techniques, Virtues and limitations of backpropagation learning, Accelerated convergence of backpropagation learning, Supervised learning viewed as optimization problem, Cover's theorem on the separability of patterns, Interpolation problem, Regularization theory and regularization networks, Generalized radial-basis function networks, Estimation of the regularization parameter, Approximation properties of RBF networks, Comparison of RBF networks and multilayer perceptron, Kernel regression and its relation to RBF networks, Learning strategies in RBF networks, Simulated annealing, Boltzmann machines, Deterministic Boltzmann machine.

Unit 2. The Math behind Neural Networks & Diving to the Depths of Deep Learning

How does a neural network look like? The matrix magic, Visualizing deep learning, The elephant in the room, Programmatic expression of deep learning's math constructs, Operations with the tensors, Array broadcasting, Scalar product/Inner product of tensors, Morphing shapes of tensors, Gradient calculation.

Deep learning depths, Model: The molecules of DL, Loss functions in neural networks, Optimizers in neural networks, Activation functions, Finding the perfect fit, Running deep learning algorithms: The frameworks, Real examples and actual schematics of building neural nets, Data preparation and label preparation, Examples of neural networks at work, Readying data for neural nets, Constructing the network, ReLU, Constructing the network, Approach validation, Plotting the loss from validation & training, What experiments do we run next? An example in regression: Guess the price of the house, Processing the data, Building the network, K-fold approach for validating algorithm, K-fold approach: In code.

Unit 3. Convolutional Neural Networks & Recurrent Neural Networks (RNN)

Convolutional neural networks, What and how of ConvNets, Example 1, Example 2, Convolution effectiveness, what is this convolution and why is it effective? Visualization of 2D convolution, Visualization of 3D convolution, Building a model without any max-pooling layers, How to train a CNN on a dataset from ground-up, Importance of deep learning when data is limited, Downloading Datasets, Working on it, Building a CNN, one layer at a time, Data preprocessing: Preparing the data, Accuracy & loss: Data processing, Making the most of what's available: Data Augmentation, Accuracy & loss: Data augmentation, Using a trained CNN, How about extracting features without augmenting data? Accuracy & loss: Without data augmentation, how about extracting features with augmenting data? Accuracy & loss: With augmenting data, Tuning the CNN, what do Convolutional Neural Network (CNN, or ConvNet) see? Seeing the intermediate, Points to ponder, Visualizing the filters themselves, looking at heat maps of how filters seek details.

Recurrent Neural Network (RNN), Why recurrent networks? RNN explained, Deep RNNs, Recursive neural networks, Step function, Tanh function, RNN in memory, LSTMs and GRUs, Long Short Term Memory (LSTM), Working components of LSTMs, Core idea behind LSTMs, LSTM: A simple walk through, Gated Recurrent Unit (GRU), GRU design steps, Fully gated vs minimal gated architecture of GRU, Working of RNN's, Recurrent neural networks, Backpropagation through timeline in RNN, Backpropagation through Computational graphs, Problem Statement 1, Problem Statement 2, Complex recurrent neural networks, Over-fitting and under-fitting, Detect and avoid overfitting, Prevent of overfitting an approach on model and data, Multi-layered RNNs, Stacked LSTM, Stacked LSTM architecture, Multi-directional RNNs, Difference between LSTM and BI-LSTM, One-dimensional sequence processing, CNN and RNN.

Unit 4. Generative Deep Learning

Generative deep learning, Using LSTMs to synthesize text, Text synthetization procedures, Neural style transfer and applications, NST working principle, Content and style management in

NST, NST implementation, Image synthesis with variational auto encoders, Need for image synthesis, Working models, Variational Auto Encoders (VAE), Latent space, Generative Adversarial Networks (GAN's), Generative and discriminative algorithms, Applications using GAN, GAN working principle, Generator and discriminator, Training GAN, Implementing GAN: 1st generation.

B.Tech C.S.E

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CSE- 501: Web and Internet Technology

Course Objectives	The course content enables students to: • Understand best technologies for solving web client/server problems • Analyze and design real time web applications • Use Java script for dynamic effects and to validate form input entry • Analyze to Use appropriate client-side or Server-side applications
Course Outcomes	At the end of the course students are able to: • Choose, understand, and analyze any suitable real time web application. • Integrate java and server side scripting languages to develop web applications. • To develop and deploy real time web applications in web servers and in the cloud. • Extend this knowledge to .Net platforms.

DETAILED CONTENT

Module 1:

Information Architecture: The role of Information Architect, Collaboration and communication, Organizing information, organizational challenges, Organizing web sites and Intranets, Creating cohesive organization systems, designing navigation systems, types of navigation systems, Integrated navigation elements, designing elegant navigation systems, Searching systems, Searching your web site, designing the search interface, Indexing the right stuff, To search or not to search grouping content, conceptual design, High level Architecture Blueprint. Architectural Page Mockups, Design Sketches.

Module 2:

Dynamic HTML and Web Designing: HTML Basic concepts, Good web design, process of web publishing phases of web site development, STRUCTURE OF HTML documents, HTML elements- Core attributes, Language attributes, Core events, Block level events, Text level events, Linking basics, Linking in HTML, Images and Anchors, Anchor Attributes, Image maps, Semantic linking meta information, image preliminaries, Image download issues, Images and buttons, introduction to layout: Backgrounds, color and text, fonts, layout with tables. Advanced layout: Frames and layers, HTML and other media types.Audio support in browsers, video support, other binary formats.Style sheets, positioning with style sheets. Basic Interactivity and HTML: FORMS, form control, new and emerging form elements.

Module 3:

Java Server Pages: Basics, Integrating Scripts in JSPs, JSP Objects and Components, configuring and troubleshooting, JSP: request and response objects, retrieving the contents of an HTML format, retrieving a query string, Working with Beans, Cookies, creating and Reading

Cookies.Using Application Objects and Events.

XML: Relationship between HTML, SGML and XML, Basic XML, Valid documents, ways to use XML, XML for data files, embedding XML into HTML documents. Converting XML to HTML for Display, Displaying XML using CSS and XSL, rewriting HTML as XML, the future of XML.

Module 4:

PhpMysql Introduction: What is PHP, History, Why choose PHP

Installation: Installation overview, Configuration, Advantage of PHP over other scripting language, creating a PHP script, Handel error in PHP script.

Data Types: Variables, Strings, String functions, Numbers, Arrays, Array functions, Booleans and NULL, Type switching and casting, Constants

Control Structures: if, else, else-if, and switch statements, Logical operators, while, for, for each loops, continue and Break statements

Functions: Defining & Using functions, Returning values from a function, Setting global variables, Setting default values

Building Web Pages: Links and URLs, Using GET values, Encoding GET values, Encoding for HTML, Building forms, Setting cookies, Establishing sessions, Headers and page redirection, Including and requiring pages

My SQL Basics:

Introduction to web form , My SQL introduction, Creating a database in My SQL, Populating a My SQL database, Php My Admin, Connecting to My SQL with PHP, Accessing data in My
SQL with PHP.

Text Books:

1. Web technology, Black Book by Kogent learning Inc , Dreamtech publication
2. Thomas A Powell, HTML The Complete Reference, Tata McGraw Hill Publications
3. HTML 5, Black Book, Wiley India Publication

Reference Books:

1. Joseph L.Weber," Using Java 2 platform " Prentice Hall of India Pvt Ltd, 2000
2. John R Hubbard, Programming with Java, Schaum's Outline Series, McGraw Hill International edition 1999.
3. Ian S. Graham, XHTML 1.0 Language and design sourcebook, John Wiley &sonsinc. 2000.
4. Peter Rossbach, Hendrik Schreiber Java Server & services Pearson education Ltd. 2000
5. The Java developer tool kit JoshuMarketos, John Wiley and Sons, 1997.

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CSE- 502: Database Management Systems

Course Objectives	• Understand the basic concepts and the applications of database systems. • Master the basics of SQL and construct queries using SQL. • Understand the relational database design principles. • Familiar with the basic issues of transaction processing and concurrency control. • Familiar with database storage structures and access techniques
Course Outcomes	• Describe the fundamental elements of relational database management systems • Explain the basic concepts of relational data model, entity-relationship model, relationaldatabase design, relational algebra and SQL. • Design ER-models to represent simple database application scenarios • Convert the ER-model to relational tables, populate relational database and formulate SQLqueries on data. • Improve the database design by normalization.

DETAILED CONTENT

Module 1

Overview of DBMS: Basic Terminology of Database: Data and information, Problems in Manual Database, Components of DBMS: users, language, structure, data-dictionary, data manager, DBA, Characteristics of a database. File processing versus Data Management, File Oriented approach versus Database Oriented approach. SPARC 3-level architecture: A brief overview of three traditional models (hierarchical mode, network model and relational model).

Types of Database Systems, Database Languages: DDL, DML, DCL.

Module 2

Relational Database Model: Components, Properties of relational model {Codd's 12 rules (integrity rules (concept of keys))}, Relational algebra (select, project, Rename, cross product, joins (theta-join, equi-join, natural-join, outer join)), Relational Calculus, Entity-Relationship model: Basic Constructs, ER Notation, Designing ER Diagram, Design Issues, Converting ER- Model into relational schema. Functional Dependencies, Fully Functional Dependency, Other Dependencies: Candidate FD, Primary FD, Multi-valued Dependencies, Join Dependency, Normalization (up to 5th level).

Module 3

File Organization: Sequential file, index sequential files, direct files, Hashing, B-trees, index files, Operations on Files.

Structured Query language: DDL and DML commands, Nested Queries, Integrity constraints, Views, Triggers, Joins operations, Grouping data.

Backup and Recovery: Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, Immediate Update, Shadow Paging, Checkpoints, Buffer

Management.

Module 4

Query processing (Introduction, steps in Query processing, General Processing Strategies, Query Optimization), Introduction to Object-Oriented Database, C/S Database, Knowledge Based Database and Distributed Database Management System.

Transaction Processing Concepts: Introduction, Properties of Transactions, Recoverability, Serializability, Concurrency control Techniques: Two phase locking, Timestamp Ordering.

Text Books:

1. C.J. Date, " An Introduction To Data Base System", 7th ed. Pearson Publication , 2000.

2. Abraham Silberschatz, Henry F. Korth, S. Sudershan, Database System Concepts, 3rd edition, The McGraw Hill Companies, Inc., 1997

3. E. Ramez, Navathe B. Shamakant, Fundamentals of Database Systems, Fifth Edition, Pearson Education.

Reference Books:

1. Introduction to Database Management by Gillenson , Wiley India

2. Naveen Prakash ,"Introduction to Database management ", Tata McGraw Hill Publishing Company Ltd., New Delhi.

3. Advance Database Management System; RiniChakrabarti ,ShilbhdraDasgupta ; Dream Tech Press.

4. A simplified approach to DBMS ;Prateek Bhatia; Kalyani Publication

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CSE- 503: Formal Languages and Automata Theory

Course Objectives	This course focuses on the basic theory of Computer Science and formal methods of computation like automata theory, formal languages, grammars and Turing Machines. The objective of this course is to explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages.
Course Outcomes	The student will be able to: • Understand the basic properties of formal languages and grammars. • Differentiate regular, context-free and recursively enumerable languages. • Make grammars to produce strings from a specific language. • Acquire concepts relating to the theory of computation and computational models including decidability and intractability • Understand the basic properties of formal languages and grammars.

DETAILED CONTENT

Module 1

Finite Automata and Regular Expressions:

Automata definition, constructing simple and complex automata, Limitation of finite automata. Finite State Systems, Basic Definitions Non-Deterministic finite automata (NDFA), Deterministic finite automata (DFA), Equivalence of DFA and NDFA Finite automata with E- moves, Concept of basic Machine, Properties and limitations of FSM. Moore and mealy Machines, Equivalence of Moore and Mealy machines.

Module 2

Regular Expressions, Constructing Regular Expression, Equivalence of finite automata and Regular Expressions, Regular expression conversion and vice versa.Method to constructing regular expression.

Properties of Regular Sets:

The Pumping Lemma for Regular Sets, Applications of the pumping lemma, Closure properties of regular sets, Myhill-Nerode Theorem and minimization of finite Automata, Minimization Algorithm.

Module 3

Grammars:

Definition, Context free and Context sensitive grammar, nature of context free grammar, Ambiguity regular grammar, Eliminating Ambiguity, Chomsky Normal Form (CNF), Converting to Chomsky normal Form, Parsing with Chomsky Normal form , Griebach Normal Form (GNF).

Pushdown Automata: Introduction to Pushdown Machines, Application of Pushdown Machines.

Module 4

Turing Machines:

Basic model of Turing machine, Representation of Turing machine Constructing simple and Complex Turing Machine, Variation of Turing machine, universal Turing Machine.

Chomsky Hierarchies:

Chomsky hierarchies of grammars, unrestricted grammars, Context sensitive languages, Relation between languages of classes.

Computability and Undesirability:

Basic concepts, the post correspondence problem, Primitive Recursive Functions, Understanding the halting problem of Turing machine.

Text Books:

1. Theory Of Computation by DrKaviMahesh , Wiley India publication.

2. Theory of Computer Sc.(Automata, Languages and computation):K.L.P.Mishra&N. Chandrasekaran, 2000, PHI.

3. Introduction to automata theory, language & computations Hopcroaft&O.D.Ullman, R Mothwani, Pearson publication, 2001.

Reference Books:

1 Formal Language and Automata Theory By BasavarajS .Anami , Wiley India publication.

2 Formal language and automata theory by C.K. Nagpal Oxford University Press

3 Introduction to languages and the Theory of Computation by John C. Martin 2003, Tata McGrew Hills.

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CSE- 504: Software Engineering

Course Objectives	• Knowledge of basic SW engineering methods and practices, and their appropriate application. Describe software engineering layered technology and Process frame work. • A general understanding of software process models such as the waterfall and evolutionary models. • Understanding of software requirements and the SRS documents. • Understanding of the role of project management including planning, scheduling, risk management, etc. • Describe data models, object models, context models and behavioral models, different software architectural styles, implementation issues such as modularity and coding standards, approaches to verification and validation including static analysis, and reviews. • Understanding of software testing approaches such as unit testing and integration testing, software measurement and software risks. • Understanding of software evolution and related issues such as version management.
Course Outcomes	• Basic knowledge and understanding of the analysis and design of complex systems. • Ability to apply software engineering principles and techniques. • Ability to develop, maintain and evaluate large-scale software systems. • To produce efficient, reliable, robust and cost-effective software solutions, Ability to perform independent research and analysis. • Ability to work as an effective member or leader of software engineering teams.

DETAILED CONTENT

Module 1

Software Evolution: Expanding role for computers, Software Engineering discipline, Computer based system ,Generic vs customer made software product , Distinctive characteristics of software product, The software problem , Emerging of software engineering.

Need for software engineering, Evolving role of software, software crisis, S/W engineering-a Layered Technology, Process and project, Component software processes, Software Development process models (SDLC), Comparison of different life cycle mode

Software Requirement Analysis and Specification- Value of Good SRS, Requiring process, Requirements specification, Formal system specification, Crucial process step, Classification of requirements, Requirement engineering task, Data dictionaries, E-R diagram , Data models, Functional Models, Object oriented models, Structured requirements definition, structured analysis & design technique, Software prototyping, Software requirements specification, Nature of the SRS, characteristics of a good SRS. Organization of the SRS.

Module 2

Software Architecture: Role of software architecture, Architecture view, component and connector view, Architecture style for C&C view, Documenting architecture design.

System Models: Domain analysis and modeling, data models, functional models, object oriented models.

Software Project Management: Software project, Project feasible study, project planning , project organization, Estimate of project effort(COCOMO), staffing level estimation, Staffing , Risk management, Project scheduling , Project monitoring and control.

S/W Design: Design Concepts, Function oriented and OO Design, Detailed Design, Verification.

Module 3

Software Quality Management : Quality Dimension , Process quality and product quality, quality assurance planning , Quality measurement, Software Configuration Management , software Process Improvement, ISO 9000 Quality standards, ISO approach to quality assurance systems, SEI capability maturity model, PSP.

Coding and unit Testing: Incrementally developing code , managing evolving code, unit testing, Non execution based testing, code inspection, testing process, Black box testing, white box testing, Metric, debugging, program analysis tool, integration testing, system testing, Testing distributed implementation, testing of real time system, accepting testing some general issue associated with testing, , recovery testing, security testing, stress testing, performance testing

Module 4

Software maintenance: Planning for maintenance, Maintenance activities , reengineering, Characteristics, potential solution to maintenance problems ,s/w maintenance process models.

Software Reuse: s/w reverse engineering, S/w reuse concepts, Basic issues in reuse program. A reuse approach, Reuse at organization level.

Emerging Trends: Client server software, SOA, Software as services.

Computer aided Software Engineering: case and its scope, case environment, case support in software life cycle, architecture of case environment.

TEXT BOOKS:

1.Software Engineering: PankajJalote A Precise Approach, Wiley India Publications.
2.Essentials Of Software Engineering: S.Thangasamy , Wiley India Publications.

REFERENCE BOOKS :

1.Fundamental of Software Engineering By Rajib Mall PHI Publication
2. Software Engineering-K.K. Aggarwal&Yogesh by New Age International Publishers.

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MC: Constitution of India/Essence of Indian Traditional Knowledge

Course Objectives	• To Enable the student to understand the importance of constitution • To understand the structure of executive, legislature and judiciary • To understand philosophy of fundamental rights and duties • To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India. • To understand the central and state relation, financial and administrative.
Course Outcomes	• Able to understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration, Knowledge/Understand 1&2 • Able to apply the knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy Application. • Able to analyze the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government Analysis. • Able to evaluate Preamble, Fundamental Rights and Duties, ZillaPanchayat, block level organization, variouscommissions of viz SC/ST/OBC and women..

DETAILED CONTENT

Module1: History of making of the Indian Constitution (4 hours)
History, Drafting Committee, (Composition& Working)

Module 2: Philosophy of the Indian Constitution (4 hours)
Preamble, Salient Features

Module 3: Contours of Constitutional Rights & Duties (4 hours)
Fundamental Rights , Right to Equality, Right to Freedom , Right against Exploitation , Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies ,Directive Principles of State Policy, Fundamental Duties.

Module 4: Organs of Governance (4 hours)
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications , Powers and Functions

Module 5: Local Administration (4 hours)
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation., Pachayati raj: Introduction, PRI: ZilaPachayat., Elected officials and their roles, CEO ZilaPachayat: Position and role., Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Module 6: Election Commission (4 hours)
Election Commission: Role and Functioning., Chief Election Commissioner and Election Commissioners., State Election Commission: Role and Functioning. , Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
5. G.L. Ginsberg, "Printed Circuit Design", McGraw Hill, 1991.

CSE- 501P: Web and Internet Technology Lab

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Course Objectives	The course content enables students to: • Develop an ability to design and implement static and dynamic website. • Analyze to Use appropriate client-side or Server-side applications
Course Outcomes	At the end of the course students are able to: • Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's. • Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services. • Get introduced in the area of Online Game programming.

LIST OF EXPERIMENTS

1. Create your own page with your favorite hobbies.

2. Create a frameset that is divided into three sections. The frameset should have three zones.

a. The Topmost section of the frameset should take up about just 15% of the browser window. Name this frame title.

b. The middle section should be 70% of the browser window. Name this frame title. c. The lower section should be 15% of the browser window. Name this frame menu.

3. Create pages for each section. For the lowermost section, create page that loads the content into the middle section. The topmost section should contain a page describing the web page itself.

4. Create a web page, which displays the map of your country Link, each city /state on the image map, such that the respective HTML page of the city/state is displayed when the user selects an area.

5. Design a Web Template Using Adobe Photoshop.

6. Embed an animation in web Page using Flash.

7. Use Style sheet to modify the following:

a. Change background to modify the following.

b. Change font type, face and color.

c. Align Text.

d. Remove underlines from hyperlinks

8. Introduction and Installation of WAMP Server.

9. Write a simple program" Hello" world Using Php.

10. Introduction to the data Types Used in Php.

11. Using Control statements in Php.

12. Printing various patterns Using loops.

13. Creating and securing database using MySql.

14. Use of Php My admin in php.

15. Creating login page using php and Mysql.

16. Create Your College Website

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CSE- 502P: Database Management Systems Lab

Course Objectives	• To explain basic database concepts, applications, data models, schemas and instances. • To demonstrate the use of constraints and relational algebra operations. • Describe the basics of SQL and construct queries using SQL. • To emphasize the importance of normalization in databases. • To facilitate students in Database design • To familiarize issues of concurrency control and transaction management
Course Outcomes	At the end of the course the students are able to: • Apply the basic concepts of Database Systems and Applications. • Use the basics of SQL and construct queries using SQL in database creation and interaction. • Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system. • Analyze and Select storage and recovery techniques of database system.

LIST OF EXPERIMENTS

1. Introduction to SQL and installation of SQL Server / Oracle.

2. Data Types and Create a database and write the programs to carry out the following operation:

- **a.** Add a record in the database.
- **b.** Delete a record in the database.
- **c.** Modify the record in the database.
- **d.** List all the records of database in ascending order.
- **e.** Alter and Drop Statements.

3. Working with Null Values, Matching a Pattern from a Table, Ordering the Result of a Query.

4. Aggregate Functions,: Grouping the Result of a Query

5. Set Operators, Nested Queries, Joins, Sequences.

6. Views, Indexes, Database Security and Privileges: Grant and Revoke Commands, Commit and Rollback Commands.

7. PL/SQL Architecture, Assignments and Expressions, Writing PL/SQL Code, Referencing Non-SQL parameters.

8. Stored Procedures and Exception Handling.

9. Triggers and Cursor Management in PL/SQL.

10. Develop a menu driven project management of database system:

11. Library information system

a. Engineering
b. MCA

12. Inventory control system
1. Computer Lab
2. College Store

Student Information System
3. Academic
4. Finance

Time Table development system
5. CSE, IT & MCA Departments.
6. Electrical & Mechanical Departments.

Usage of S/W:
1. VB, ORACLE and/or DB2
2. VB, MSACCESS
3. VB, MS SQL SERVER 2002

Note: At least 5 or 10 more exercises to be given by the teacher concerned

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CSE -508: Computational Linguistics and Natural Language Processing

Course Objectives	• To introduce students to the fundamental principles and historical evolution of computational linguistics and natural language processing. • To familiarize students with classical approaches, empirical methods, and statistical techniques used in NLP. • To explore the application of NLP in diverse domains including information retrieval, question answering, information extraction, and report generation. • To provide hands-on experience with text processing tools, annotation techniques, and corpus creation for NLP tasks. • To discuss emerging applications of NLP in multimedia presentation generation, education, healthcare, and information visualization. • To analyze the challenges and limitations of NLP techniques and propose strategies for addressing them. • To encourage critical thinking and research skills in the field of computational linguistics and NLP.
Course Outcomes	Upon successful completion of the course, students will be able to: •Explain the fundamental concepts and historical development of computational linguistics and NLP. •Apply classical approaches, empirical methods, and statistical techniques for natural language processing tasks. •Develop and evaluate NLP models for applications such as information retrieval, question answering, and sentiment analysis. •Utilize text processing tools and corpus annotation techniques for NLP tasks. •Design and implement NLP applications in emerging domains including multimedia presentation generation, education, and healthcare. •Critically assess the challenges and limitations of NLP techniques and propose solutions for improvement. •Demonstrate effective communication and presentation skills in discussing NLP concepts, methodologies, and applications.

Detailed Content

Unit -1 Introduction, Classical approaches to natural language processing, Approaches to natural language processing, Understanding linguistics, Level 1: Morphology, Level 2: Syntax, Level 3: Semantics, Level 4: Pragmatics, Understanding linguistics, Traditional approach, Example: Automatic summarization using NLP, Drawbacks, Text processing, What Is text processing? Text analysis vs. Text mining vs. Text analytics, Tools and methodologies: Statistical methods, Tools and methodologies: Text classification, Tools and methodologies: Text extraction, Tools and methodologies: Example, Scope of text analysis/processing, Importance of text analysis, Working

principles of text analysis, Data gathering, Data preparation, Data preparation steps, Data analysis, Evaluation of text classification process, Text extraction, Analysis in test extraction, Evaluation of text extraction process, Text analysis APIs, Levels of NLP, Lexical analysis, Pre-processing activity, POS tagging, Syntactic parsing, Types of parsing, Derivation logic, Grammar, Semantic analysis, Semantic analysis elements, Representation in semantic analysis, Natural language generation, NLP vs NLG, History of NLG, Working principle of natural language generation, Limitations in natural language generation.

Unit 2. Empirical Approaches

Corpus creation, Corpus linguistics, Types of corpora, Lexicographical implementations in corpora, Timeline of corpus linguistics, Usage areas of corpora, Traits of a good text corpus, Annotations in text corpus, NLP task-specific training corpora, Data sets used for natural language processing, Treebank annotation, Linguistic description layers, Areas using text annotations, Usage of annotations and corpora, Kinds of annotations, Annotation semantic labels, Annotations in machine learning, Annotation development cycle, Model creation, Create annotations, Training and testing the algorithms, Result evaluation, Revision of the model, Tree banks and its construction, Need for tree bank, Types of tree bank corpus, Phrase structured vs dependency structured tree bank, Fundamental statistical techniques, Problems of the traditional approach, How statistics helps, Problems of the traditional approach and how statistics helps, Hidden Markov model, Maximum entropy Markov model, Conditional random field model, Support vector machine, N-GRAM, Genetic algorithm, POS Tagging, Word sense disambiguation, POS tag and Tagsets, Types of POS taggers, Markovian model, Hidden Markov model, POS tagging using HMM.

Unit 3. Statistical Approaches

Parsing, Statistical parsing, Approaches to parsing, Statistical approach, Lexicalized statistical parsing, Top-down parsing, Bottom-up parsing, Left corner parsing method, Statistical parsing: Probabilistic parser, Multiword expressions, Features of MWE, Types of multi word expressions, Multi word verbs, Word similarity and text similarity, Text similarity methods, Jaccard similarity, K-means, Cosine similarity, Word Mover's distance, Variational auto encoders, Pre-trained sentence encoders, Bidirectional Encoder Representations from Transformers (BERT) with cosine distance, Word sense disambiguation, Complications in WSD, Methods in WSD, Evaluation of WSD, History of speech recognition technology, Working principle in voice recognition, Major leaders in speech recognition and voice assistant, Amazon Alexa, Microsoft Cortana, Google Assistant, Machine translation, Rule-based machine translation, Statistical machine translation, Rule-based MT vs. statistical MT, Working principle of SMT, Challenges with statistical machine translation.

Unit 4. Applications of Natural Language Processing

Information retrieval, Information retrieval in NLP, IR development, Model types, Model types: Mathematical basis model, Problems with NLP in information retrieval, NLP in information

retrieval, IR evaluation metrics, Information Retrieval (IR) model and types, Design features of IR systems, Design features of IR systems, Question answering systems, QA system architecture, QA system types, Text based QA systems, Factoid question answering system, Web based question answering system, Information retrieval or information extraction based QA systems, Restricted domain question answering, Rule based question answering systems, Information extraction, Working of information extraction, Information extraction applications, Chunking, Representing chunks: Tags vs trees, Report generation, Text report specifications, Features of reports, Report generation process, Usage of NLP text in report generation, Ontology construction, Ontology classifications and process, Why ontology and its advantages, Ontology components, Levels of formality, Ontology construction approaches, Ontology construction.

Unit 5. Emerging Applications of Natural Language Generation in Information Visualization, Education, and Health Care

Multimedia presentation generation, Focus points to add multimedia in NLG, Text generation: Meaning representation, Text generation: Document structure design, Text generation: Linguistic style control, Document layout, Layout and meaning representation, Layout style and wording representation, Image style and meaning representation, Image and wording usage, Scripted dialogue, Language interfaces for intelligent tutoring systems, CIRCSIM-Tutor, CIRCSIM-Tutor architecture, data presentation and process cycle, AUTOTUTOR, AUTOTUTOR architecture and process, ATLAS Andes, Andes system architecture and design, Pedagogical considerations in Andes, WHY2-ATLAS, Why 2 Atlas architecture and process, Argumentation for healthcare consumers, CDS architecture and processing, NLP for CDS scope, NLP models, Building blocks of NLP - CDS, Data based evidence collection: Summarization, Applications of NLP in healthcare, Sentiment analysis and subjectivity, Difficulties in sentiment analysis, Document level sentiment classification, Sentence level sentiment classification, Lexicon, Feature-based sentiment analysis, Opinion summarization.

Reference Books:

1. "Speech and Language Processing" by Daniel Jurafsky and James H. Martin
2. "Foundations of Statistical Natural Language Processing" by Christopher D. Manning and Hinrich Schütze
3. "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper
4. "Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze
5. "Deep Learning for Natural Language Processing" by Palash Goyal, Sumit Pandey, and Karan Jain
6. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
7. "Handbook of Natural Language Processing" edited by Nitin Indurkhya and Fred J. Damerau

B.Tech C.S.E

VI SEMESTER

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CSE- 601: Programming In Java

Course Objectives	• Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc. • Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms. • Understand the principles of inheritance, packages and interfaces.
Course Outcomes	• Identify classes, objects, members of a class and relationships among them needed for a specific problem. • Write Java application programs using OOP principles and proper program structuring. • Demonstrate the concepts of polymorphism and inheritance. • Write Java programs to implement error handling techniques using exception handling.

DETAILED CONTENT

Module 1

Introduction To Object Oriented Programming: Data Abstraction, Encapsulation, Inheritance (Public, Protected And Private), Polymorphism, and Information Hiding.
Java Elements: Data Types, Literal and Variables, Operators–Arithmetic, Bit-wise, Relational, Boolean Logical, Assignment, The '?' Operator, Operator Precedence, Control Statements–Selection (if, switch), Iteration Statements (while, do-while, for) Jump Statements (break, continue, return), Arrays (One-dimensional, Multi-Dimensional).

Module 2

Introducing Classes: Class Fundamentals, Declaring Objects, Methods, Constructors, 'This' Keyword, Over loading Methods.
Inheritance: Inheritance Basics, Protected Members, Method Overriding, Multiple Inheritance, Template Classes and Functions.

Module 3

Exception Handling: Fundamental, Exception Types, Uncaught Exceptions, Try and Catch, Dealing With Exceptions (try, throw, throws, finally).

Module 4
Java Applets: Applet Basics, the Applet Class, Applet Architecture, An Applet Skeleton, Applet Display Methods, Handling Events.

Advanced Java Programming: Multithreading–Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Inter-thread Communication, Multithreading.

Text Books

1. Patrick Naughten& Herbert Schildt, " The Complete Reference Java ." Tata McGraw Hill.

Reference Books

1. Gilbert, Stephan D. and William B. Hccarthy, " Object Oriented Programming In Java ",1997, The Waite Group Press.
2. Mary Compoine and Kathy Walrath," The Java Turtorial ", Addison-Wesley, 1996.
3. Horstmann, Cay S. and Gary Cornell, "Core Java 1.1: Fundamentals." Addison–Wesley,1997.

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CSE- 602: Computer Graphics

Course Objectives	• Understand the need of developing graphics application • Learn algorithmic development of graphics primitives like: line, circle, polygon etc. • Learn the representation and transformation of graphical images and pictures.
Course Outcomes	• Understand the basics of computer graphics, different graphics systems and applications of computer graphics. • Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis. • Use of geometric transformations on graphics objects and their application in composite form. • Extract scene with different clipping methods and its transformation to graphics display device. • Explore projections and visible surface detection techniques for display of 3D scene on 2D screen. • Render projected objects to naturalize the scene in 2Dview and use of illumination models for this.

DETAILED CONTENT

Module 1: Introduction to Computer Graphics

Overview of Graphics Systems, Display Devices, Hard copy Devices. Interactive Input Devices, Display Processors, The Graphical Kernel System, Output Primitives, Line drawing algorithms, Circle Generation algorithms, Character Generation. **Raster Scan Graphics -** Line Drawing Algorithms, Circle Generation, General Function Rasterization, Scan Conversion-Generation of the display, Image Compression, Polygon Filling, Fundamentals of Antialiasing.

Module 2: Two-Dimensional Geometric Transformation & Viewing

Basic Transformation, Translation, Rotation, Scaling, Other Transformation Reflection, Shear, Transformation functions, Window to viewport co-ordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping.

Three- Dimensional Concepts & Object Representations

Three Dimensional Display Methods, Parallel Projection, Perspective Projection, Translation, Rotation, Scaling, Composite Transformation, Three dimensional Transformation function, Polygon Surfaces, Curved Lines and surfaces, Bezier Curves and surfaces, B-Spline Curves and surfaces.

Module 3: Graphics hardware

Display technology, random scan, raster scan display processing, input devices for interaction.

Visible Lines and Visible Surfaces

Visual Realism, Hidden line and hidden surface removal: depth buffer algorithm, geometric

computations, scan line coherence algorithms, area coherence algorithms, priority algorithm, shading and color models, Modeling methods.

Module 4: Rendering

A simple illumination model, Transparency, Refraction effects in transparent materials, Simple Transparency Models, Z-Buffer Transparency, Shadows, Texture.

Text and Reference Books

1. D.F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill.
2. Hearn and Baker, "Computer Graphics", PHI.
3. S. Harrington, "Computer Graphics - A programming approach", McGraw Hill.4. D.F. Rogers, "Mathematical Elements for Computer Graphics", McGraw Hill.

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(ELECTIVE-I) ECE- 404: Signals & Systems

Course Objectives	The objective of this course is to enable students • To apply mathematical concepts and tool in analysis of electrical signals and systems. • This course trains students for an intermediate level of fluency with signals and systems in both continuous time and discrete time. • Preparation for more advanced subjects in digital signal processing (including audio, image and video processing),communication theory and system theory.
Course Outcomes	At the end of this course students will demonstrate the ability to: • Mathematically characterize different types of signals and systems. • Analyze the behavior of linear-shift invariant systems. • Apply concepts of Fourier and Laplace Transforms to analyze continuous-time signals and systems. • Investigate discrete-time signals and systems using Discrete-Time Fourier and Z-transforms. • Investigate whether the system is stable • Sampling and reconstruction of a signal

DETAILED CONTENT

Module 1: Introduction to Signals and Systems: (3 hours)

Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

Module 2: Behavior of continuous and discrete-time LTI systems: (8 hours)

Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems.System representation through differential equations and difference equations.State-space representation of systems.State-Space Analysis, Multi-input, multi-output representation.State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

Module 3: Fourier, Laplace and z- Transforms: (10 hours)

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The DiscreteTime Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

Module 4: Sampling and Reconstruction: (4 hours)

The Sampling Theorem and its implications.Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects.Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Text S Books

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall,1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.

Reference Books

1. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
2. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.

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(ELECTIVE-I) ECE- 601: Digital Signal Processing

Course Objectives	• To make students familiar with the most important methods in DSP, including digital filterdesign, transform-domain processing and importance of Signal Processors. • To make students aware about the meaning and implications of the properties of systems and signals.
Course Outcomes	At the end of this course students will demonstrate the ability to: • Represent signals mathematically in continuous and discrete time and frequency domain. • Get the response of an LSI system to different signals. • Design of different types of digital filters for various applications.

DETAILED CONTENT

Module 1.Discrete Time Systems:
Discrete Time Signals:Sequences; representation of signals on orthogonal basis; Samplingandreconstruction of signals;Discrete systems attributes.

Module 2. Z-Transform:
Z-Transform, Analysis of LSIsystems, frequencyAnalysis, Inverse Systems,

Module 3. Discrete Fourier Transform:
Discrete Fourier Transform (DFT),Fast FourierTransform Algorithm, Implementation of Discrete Time Systems.

Module 4.Design of Digital Filters:
Structures for realization of discrete time system,Design of FIR Digital filters: Windowmethod,Park-McClellan's method.Design of IIR DigitalFilters: Butterworth, Chebyshev and Elliptic Approximations;Lowpass, Bandpass, Bandstop andHigh pass filters.Effect of finite register length in FIR filter design.Parametric and non-parametric spectralestimation. Introduction to multirate signalprocessing.Application of DSP.

Module 5.DSP Processor Architecture Fundamentals:
Study of ADSP and TMS series of processor architectures.

Text Books

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, 1997.

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(ELECTIVE-I) CSE- 507: Introduction to Emerging Technologies

Course Objectives	This course will enable students to explore current breakthrough technologies in the areas of Artificial Intelligence, Internet of Things and Augmented Reality that have emerged over the Course past few years.
Course Outcomes	By the end of this course the student will able to: • Identify different emerging technologies • Differentiate different emerging technologies • Select appropriate technology and tools for a given task • Identify necessary inputs for application of emerging technologies.

DETAILED CONTENT

Module 1: Introduction to Emerging technologies

Evolution of technologies, Introduction to Industrial revolution, Historical background (IR 1.0, IR 2.0, IR 3.0), Fourth industrial revolution (IR 4.0), Role of data for Emerging technologies, Enabling devices and networks for emerging technologies (programmable devices), Human to Machine Interaction, Future trends in emerging technologies.

Module 2: Introduction to Data Science

Overview for Data Science, Definition of data and information, Data types and representation, Data Value Chain, Data Acquisition, Data Analysis, Data Curating, Data Storage, Data Usage, Basic concepts of Big Data.

Module 3: Artificial Intelligence (AI)

Introduction to AI, What is AI, History of AI, Levels of AI, Types of AI, applications of AI, Agriculture, Health, Business (Emerging market), Education, AI tools and platforms (eg: scratch/object tracking), Sample application with hands on activity (simulation based).

Module 4: Internet of things (IOT)

Overview of IOT, What is IOT?, History of IOT, Advantages of IOT, Challenges of IOT (IoT), How IOT works, Architecture of IOT, Devices and network , Applications of IOT.

Module 5: Augmented Reality (AR)

Introduction to AR, Virtual reality (VR) , Augmented Reality(AR) vs mixed reality (MR), architecture of AR systems, Application of AR systems (education, medical, assistance, entertainment) workshop oriented hands demo.

Module 6: Ethics and professionalism of Emerging technologies

Technology and ethics, Digital privacy, Accountability and trust, Treats and challenges.

Module 7: Other Emerging technologies

Nanotechnology, Biotechnology, Blockchain technology, Cloud and quantum computing, Autonomic computing, Computer vision, Embed systems, Cyber security, Additive manufacturing (3D Printing), Etc.

Suggested Books:

1. Follett, J. (2014). Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things: O'ReillyMedia.
2. Vong, J., & Song, I. (2014). Emerging Technologies for Emerging Markets: Springer Singapore.
3. Del Rosal, V. (2015). Disruption: Emerging Technologies and the Future of Work. Emtechub.
4. Sadiku, M. N. O. (2019). Emerging Internet-Based Technologies: CRC Press.
5. Mohamed Anis Bach Tobji, Rim Jallouli, Yamen Koubaa, Anton Nijholt Digital Economy. Emerging Technologies and

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(ELECTIVE-I) CSE- 506: Signals and Networks

Course Objectives	• Analyze the discrete time signals and system using different transform domain techniques. • Design and implement LTI filters for filtering different real world signals. • Develop different signal processing applications using DSP processor**.**
Course Outcomes	On completion of the course, • Student will be able to Analyze the discrete time signals and system using different transform domain techniques. • Design and implement LTI filters for filtering different real world signals. • Develop different signal processing applications using DSP processor.

DETAILED CONTENT

Module 1

Objective and overview, signal and system types and classifications, step response, impulse response and convolution integral; Periodic signal analysis: Fourier series and properties;

Module 2

Aperiodic signal analysis: Fourier Transform - its properties and sinusoidal steady state analysis of systems; Elements of electrical network: dependent and independent sources, active and passive components; classical differential equations for description of transient conditions of Network; Solutions of linear time invariant networks with initial conditions;

Module 3

Unilateral and Bilateral Laplace Transforms and properties; Transient solutions of networks using Laplace Transform; Network functions: poles, zeros, transfer function, Bode plot; One and two port network parameters and functions : Z, Y and ABCD parameters, driving point and transfer impedances and admittances;

Module 4

Network Theorems and Formulation of Network equations: generalized formulation of KCL, KVL, State Variable descriptions; Thevenin, Norton, Maximum Power Transfer, Tellegen and Reciprocity Theorems;

Module 5

Graph theory: Tree, Co-tree, fundamental cut-set, fundamental loop analysis of network; Analog filter design: Butterworth, Sallen Key, frequency transformation and scaling;

Reference Books:

1. Signals, Systems and Networks by Gyorgy Fodor.
2. Signals and Systems by P. Ramesh Babu& R. AnandaNatarajan, Scitech Publications (India)

Signals & Systems by A. V. Oppenheim, A. S. Willsky and S. H. Nawab, Prentice-Hall India

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CSE- 601P: Programming in Java Lab

Course Objectives	• This course introduces computer programming using the JAVA programming language with object-oriented programming principles. • Emphasis is placed on event-driven programming methods, including creating and manipulating objects, classes, graphics concepts, applet programming concepts etc., • Upon completion, students should be able to design, code and debug JAVA language programs.
Course Outcomes	• Remember the fundamentals of Java programming language • Understand the basics of Java programming, multi-threaded programs and Exception handling • Analyze and use Java in a variety of applications. • Write and debug a software application developed using the Java programming language.

LIST OF EXPERIMENTS

1. Write a program to print ―Hello World‖ on the screen.
2. Write a program that calculates how long it takes to drive from Kahsmir to Kanyakumari at 75 mile per hour (Use 3000 miles as the approximate distance between two cities).
3. Write a program that creates and initializes a four-element int array. Calculate and display the average of its values.
4. Write a program that creates a 2-d array with int values the first element should be an array containing 32. The second array should be an array containing 500 and 300 .The third element should be an array containing 39.45 and 600.Declare, allocate and initialize the array display its length and elements.
5 Write a program to swap two values using object reference. Your program should have a swap function.
6. Write an application that accepts two doubles as its command line arguments, multiple these together and display the product.
7. Write an application that accepts one command line argument; display the line of reporting if number is even or odd.
8. Write an application that accepts radius of a circle as its command line argument display the area.
9. WAP that describes a class person. It should have instance variables to record name, age and salary.
Create a person object. Set and display its instance variables.
10. Write a program that uses length property for displaying any number of command line

arguments.
11. WAP that creates a class circle with instance variables for the centre and the radius. Initialize and display its variables.
12. Modify experiment 1 to have a constructor in class circle to initialize its variables.
13. Modify experiment 2 to show constructor overloading.
14. WAP to display the use of this keyword.
15. Write a program that can count the number of instances created for the class.
Week 4
16. WAP that implements method overloading.
17. WAP that shows passing object as parameter.
18. WAP that illustrates method overriding
19. Write a program to show that the value of non static variable is not visible to all the instances, and therefore cannot be used to count the number of instances.
20. WAP to illustrate simple inheritance
21. WAP illustrating a super class variable a referencing as sub class object.
22. WAP illustrating all uses of super keywords.
23. Create an abstract class shape. Let rectangle and triangle inherit this shape class. Add necessary functions.
24. Write an application that creates a package p1. Add some classes in it.
25. Write an application that uses the package p1 created in the program 21.
26. Write an application that creates an interface and implements it.
27. Write an application to illustrate Interface Inheritance.
28. Write an application that shows the usage of try, catch, throws and finally.
29. Write an application that shows how to create a user-defined exception.
26. Write an application that creates an interface and implements it.
27. Write an application to illustrate Interface Inheritance.
28. Write an application that shows the usage of try, catch, throws and finally.
29. Write an application that shows how to create a user-defined exception.
30. Write an application that executes two threads. One thread displays ―An‖ every 1000 milliseconds and other displays "B" every 3000 milliseconds. Create the threads by extending the Thread class.
31. Write an application that shows thread synchronization.
32. Write an application that displays deadlock between threads.
33. Write an application that shows thread priorities.
34. Write an Applet that displays "Hello World" (Background color-black, text color-blue and your name in the status window.)
35. Write a program that displays the life cycle of an Applet.
36. Write an Applet displaying line, rectangle, rounded rectangle, filled rectangle, filled rounded rectangle, circle, ellipse, arc, filled arc and polygon, all in different colors
37. Write an Applet that displays a counter in the middle of applet.
38. Write an Applet that displays a counter in the middle of applet. The counter starts from zero and keeps on incrementing after every second.
39. Write an Applet that draws a dot at a random location in its display area every 200ms. Any existing dots are not erased. Therefore dots accumulate as the applet executes.
40.Write an Applet that illustrates how to process mouse click, enter, exit, press and release events. The background color changes when the mouse is entered, clicked, pressed, released or exited.

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CSE-602P: Computer Graphics Lab

Course Objectives	• To acquaint the learner with the basic concepts of Computer Graphics • To learn the various algorithms for generating and rendering graphical figures • To get familiar with mathematics behind the graphical transformations
Course Outcomes	• Understand the basic concepts of computer graphics. • Design scan conversion problems using C programming. • Apply clipping and filling techniques for modifying an object. • Understand the concepts of different type of geometric transformation of objects in 2D and 3D. • Understand the practical implementation of modeling, rendering, viewing of objects in 2D.

LIST OF EXPERIMENTS

1. Introduction to Computer Graphics.

2. Familiarize yourself with creating and storing digital images using scanner and digital camera (compute the size of image when stored in different formats) and convert the stored images from one format to another (BMP, GIF, JPEG, TIFF, PNG, etc.) and analyze them.

3. Implement bresenham's line algorithm. Also provide Provision to change attributes of graph primitives such as stippling (Dotted and Dashed pattern), colors.

4. Implement bresenham's circle algorithm. Also provide to change attributes of graph primitives such as stippling (Dotted and Dashed pattern) and colors.

5. Implement 2-D transformation with translation, scaling, rotation, reflection, Shearing and scaling

6. Implement tweening procedure for animation with key frames having equal or different no. of edges.

7. Write a program for 2D line drawing as Raster Graphics Display.

8. Write a program for 2D circle drawing as Raster Graphics Display.

9. Write a program for 2D polygon filling as Raster Graphics Display.

10. Write a program for line clipping.

11. Write a program for polygon clipping.

12. Implement Flood Fill Method to fill interior and exterior of a polygon.

13. Write a program for displaying 3D objects as 2D display using perspectives Transformation.

14. Write a program for rotation of a 3D object about arbitrary axis.

15. Write a program to draw different shapes and fill them with various patterns.

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CSE – 614: Pattern Recognition and Anomaly Detection

Course Objectives	• Understand the fundamentals of pattern recognition and its applications in various domains. • Gain insight into statistical approaches for analyzing and interpreting patterns in data. • Familiarize themselves with machine learning algorithms and neural networks for pattern recognition tasks. • Develop an understanding of anomaly detection and its practical use cases. • Explore different anomaly detection approaches and evaluate the performance of anomaly detectors. • Apply pattern recognition and anomaly detection techniques to real-world problems, such as network intrusion detection, IoT data analysis, time series forecasting, and more. • Analyze and interpret the results of anomaly detection algorithms to make informed decisions in diverse applications
Course Outcomes	Upon successful completion of the course, students will be able to: • Identify patterns in data and utilize statistical techniques to analyze and interpret patterns effectively. • Apply various machine learning algorithms, including neural networks, for pattern recognition tasks. • Implement anomaly detection techniques and evaluate the performance of anomaly detectors on different types of data. • Solve real-world problems related to anomaly detection, such as network intrusion detection, IoT data analysis, and time series forecasting. • Demonstrate a comprehensive understanding of the principles and applications of pattern recognition and anomaly detection in diverse domains. • Interpret the results of pattern recognition and anomaly detection algorithms and communicate their findings effectively to stakeholders. • Apply the knowledge gained from the course to address complex data analysis challenges and make data-driven decisions.

Detailed Content

Unit 1. Pattern and Anomaly Detection Introduction

What is pattern? What is pattern recognition? Pattern recognition techniques, Training and learning in pattern recognition, Pattern recognition applications, Pattern recognition use cases, what is anomaly detection? What are some other practical uses for anomaly detection? How is anomaly detection calculated over time? Key point for AI and ML-anomaly detection, Tasks

for artificial intelligence, AI system learning process, Test to geometric requirements for curves algebraic, Curves matched to data points, Case study: Anomaly detection with IBM Watson, Probability theory, Maximum likelihood theory and estimation, Model selection, Matrices of uncertainty (confusion matrices), Loss of logging (log-loss), Rate for F1 (F1 score), Metric selection, Hyperparameter selection, The problem with high dimensionality, Information theory.

Unit 2. Statistical Approaches for Pattern Recognition

Understanding statistics, T-test, Z-test, Z-test and t-test difference, P-value, Descriptive statistics, Type I error, Type II error, Differences between type I and type II errors, Null hypothesis, Statistical significance, Hypothesis testing, Four steps of hypothesis testing, Real-world example of hypothesis testing, Bonferroni test, Check of one-tailed, Probability distributions, Types of distributions, Regression models, Types of regression, How to select the best model for regression? Common questions, Linear models for classification, Example of positive linear regression.

Unit 3. Machine Learning Approaches for Pattern Recognition

Neural networks, how neural networks learn? Neural networks examples, Neural networks use cases, Kernel methods, Sparse kernel machines use cases, Graphical models, Mixture models and EM, Bayesian networks: Directed graphical models, Conditional probability distributions, Potential functions, Conditional independences, Sampling methods for pattern recognition, Continuous latent variables, Combining models for pattern recognition, Markov chain Monte Carlo, The K-means algorithm, Applications of K-means.

Unit 4. Anomaly Detection & Anomaly Detection Approaches

What are anomalies? Applications of anomaly detection, Related use cases, Types of input data, Types of anomalies, Evaluation of an anomaly detector, Taxonomy of approaches, Classification based, Classification use cases, Supervised classification techniques, Nearest neighbour based techniques, Others model techniques, Information theory, Contextual anomaly based, Collective anomaly detection, On-line based model, Distributed anomaly detection, IDS analysis strategy.

Unit 5. Real-world problems

Network intrusion detection, Understanding of IDS core operation, How an IDS works? Types of intrusion detection systems, Fundamental concerns of intrusion detection systems, Intrusion detection vs. intrusion prevention, The future of IDS, Anomaly detection in big data, Key attributes of advanced anomaly detection, The real-world impact of anomaly detection, Anomaly detection on 5G: Possibilities and opportunities, Real time anomaly detection in docker, Hadoop cluster, Anomaly detection in IoT, Detection of deviations in deep learning time series results, Anomaly detection use cases, Anomaly detection with time series forecasting, What is time series analysis? Time series data models, how to find anomaly in time series data? Anomaly detection using machine learning, Anomaly detection using deep learning, Anomaly detection for an e-commerce pricing system, IBM’s Watson AIOps automates IT anomaly detection and remediation.

Reference books -

1. "Pattern Recognition and Machine Learning" by Christopher M. Bishop
2. "Anomaly Detection Principles and Algorithms" by Kishan G. Mehrotra, Chilukuri K. Mohan, and HuaMing Huang

3. "Introduction to Statistical Pattern Recognition" by Keinosuke Fukunaga
4. "Pattern Recognition: A Machine Learning Approach" by Christos Aggelos and Dimitrios Zevgolis
5. "Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy
6. "Anomaly Detection for the Internet of Things" by Salvatore Venticinque and Michele Nitti
7. "Intrusion Detection: A Machine Learning Approach" by Rebecca Montanari.

B.Tech C.S.E

VII SEMESTER

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(ELECTIVE –II) CSE- 603: Computer Networks

Course Objectives	The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.
Course Outcomes	• Describe how computer networks are organized with the concept of layered approach. • Describe how signals are used to transfer data between nodes. Implement a simple LAN with hubs, bridges and switches. • Describe how packets in the Internet are delivered.

DETAILED CONTENT

Module 1:

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spreadspectrum.

Module 2:

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA.

Module 3:

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Module 4:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucketalgorithm.

Module 5:

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Suggested books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw- Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Suggested reference books

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

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(ELECTIVE –II) CSE- 604: Computational Geometry

Course Objectives	The participants will after the course have detailed knowledge of the fundamental problems within computation geometry and general techniques for solving problems within computational geometry and practical experience with implementation issues involved in converting computation geometry algorithms into running programs.
Course Outcomes	The participants must at the end of the course be able to: • Construct algorithms for simple geometrical problems. • Implement computational geometry algorithm.

DETAILED CONTENT

Module 1:

Introduction, Visibility Problems, 2D Maxima, Line Sweep Method, Segment Intersection Problem, Line Sweep: Rectangle Union.

Convex Hull, Quick Hull, More Convex Hull Algorithms, Intersection of Half Planes and Duality, Lower Bounds.

Module 2:

Planar Point Location, Point Location and Triangulation Contd., Triangulation of Arbitrary Polygon.,Voronoi Diagram : Properties.

Voronoi Diagram Construction, Delaunay Triangulation., Quick sort and Backward Analysis, Generalized RIC, Arrangements.

Module 3:

Z one Theorem and Application, Levels, Range Searching : Introduction, Orthogonal Range searching, Priority Search Trees,

Non - Orthogonal Range Searching, Half - Plane Range Query, Well Separated Partitioning, Quadtrees Epsilon –WSPD, Construction of Epsilon – WSPD

Module 4:

Epsilon - WSPD to Geometric Spanner, Epsilon-Nets & VC Dimension, Epsilon-Nets & VC Dimension contd., Geometric Set Cover, Geometric Set Cover (with Bounded VC Dimension), Shape Representation, Shape Comparison.

Text Books:

1. Franco P. Preparata and Michael Ian Shamos, Computational Geometry an Introduction.Texts and Monographs in Computer Science, Springer Verlag.

2. Joseph O'Rourke, Computational Geometry in C. Cambridge University Press 2nd Edn.
3. Mark. de Berg, Marc. vanKreveld, Mark. Overmars and Otfried Cheong, Computational Geometry- Algorithms and Applications. Springer- Verlag 3rd Edn.

References:

1. Herbert Edelsbrunner, Algorithms in Combinatorial Geometry, EATCS Monographs on Theoretical Computer Science, SpringerVerlag.
2. Joseph O' Rourke, Art Gallery Theorems. Oxford Presspublications.

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(ELECTIVE –II) CSE- 605: Neural Networks and Deep Learning

Course Objectives	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
Course Outcomes	• Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains. • Implement deep learning algorithms and solve real-world problems.

DETAILED CONTENT

Module 1:
Introduction: Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Feed forward neural network: Artificial Neural Network, activation function, multi-layer neural network.

Module 2:
Training Neural Network: Risk minimization, loss function, backpropagation, regularization, model selection, and optimization. Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

Module 3:
Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.

Module 4:
Probabilistic Neural Network: Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Auto encoders. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing. Deep Learning Tools: Caffe, Theano, Torch.

Text Books

- Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
- Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

Reference Books

- Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
- Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
- Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Books on Optimization Techniques

- A. Ravindran, K. M. Ragsdell , and G. V. Reklaitis , ENGINEERING OPTIMIZATION: Methods and Applications , John Wiley & Sons, Inc. , 2016..
- Antoniou, W. S. Lu, PRACTICAL OPTIMIZATION Algorithms and Engineering Applications, Springer , 2007.

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(ELECTIVE –II) ECEL-03: Information Theory and Coding

Course Objectives	• Introduce the principles and applications of information theory. • To teach study how information is measured in terms of probability and entropy, and the relationships among conditional and joint entropies. • To teach coding schemes, including error correcting codes. • Explain how this quantitative measure of information may be used in order to build efficient solutions to multitudinous engineering problems.
Course Outcomes	At the end of the course, students will demonstrate the ability to: • Understand the concept of information and entropy • Understand Shannon's theorem for coding • Calculation of channel capacity • Apply coding techniques

DETAILED CONTENT

Module 1: Basic Concepts of Information Theory:
Basics of information theory, entropy for discrete ensembles; Shannon's noiselesscodingtheorem; Encoding of discrete sources.

Module 2:Elements of Encoding:
Markov sources; Shannon's noisy coding theorem and converse for discrete channels;Calculationof channel capacity and bounds for discrete channels; Application to continuous channels.

Module 3: Coding and Decoding Techniques:
Techniques of coding and decoding; Shannon's Binary encoding, Shannon Fano encoding,Huffman codes and uniquely detectable codes;Huffman's Minimum Redundancy codes. Coding for Reliable Digital Transmission & Storage: Introduction, types of codes,

Module 4. Linear Block and BCH Codes:
Description of Cyclic codes; encoding of cyclic codes;convolutional arithmetic codes: Encoding of convolution codes, structural properties of Convolution codes, distance properties of conventional codes,

Text Books

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
3. R.B. Ash, Information Theory, Prentice Hall, 1970.

Reference Books

1. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

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(ELECTIVE –III) CSE-607: Compiler Design

Course Objectives	• To provide a thorough understanding of the internals of Compiler Design.
Course Outcomes	The students will be able to • Explain the concepts and different phases of compilation with compile time error handling. • Represent language tokens using regular expressions, context free grammar and finite automata and design lexical analyzer for a language. • Compare top down with bottom up parsers, and develop appropriate parser to produce parse tree representation of the input. • Generate intermediate code for statements in high level language. • Design syntax directed translation schemes for a given context free grammar. • Apply optimization techniques to intermediate code and generate machine code for highlevel language program.

DETAILED CONTENT

Module 1:

Introduction to Compilers

Compiler and translators need of translators, structure of a compiler, lexical analysis, syntax Analysis.

Basic Parsing Techniques

Parsers, shift-reduce parsing, predictive parsing.

Module 2:

Automatic Construction of Efficient Parsers

LR parsers, canonical collection of LR(0) items, construction canonical LR parsing tables, construction LALR and SLR parsing tables using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, Construction LALR sets of items.

Module 3:

Syntax-Directed Translation

Syntax directed translation schemes, implementation of syntax directed translation, intermediate code, postfix notation parse trees and syntax trees, three address code, quadruples and triples, translation of assignment statements, postfix translation with top down parser.

Symbol Tables: Contents of a table, data structures for symbol tables, representing scope

information.

Module 4:

Error detection and recovery

Errors, lexical-phase errors, syntax-phase errors, semantic errors.

Introduction to Code optimization

The principal source of optimization, loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, global data flow analysis.

Code Generation

Object programs, problems in code generation, machine model, simple code generator, register allocation and assignment, code generation from DAG‟s, peephole optimization.

Text and Reference Books

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

2. Allen I. Holub "Compiler Design in C", Prentice Hall of India

3. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings

4. J.P. Bennet, "Introduction to Compiler Techniques", Tata McGraw-Hill

5.HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI

6. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning

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(ELECTIVE –III) ECEL-18: Embedded Systems

Course Objectives	• To have knowledge about the basic working of a microcontroller system and its programming in assembly language. • To provide experience to integrate hardware and software for microcontroller applications systems.
Course Outcomes	At the end of the course, students will demonstrate the ability to: • Suggest design approach using advanced controllers to real-life situations. • Design interfacing of the systems with other data handling / processing systems. • Appreciate engineering constraints like energy dissipation, data exchange speeds etc.

DETAILED CONTENT

Module 1.Introduction:
The concept of embedded systems design, Embedded microcontroller cores, embeddedmemories. Examples of embedded systems,

Module 2: ATMEL RISC Processors and Development Tools
Introduction, Basics of developing for embedded systems,Embedded system Initialization,Atmel RISC Processors Architecture, Memory, Reset and interrupt functions,Parallel I/O ports, Timer/Counters, Serial communication using UART, SPI, Analog Interfaces AVR RISC Assembly language instruction set.

Module 3. Technological Aspects of Embedded Systems:
Interfacing between analog and digital blocks, signal conditioning, digital signal processing. Subsystem interfacing, interfacing with external systems, user interfacing. Design tradeoffs due toprocess compatibility, thermal considerations, etc.,

Module 4. Software Aspects of Embedded Systems:
Realtime programming languages and operating systems for embedded systems.

Text Books

1. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole,2000.
2. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
3. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.

Reference Books

1. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.
2. K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.

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(ELECTIVE –III) CSE-608: Cloud Computing

Course Objectives	• Identify the technical foundations of cloud systems architectures. • Analyze the problems and solutions to cloud application problems. • Apply principles of best practice in cloud application design and management. • Identify and define technical challenges for cloud applications and assess their importance
Course Outcomes	• Understand the fundamental principles of distributed computing. • Understand how the distributed computing environments known as Grids can be built from lower level services. • Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing. • Analyze the performance of Cloud Computing. • Understand the concept of Cloud Security. • Learn the Concept of Cloud Infrastructure Model..

DETAILED CONTENT

Module 1:

Journey to the cloud

Business driver for cloud computing, Definition of cloud computing, Characteristics of cloud computing as per NIST, Steps involve in transitioning from classic data center to cloud computing environment, Disadvantage of cloud computing , Cloud Models.

Classic data center (CDC)

Application, DBMS, compute, storage and networking, Object based and unified storage technologies, Business continuity overview and backup, Replication technologies, CDC management.

Module 2:

Cloud as a Service : Gamut of Cloud Solutions , Principal Technologies ,Cloud Strategy , Cloud Design and Implementation Using SOA Conceptual Cloud Model , Cloud Service Defined .

Cloud Solution: Cloud Ecosystem , Cloud Business Process Management , Cloud Service Management , On-Premise Cloud Orchestration and Provisioning Engine , Computing on Demand (CoD) Cloud sourcing .

Cloud Offerings : Introduction , Information Storage, Retrieval, Archive, and Protection ,

Cloud Analytics , Testing Under Cloud Information Security , Virtual Desktop Infrastructure , Storage Cloud , Cloud architecture.

Module 3:

Cloud Management : Resiliency , Provisioning , Asset Management , Cloud Governance , High Availability and Disaster Recovery Charging Models, Usage Reporting, Billing, and Metering.

Cloud Virtualization Technology : Introduction , Virtualization Defined , Virtualization Benefits , Server Virtualization , Virtualization for x86 Architecture , Hypervisor Management Software, Virtual Infrastructure Requirements , Virtualized data center (VDC),

Cloud Infrastructure: Storage Virtualization , Storage Area Networks , Network-Attached Storage, Cloud Server Virtualization Networking Essential to Cloud, Virtual LAN(VLAN) and virtual SAN (VSAN)and their benefits, and considerations, Backup and recovery of virtual machines(VMs)

Module 4:

Cloud and SOA : SOA Journey to Infrastructure , SOA and Cloud , SOA Defined , SOA and IAAS , SOA-Based Cloud Infrastructure Steps , SOA Business and IT Services Cloud Mobility : Introduction , The Business Problem , Mobile Enterprise Application Platforms Mobile Application Architecture

Cloud security and migration to cloud

Security concerns and counter measures in a VDC and cloud environment, Governance, risk, and compliance aspects in cloud, Cloud models suitable for different categories of users, Consideration for choosing applications suitable for cloud, Different phases to adopt the cloud.

Text Books:

1. Cloud Computing By DR. KUMAR SAURABH, Wiley India Pvt Ltd.

2. Cloud Computing By BARRIE SOSINSKY Wiley India Pvt Ltd

3. Cloud Computing : A practical approach by Anthony T. Velte- Tata McGraw Hill Education Private Limited (2009) ISBN: 0070683514.

Reference Books :

1. Cloud Computing For Duminies by Halper Fern, Kaufman Marica, Bloor Robin, Hurwit Judith, - Wiley India Pvt Ltd (2009) ISBN: 8126524871.

2. Grid and cluster computing by Prabhu , PHI publication.

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(ELECTIVE –III) CSE-609: Soft Computing

Course Objectives	To introduce the concepts in Soft Computing such as Artificial Neural Networks, Fuzzy logic-based systems, genetic algorithm-based systems and their hybrids.
Course Outcomes	The Students will be able to • Learn soft computing techniques and their applications. • Analyze various neural network architectures. • Define the fuzzy systems. • Understand the genetic algorithm concepts and their applications. • Identify and select a suitable Soft Computing technology to solve the problem; construct a solution and implement a Soft Computing solution..

DETAILED CONTENT

Module 1:

Neural Networks

History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, AssociativeMemories, Applications of Artificial Neural Networks.

Module 2:

Fuzzy Logic:

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations. Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic, Multivalued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

Module 3:

Uncertainty based Information: Information& Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets.

Introduction of Neuro-Fuzzy Systems: Architecture of Neuro Fuzzy Networks.

Module 4:

Application of Fuzzy Logic: Medicine, Economics etc.

Genetic Algorithm: An Overview, GA in problem solving, Implementation of GA.

Swarm Intelligence: Ant Colony system, PSO system.

Text Books

1. Anderson J.A., "An Introduction to Neural Networks", PHI,
2. Hertz J. Krogh, R.G. Palmer, "Introduction to the Theory of Neural Computation", Addison-Wesley,
3. G.J. Klir& B. Yuan, "Fuzzy Sets & Fuzzy Logic", PHI,
4. Melanie Mitchell , "An Introduction to Genetic Algorithm", PHI,

Reference Book

1. Freeman J.A. & D.M. Skapura, "Neural Networks: Algorithms, Applications and Programming Techniques", Addison Wesley

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(OPEN ELECTIVE-I) CSE-611: System Programming

Course Objectives	• To introduce student the fundamental model of the processing of high level language programs for execution on computer system. • To explain the basic operations that are performed from the time a computer is turned on until a user is able to execute programs. • To understand and implement Assembler, Loader, Linkers, Macros & Compilers. • To introduce students the process management and information management via different software tools.
Course Outcomes	By the end of the course students will be able to • Understand different components of system software. • Understand intermediate code generation in context of language designing. • Recognize operating system functions such as memory management as pertaining to run time storage management.

DETAILED CONTENT

Module 1:

Overview of System Software

Introduction, Software, Software Hierarchy, Systems Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Tools, Life Cycle of a Source Program, Different Views on the Meaning of a Program, System Software Development, Recent Trends in Software Development, Levels of System Software.

Overview of Language Processors

Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables, Data Structures for Language Processing: Search Data structures, Allocation Data Structures. Assemblers

Module 2:

Elements of Assembly Language Programming, Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two-Pass Assemblers, One-Pass Assemblers, Single pass Assembler for Intel x86 , Algorithm of Single Pass Assembler, Multi-Pass Assemblers, Advanced Assembly Process, Variants of Assemblers Design of two pass assembler, Macro and Macro Processors

Module 3:

Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design Of a Macro Pre- processor, Design of a Macro Assembler,

Functions of a Macro Processor, Basic Tasks of a Macro Processor, Design Issues of Macro Processors, Features, Macro Processor Design Options, Two-Pass Macro Processors, One-Pass Macro Processors

Linkers and Loaders

Introduction, Relocation of Linking Concept, Design of a Linker, Self- Relocating Programs, Linking in MSDOS, Linking of Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders, General Loader Schemes, Absolute Loaders, Relocating Loaders, Practical Relocating Loaders, Linking Loaders, Relocating Linking Loaders, Linkers v/s Loaders

Module 4:

Scanning and Parsing

Programming Language Grammars, Classification of Grammar, Ambiguity in Grammatic Specification, Scanning, Parsing, Top Down Parsing, Bottom up Parsing, Language Processor Development Tools, LEX, YACC

Compilers

Causes of Large Semantic Gap, Binding and Binding Times, Data Structure used in Compiling, Scope Rules, Memory Allocation, Compilation of Expression, Compilation of Control Structure, Code Optimization

Interpreters & Debuggers

Benefits of Interpretation, Overview of Interpretation, The Java Language Environment, Java Virtual Machine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger

Reference Books:

1) System Programming by D M Dhamdhere McGraw Hill Publication

2) System Programming by Srimanta Pal OXFORD Publication

3) System Programming and Compiler Construction by R.K. Maurya& A. Godbole.

4) System Software – An Introduction to Systems Programming by Leland L. Beck, 3rd Edition, Pearson Education Asia, 2000

5) System Software by Santanu Chattopadhyay, Prentice-Hall India,2007

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(OPEN ELECTIVE-I) CSE-612: Introduction to Philosophical Thoughts

Course Objectives	The course has been devised to introduce to the students the very basicsof philosophy – its subject matter as well as its structural framework. The students are alsoexpected to acquaint themselves with the various branches of philosophy and differentphilosophical standpoints
Course Outcomes	The students will be able to understand the subject matter andstructural framework of the discipline of Philosophy. They will have knowledge of variousbranches of philosophy and will be able to understand different philosophical standpoints.

DETAILED CONTENT

Module 1:

- What is philosophy and what is an argument?
- Philosophical Method/Logic
- Ethics
- Applied Ethics
- Debate on abortion

Module 2:

- Epistemology
- Mind Body Problem
- Debate on the mind-body problem
- Knowledge and Certainty
- Being and Reality

Module 3:

- Metaphysics- Personal Identity
- Philosophy of Religion
- Debate on the existence of God
- God and Religion
- Freedom

Module 4:

- Science and Method
- Morality and the Good Life
- Authority & the State
- Beauty and Art

Reference Books:

1. Western Philosophy: An Anthology. John Cottingham, ed. Second edition (2008).
2. A Rulebook for Arguments. Anthony Weston. Fourth edition.
3. The Elements of Style. William Strunk Jr. and E.B. White. Fourth edition.

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(OPEN ELECTIVE-I) CSE-613: Multimedia Technology

Course Objectives	• To identify a range of concepts, techniques and tools for creating and editing the interactive multimedia applications. • To identify the current and future issues related to multimedia technology. • To identify both theoretical and practical aspects in designing multimedia systems surrounding the emergence of multimedia technologies using contemporary hardware and software technologies.
Course Outcomes	• Describe the types of media and define multimedia system. • Describe the process of digitizing (quantization) of different analog signals (text, graphics, sound and video). • Use and apply tools for image processing, video, sound and animation. • Apply methodology to develop a multimedia system. • Apply acquired knowledge in the field of multimedia in practice and independently continue to expand knowledge in this field.

DETAILED CONTENT

Module 1:

Introduction: Multimedia and its types, Use of multimedia, Introduction to Multimedia Systems and their Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia, Structure and components of Multimedia. Application Domains, Internet and Multimedia.

Technology: Architecture of a sound card, MIDI interface, protocol and data format , digitization of audio signal - sampling and coding, digital audio signal processing, architecture of a sound card, elementary concept of music, pitch and voice, staff notation and scoring, electronic music and synthesizer , Multimedia Hardware devices/Software's, Multimedia software development tools.

Module 2:

Image & Graphics: Basic concept, Digital image Representation and formats, Graphic drafting Tools, Image processing and enhancement, Color printer principles, Image scanner principle, File formats, Digital still Camera and photography.

Animation and special effects: animation principles, Survey of animation tools, Special Visual Effects wiping, morphing using Dream viewer.

Video Technology: Analog Video, Principles Broadcast standards, CCD Camera, Recording formats and standard, Digital Video, Principles, PC video and Videoconference standards, TV Cards Frame Grabber Principles, IDTV and HDTV principles, Motion Picture to Video Conversion, video performance measurement.

Module 3:

Compression and decompression: Type of compression, Need of data compression, Binary image compression schema, Color and gray schema, and still video image compression, video image compression, Audio compression.

Multimedia Document and Interchange formats: Media preparation, media composition, Hypertext, HTML, MHEG and Hypermedia, SGML, TIFF, TWAIN, Open document Architecture (ODA), Quick Time Movie film format, Open Media framework (OMFI).

Module 4:

Synchronization: Temporal Dependence in Multimedia presentation. Inter-object and IntraobjectSynchronization , Time Abstraction for authoring and visualization, Reference Modle and Specification.

Hypermedia Messaging: Mobile messaging, Hypermedia message component, Hypermedia linking and embedding, creating hypermedia message, Integrated multimedia message standards, integrated document management.

Distributed Multimedia system: Component of distributed Multimedia system, Client server operation , Multimedia object servers, Multi-server network topologies , Distributed multimedia data bases, Managing distributed object.

Text Books:

1. Multimedia Systems Design, P.K.Andleigh and K.Thakrar, Prentice Hall PTR, 1996.
2. Multimedia system Ed by John f.KBuford , Addison Weslay Publication.
3. Multimedia Computing, Communications and Applications, Ralf Steinmetz and Klara Nashtedt, Prentice Hall 1995

Reference Books:

1. Multimedia and web design by Vikas Gupta , Dreamtech publication.
2. Multimedia Technology & Applications, David Hillman, Galgotia Publications.

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CSE 714: Application of Machine Learning in Industries

Course Objectives	• To familiarize students with the application of machine learning in diverse industries and its significance in solving complex problems and driving business growth. • To explore various machine learning techniques and algorithms used in different industrial domains, including banking, healthcare, retail, transportation, energy, and more. • To provide hands-on experience in implementing machine learning models to solve industry-specific challenges through case studies and practical assignments. • To understand the challenges and limitations of applying machine learning in different industries and develop strategies to overcome them. • To develop critical thinking and analytical skills to identify suitable machine learning solutions for specific industry problems.
Course Outcomes	By the end of the course, students will be able to: • Demonstrate a comprehensive understanding of the application of machine learning in various industries, including banking, healthcare, manufacturing, logistics, and more. • Apply machine learning algorithms and techniques to address specific challenges in different industrial domains. • Evaluate and compare the performance of machine learning models in industry-specific applications and make data-driven decisions. • Design and implement machine learning-based solutions to improve operational efficiency and decision-making in different industries. • Identify potential use cases for machine learning in various industrial sectors and propose innovative solutions. • Analyze the challenges and limitations of applying machine learning in industries and propose strategies to enhance model performance and overcome obstacles. • Communicate effectively about machine learning concepts, applications, and results to both technical and non-technical stakeholders in industrial settings.

Detailed Content

Unit 1. Machines Learning in Banking and Securities

Why machine learning in banking sector, Use of AI in banking and finance, Fraud detection, Tough competition in banking industry, Risk modeling and investment banks, Customer data management, Decreased customer experience and loyalty, Personalized marketing, Role of machine learning: Challenges of banking sector and securities, Widely used machine learning algorithm in banking and security, Fraud prevention and detection systems, Rule based and

machine learning based approach in fraud detection, Anomaly detection: Ways to expose suspicious transactions in banks, Advanced fraud detection systems, Risk management systems, Case study: Application of machine learning for financial risk management, Credit risk analysis using machine learning classifier, Investment prediction systems, Portfolio management systems, Objectives of portfolio management, Algorithmic trading, Deep learning for customer services, Chatbot: Deep learning approach, AI powered marketing systems, Deep learning in cyber security, Types of cyber-attacks in banks, Deep learning methods used in cyber security, Deep learning v/s restricted Boltzmann machines, Convolution Neural Networks (CNNs), Recurrent neural networks, Machine learning techniques: Loan underwriting & sentiment/news analysis, Sentiment or news analysis, Current challenges and opportunities: Banking and security domain.

Unit 2. Machine Learning in Communication, Media and Entertainment

Machine learning in communication, media and entertainment, Usage of machine learning in media and entertainment industry, Machine learning techniques for customer sentiment analysis, World embedding's, Sentiment analysis with long short term memory networks, Real-time analytics in communication, media and entertainment industries, Real time analytics and social media, Deep learning for social media analytics, Recommendations engines, Collaborative filtering, Memory based collaborative filtering, Model based collaborative filtering, Content based filtering, Hybrid recommendation systems, Summary of recommendation systems, Deep learning techniques on recommender systems.

Unit 3. Machine Learning in Healthcare and Life Science

Applications of machine learning in health and life sciences, The most important applications of machine learning in healthcare, Role of machine learning in drug discovery, Machine learning approaches in drug discovery, Medical image analysis, Why deep learning for medical image analysis, Neural network and deep learning architecture, Comparisons between architecture of different types of deep learning models, Machine learning in genetics and genomics, Genomics and AI background, Two category of genomics, How to use deep learning effectively, Interpreting deep learning models, Predictive medicine: Prognosis and diagnostics accuracy, Predictive medicine: Examples, ML applications in breast cancer diagnosis and prognosis.

Unit 4. Machines Learning in Education

Machine learning in education, Advantages of machine learning in education, learning analytics, Academic analytics, Action research, Educational data mining, Recommender system, Personalized adaptive learning, Learning analytics process, Data environment: What? Stakeholders: Who? Methods: How? Case study: Sentimental analysis for student's feedback using ML, Recommender systems in education, Domain model, Learner model, Students classification algorithm, Recommendation model, Case study: Application of ML in predicting students' performance, Proposed methodology, Data description, Sample data sets, Visualization, Selection of machine learning technique.

Unit 5. Machine Learning in Manufacturing and Petroleum Industries

Introduction, Applications of machine learning in manufacturing industry, Deep learning for smart manufacturing, Machine learning for quality control in manufacturing, Case study, Construction of CNN, Experimental results, Efficiency of CNN for defect detection, Comparative experiments, Machine learning for fault assessment, Time frequency methods, Spectrograms: Short-Time Fourier Transform (STFT), Scalograms: Wavelet transform, Hilbert-Huang transform, Proposed CNN architecture for fault classification based on vibration signals, Case study, Machinery failure prevention technology, Conclusion.

Unit 6. Applications of Machine Learning in Government Administration

Introduction, Risk and compliance, Type of government problems appropriate for AI applications, AI for citizen services use cases, Answering questions, Routing requests, Translation, Drafting documents, Chat bots for communication between citizen and government, Media richness theory, Chatbots in the public sector, Case study, Data management services, Knowledge processing services, Application services, An application scenario, Classifications of citizen complaints using ML, Case study Step 1: Document collection, Step 2: Prepossessing, Step 3: Feature extraction, Term frequency-Inverse document frequency, Step 4: Feature selection, Step 5: Classification, How to implement, Result.

Unit 7. Machine Learning in Insurance Industry

Importance of machine learning in insurance, Potential use cases of machine leaning in insurance industry, Case study on insurance climb analysis using machine learning algorithms, Case study on using machine learning for insurance pricing optimization, Personalized marketing in insurance industry, Predictive model for insurance underwriting, Case study: Risk prediction in life insurance industry.

Unit 8. Applications of Machine learning in Retail Industry and Supply Chain

Introduction, Inventory management, Few use case examples, Benefits of predictive analytics to retailers, Robots-seeing to customer satisfaction, IoT: Prevention first, Predictive analytics: Weathering demand, Analysing buying patterns, Analysing traffic patterns, Assortment planning, Eliminate guess work, Feed the right stores, Get better information, Assortment planning to drive supply chain, Retail analytics, Domestic forecasting, Case study: Forecasting seasonal footwear demand using ML, Demand forecasting methods, Predictor variables in demand forecasting, Traditional techniques v/s machine learning techniques, Methodology, Machine learning techniques used, List of attributes from the aggregated data by month at the style level, Feature selection and engineering, List of attributes for feature selection, Dataset partitioning, Model building, Three step model, K-means clustering, Three steps followed in classification, Three sub-steps in prediction, Performance measurement, Results, Three step model, Machine learning for supply chain management, Recommended architecture for machine learning models, Machine learning models use case.

Unit 9. Machine Learning in Transportation and Logistics

Introduction, Applications of ML and artificial intelligence in transportation, Applications of machine learning in transport, Incident detection, Predictive models, Application of AI in aviation and public transportation, Aviation, Shared mobility, Buses, Intelligent urban mobility, Autonomous vehicles, Autonomous transportation, Artificial intelligence use cases in logistics, Back office AI, Cognitive customs, Predictive logistics, Predictive risk management, Seeing thinking and speaking logistics operations, ML powered customer experience, Limitations of AI techniques in transportation, Computation complexity of AI algorithms.

Unit 10. Machine Learning in Energy and Utilities

Introduction, Smart grid, Smart grid technologies, Key characteristics of smart grid, Machine learning applications in smart grid, Machine learning techniques for renewable energy generation, Forecasting renewable energy generation, Wind power generation, Solar energy generation, Hydro power generation, Determining plant location, size and configuration, Managing renewable energy-integrated smart grid, Machine learning applications in wind energy forecasting, Case study: Wind power forecasting based on daily wind speed data, Wind energy output calculations based on hourly wind speed, Machine learning techniques used, LASSO regression, KNN regression, xGBoost regression, Random forest regression, Support vector regression, Wind power forecasting method using machine learning algorithm, About data set, Case studies, Case 1: Wind power forecasting based on daily mean wind speed and standard deviation, Forecasting accuracy of algorithms, Case 2: Wind power forecasting based on only daily mean wind speed, Case 3: Wind power forecasting for a different region.

Reference books -

1. "Machine Learning in Finance: From Theory to Practice" by Bob Hunt, Yanbo Wang, and David Wong

2. "Machine Learning for Dummies" by John Paul Mueller and Luca Massaron

3. "Machine Learning for Healthcare" by Stephen P. King

4. "Machine Learning in Action" by Peter Harrington

5. "Predictive Analytics for Business: Using Data Mining for Business Advantage" by Galit Shmueli, Nitin R. Patel, and Peter C. Bruce

6. "Machine Learning for the Web" by Andrea Isoni

7. "Artificial Intelligence for Supply Chain Management: Smart Manufacturing, Digital Twins, and Industry 4.0" by Chung-Yee Lee and Tsan-Ming Choi

B.Tech C.S.E

VIII SEMESTER

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(ELECTIVE –IV) CSE-702: Distributed Systems

Course Objectives	This course is an introduction to the design of distributed systems and algorithms that support distributed computing. It aims to provide a practical exposure into the design and functioning of existing distributed systems.
Course Outcomes	At the end of the course the students will be able to • Understand the design principles in distributed systems and the architectures for distributed systems. • Apply various distributed algorithms related to clock synchronization, concurrency control, deadlock detection, load balancing, voting etc. • Analyze fault tolerance and recovery in distributed systems and algorithms for the same. • Analyze the design and functioning of existing distributed systems and file systems. • Implement different distributed algorithms over current distributed platforms.

DETAILED CONTENT

Module 1:

Foundations

Characterization of DS, Examples of distributed systems, Resource sharing and the World Wide Web, Challenges. **System Models :** Architectural models, Fundamental models.

Module 2:

Interprocessor Communication

The API for the Internet protocols, characteristics of interprocess communication, Sockets, UDP datagram communication, TCP stream communication, External data representation and marshalling, Client-server communication, Group communication, IP multicast.

Module 3:

Distributed Objects and remote Invocation

Indirect Communication, Operating System Support, Distributed File Systems, Name Services.

Time and Global States : Clocks, events and process states, physical time and clocks, logical time and clocks, global states, distributed debugging.

Module 4:

Coordination and Agreement

Distributed mutual exclusion, elections, multicast communication, coordination agreement, consensus and related problems.

Text and Reference Books

1. G. Coulouris, J. Dollimore, and T. Kindberg, "Distributed Systems: Concepts and Design", Pearson Education.
2. Taunenbaum, "Distributed Systems: Principles and Paradigms", PHI.
3. M. Singhal& N. Shivaratri, "Advanced Concepts in Operating Systems", TMH.

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(ELECTIVE –IV) CSE-703: Ad-Hoc and Sensor Networks

Course Objectives	The objective of this course is to study the fundamentals of Adhoc and Sensor Networks useful in data acquisition and IoT systems
Course Outcomes	The student will be able to: • Appreciate the importance of Adhoc and sensor networks for applications like environment monitoring, habitat monitoring, health care and data acquisition systems. • Understanding of data transmission technologies of the Adhoc and sensor devices with focus on channel access routing and security. • Appreciate the need and importance of converged networks, ubiquitous environment and 'Internet of things' in the context of Adhoc and sensor networks. • Capable of model building, new protocol design and strategies simulation of the systems that include the above..

DETAILED CONTENT

Module 1:

Introduction

Fundamentals of wireless communication technology – the electromagnetic spectrum – radio propagation mechanisms – characteristics of the wireless channel -mobile ad hoc networks (MANETS) and wireless sensor networks (WSNs): concepts and architectures. Applications of ad hoc and sensor networks. Design challenges in ad hoc and sensor networks.

Module 2:

Mac Protocols For Ad Hoc Wireless Networks

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocolsContention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

Routing Protocols And Transport Layer In Ad Hoc Wireless Networks

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

Module 3:

Wireless Sensor Networks (Wsns) And Mac Protocols

Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

Module 4:

Wsn Routing, Localization &Qos

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues.

Text Book:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ",
Prentice Hall Professional Technical Reference, 2008.
.

References:

1. Carlos De MoraisCordeiro, Dharma PrakashAgrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication - 2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”,Wiley, 2005

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(ELECTIVE –IV) CSE-704: Internet-of-Things

Course Objectives	• To understand about the fundamentals of Internet of Things and its building blocks along with their characteristics • To understand the recent application domains of IoT in everyday life • To understand the protocols and standards designed for IoT and the current research on it. • To understand the other associated technologies like cloud and fog computing in the domain of IoT
Course Outcomes	• The students will be thorough about the technology behind the IoT and associated technologies • The students will be able to use the IoT technologies in practical domains of society • The students will be able to gain knowledge about the state of the art methodologies in IoT application domains.

DETAILED CONTENT

Module 1: Introduction to IoT

Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

Module 2: IoT& M2M

Machine to Machine, Difference between IoT and M2M, Software define Network

Network & Communication aspects

Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

Module 3: Challenges in IoT

Design challenges, Development challenges, Security challenges, Other challenges

Domain specific applications of IoT

Home automation, Industry applications, Surveillance applications, Other IoT applications

Module 4: Developing IoTs

Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python

Reference Books:

1. Vijay Madisetti, ArshdeepBahga, “Internet of Things: A Hands-On Approach”

2. WaltenegusDargie,ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".

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(ELECTIVE –IV) CSE-713: Advanced Web Development

Course Objectives	The advanced web development course is designed for students who have already completed the basic course or have prior experience in web development. The course is aimed at providing students with advanced skills and knowledge in web development, including advanced front-end and back-end development, payment gateway integration, and advanced debugging and optimization techniques.
Course Outcomes	Upon completion of the advanced course, students will be able to: • Develop advanced front-end web applications using CSS Animations . • Implement advanced debugging and error handling techniques • Optimize the performance of web applications • Develop real-world advanced web applications using various technologies learned in the course.

DETAILED CONTENT

Module 1:
Introduction to Web Development, Overview of Web Development, Tools and Technologies used

Module 2: Front-End Web Development Fundamentals, HTML basics, CSS basics, JavaScript basics, React JS basics, Document Object Model (DOM) , jQuery basics

Module 3: Back-End Web Development Fundamentals, PHP, Node JS basics, MySQL, Databases and SQL Connections, MSSQL, Deploying web applications.

Module 4: Web Development Best Practices, Authentication and Security, Building secure web applications, Version control using Git, Debugging and error handling, Performance optimization, Best coding practices.

Module 5: Web Development Projects, Building real-world web applications, Working on sample projects, Integrating various technologies learned , Deploying the web applications , Troubleshooting and bug fixing , Final project presentation **.**

Suggested Books:

1. JavaScript: A Beginner's Guide, Fourth Edition 4th Edition by John Pollock.
2. Html5 and Css3 (Visual Quickstart Guides) Original Edition by Elizabeth Castro

(OPEN ELECTIVE-II) CSE-710: Cyber Law and Ethics

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Course Objectives	The objective of this course is • To study the legal issues arising from information technology (IT), and the ethical implication of IT in society.
Course Outcomes	On completion of the course, students should: • Understand privacy, intellectual property rights, contracts & licenses as well as common criminal issues. • Understand the legal obligations of a computer professional. • Understand computer ethics and the importance of professional codes of conduct, • and be able to derive and justify a personal position on moral and ethical matters related to computers in society.

DETAILED CONTENT

Module I:

Introduction, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level. Jurisdictional Aspects in Cyber Law, Issues of jurisdiction in cyberspace , Types of jurisdiction The Test evolved - Minimum Contacts Theory - Sliding Scale Theory - Effects Test and International targeting , Jurisdiction under IT Act, 2000.

Module II:

Cyber Crimes& Legal Framework , Cyber Crimes against Individuals, Institution and State ,Hacking ,Digital Forgery , Cyber Stalking/Harassment , Cyber Pornography , Identity Theft & Fraud Cyber Terrorism, Cyber Defamation , Right to Privacy and Data Protection on Internet - Concept of privacy - Threat to privacy on internet - Self-regulation approach to privacy - Ingredients to decide confidentiality of information - Breach of sensitive personal information and confidentiality under IT Act and penalties for the same. - Right of Interception under IT Act , Different offences under IT Act, 2000

Module III:

Digital signature and Electronic Signature and Data Protection - Concept of public key and private key - Certification authorities and their role - Creation and authentication of digital signature - Concept of electronic signature certificates , Electronic Governance - Concept of electronic records and electronic signatures - Rules for attribution, acknowledgement and dispatch of such records

Module IV:

E Contracting , Salient features of E-contract , Formation of E-contract and types , E-mail Contracting , Indian Approach on E-contracts .E Commerce ,E-commerce-Salient Features and advantages , Models of E-commerce like B2B, B2C , Indian Laws on E-commerce

Module V:

Intellectual Property Issues in Cyber Space , Interface with Copyright Law , Interface with Patent Law , Trademarks &Domain Names Related issues , Dispute Resolution in Cyberspace

References

1. Karnika Seth, Computers, Internet and New Technology Laws, Lexis NexisButterworthsWadhwaNagpur.
2. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
3. Justice YatindraSingh,Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).

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(OPEN ELECTIVE-II) CSE-711: Soft Skills and Interpersonal Communication

Course Objectives	• To encourage the all-round development of students by focusing on soft skills. • To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice. • To develop and nurture the soft skills of the students through individual and group activities. • To expose students to right attitudinal and behavioral aspects and to build the same through activities
Course Outcomes	On completion of the course, student will be able to– • Effectively communicate through verbal/oral communication and improve the listening skills • Write precise briefs or reports and technical documents • Actively participate in group discussion / meetings / interviews and prepare & deliver presentations • Become more effective individual through goal/target setting, self-motivation and practicing creative thinking. • Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

DETAILED CONTENT

Module 1: SELF ANALYSIS SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

Module 2: CREATIVITY Out of box thinking, Lateral Thinking.

Module 3: ATTITUDE Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette.

Module 4: MOTIVATION Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

Module 5: GOAL SETTING Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals. Time Management Value of time, Diagnosing Time Management, Weekly Planner to do list, Prioritizing work.

TEXT BOOK: SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications .

REFERENCES:

1. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.
2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.
3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972 4. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

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(OPEN ELECTIVE-II) CSE-712: Management Information System

Course Objectives	• To learn different types of information systems in an organization • To understand various MIS operating in functional areas of an organization and explain its relationship with the various activities of the organization. • To know how MIS is developed and implemented for various levels in an organization.
Course Outcomes	• Understand information systems and their uses. • Use computerized management information systems. • In-depth analysis and decision making. • Aware of security issues related to information systems.

DETAILED CONTENT

Module 1:

The Need for Information Systems: Digital Convergence and the changing Business Environment; Information and Knowledge Economy; Contemporary approach to IS and Management challenges.

Information systems in the Enterprise: Types of Information Systems in the Organisation; TPS, DSS, MIS and ESS. Functional Perspective of IS; Enterprise systems; Strategic Uses of Information systems; Economic Organisational and Behavioural Impacts; IT impact on decision Making; Leveraging Technology in the value chain; MIS and Core competencies; Strategic Information Systems SIS.

Module 2:

Electronic Commerce and the Digital Organisation: Internet based Business Models. B2B, EDI and B2C Models. Role of Intranets. Business Hardware Software and IT Infrastructure: Evolution of IT Infrastructure; Moore's law, law of Mass Digital Storage; IT infrastructure components; Current trends in Hardware Platforms.; Enterprise Software; Groupware.

Module 3:

Business Networks and Telecommunications: Communication technologies in Business, Videoconferencing, Wireless Payments; Bandwidth and Media; Networks and their Types; Protocols. Internet networking Services.; Future of Networking Technologies; Broadband telephony, VOIP, RFID and convergenceDatabases and Data Warehouses: Traditional vs. Database approach; Database Models, relational Model, and Object Oriented Model. Relational Operations SQL; Data Modelling; Databases on the Web; Data Warehousing.

Module 4:

The Wireless Revolution: Introduction. Business Value. Wi-Max and EVDO; M- Commerce; Applications in CRM , Supply Chain and Healthcare. Enhancing decision making for the Digital firm: Decision making and Decision support systems; Business intelligence and decision support; business decision making and the decision making process; GDSS, GIS.

Module 5:

Managing knowledge in the Digital Firm: knowledge Management system, Enterprise-wide knowledge management systems. Redesigning the Organization with Information Systems: BPR and Process Improvement; Systems Analysis, System Design; Alternative system Building Approaches; Management Opportunities Challenges and solutions.

REFERENCES:

1. Kenneth C Laudon and Jane P Laudon, Management Information Systems – Managing the Digital Firm, 9th Ed. Pearson Education Asia, New Delhi, 2007.

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(OPEN ELECTIVE-III) CSE-805: Linux Administration and Shell Programming

Course Objectives	• To teach principles of operating system including File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking Commands, Basic Linux commands, Scripts and filters. • To familiarize fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts. • To impart fundamentals of file concepts kernel support for file, File structure related system calls (file API's). • To facilitate students in understanding Inter process communication. • To facilitate students in understanding semaphore and shared memory. • To facilitate students in understanding process.
Course Outcomes	• Ability to use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator. • Ability to write Shell Programming using Linux commands. • Ability to design and write application to manipulate internal kernel level Linux File System. • Ability to develop IPC-API's that can be used to control various processes for synchronization.

DETAILED CONTENT

Module 1:Introduction

History of Linux, Linux Overview, Linux releases, Open Linux.

Installing Linux

Hardware, Software and information requirements: opening disk for Linux portions, creating the open Linux install disks, installing Linux, Installing and configuring X-Window, installing sound drivers.

Module 2: Linux Startup and Setup

User accounts, accessing the Linux system, Linux commando, online manual, online documentation, installing software packages, remote communications, internet connection with modem, email.

Module 3: Shell

The command line special characters and file arguments, standard input/ output and redirection, pipes, redirecting and piping with standard errors, shell script, jobs.

Module 4: Linux File Structure

Linux files, file structure, listing displaying and printing files, making directories, file and directory operations.

Vi Editor

Vi editing commands, advanced VI editing commands, line editing commands, options in Vi.

Module 5: System Administration

System management, managing users, installing and managing devices, floppy disk management, file system administration, backups.

TEXT/REFERENCE BOOKS:

1. Linux- The complete Reference by Richard Peterson, Tat McGraw Hill, New Delhi
2. Linux- Install and configuration Black Book by Dee Ann Leblanc and Isaak Yates, IDG Books India Private Ltd. Delhi
3. Unleashed Linux by Tech Media Publishers.

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(OPEN ELECTIVE-III) CSE-806: History of Science and Engineering

Course Objectives	The main objective of this course is to allow the students to have a glimpse into both the history of the world and into just how we discovered everything we know about the world.
Course Outcomes	By the end of the course, you will be able to: • Identify major changes in science and technology over time; • Identify sources and methods used in historical writing and critically assess the validity of arguments in the history of science and technology. • Describe how central ideas in science and technology, such as discovery, innovation, modernity, risk, etc., have been historically and socially constructed; • Explain how understanding the historical dimensions of issues with contemporary significance can inform responsible actions in the present.

DETAILED CONTENT

Module 1: Science and Technology- The Beginning

Development in different branches of Science in Ancient India: Astronomy, Mathematics, Engineering and Medicine. Developments in metallurgy: Use of Copper, Bronze and Iron in Ancient India. Development of Geography: Geography in Ancient Indian Literature.

Module 2: Developments in Science and Technology in Medieval India

Scientific and Technological Developments in Medieval India; Influence of the Islamic world and Europe; The role of maktabs, madrasas and karkhanas set up. Developments in the fields of Mathematics, Chemistry, Astronomy and Medicine. Innovations in the field of agriculture - new crops introduced new techniques of irrigation etc.

Module 3: Developments in Science and Technology in Colonial India

Early European Scientists in Colonial India- Surveyors, Botanists, Doctors, under the Company's Service. Indian Response to new Scientific Knowledge, Science and Technology in Modern India. Development of research organizations like CSIR and DRDO; Establishment of Atomic Energy Commission; Launching of the space satellites.

Module 4: Prominent scientist of India since beginning and their achievement

Mathematics and Astronomy: Baudhayan, Aryabhtatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna. Medical Science of Ancient India (Ayurveda & Yoga): Susruta, Charak, Yoga &Patanjali. Scientists of Modern India: Srinivas Ramanujan, C.V. Raman, Jagdish Chandra Bose, HomiJehangirBhabha and Dr. Vikram Sarabhai.

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(OPEN ELECTIVE-III) CSE-807: Comparative Study of Literature

Course Objectives	The objective of this course is to provide students with broad general issues linked with key areas of study within Comparative Literature.
Course Outcomes	The students will able to • Comparative Literature traces the transformations and travels of literary genres and texts across time and space. • Explore the connections of literature with history, philosophy, politics, and literary theory.

DETAILED CONTENT

Module 1:

History of Comparative Literature: (i) Theory and Method of Comparative Literature (ii) Comparative Literature and Theory (iii) Comparative Literature from Alternative Perspectives/ Contemporary Issues in Comparative Literature

Module 2:

Thematology: (i) Definition of Key Terms (ii) Myth and Reworking of Myths (iii) Theme and Interpretation/Issues in Rewritings

Module 3:

Genology: (i) Genology in the West – bases of categorisation (ii) Genology in India – bases of categorisation (iii) Modern Perspectives on Genology / Genres and Countergenres / (iv) The Peripheral and the Canonical

Module 4:

Historiography: (i) Conceptualisation of 'Time' in Non-Western and Western Culture and Literary History (ii) Issues in Periodisation / Reading History from Below (iii) Writing Cultural History in Post-colonial Countries

Module 5:

Inter-literary Studies: (i) Definition of Terms (ii) The Aesthetics of Reception (The Constance School)/ Literary Comparatistics (DionyszDurisin) (iii) Polysystem: Relations and Inferences / Reception in the Context of Post-Colonial Countries

Suggested Books:

1. Susan Bassnett, Comparative Literature: A Critical Introduction, Oxford UK and Cambridge USA, Blackwell, 1993;
2. Charles Bernheimer, Comparative Literature in the Age of Multiculturalism,Baltimore, Johns Hopkins UP, 1995;
3. Amiya Dev, The Idea of Comparative Literature in India, Calcutta, Papyrus, 1984;
4. Amiya Dev and Sisir Kumar Das(eds), Comparative Literature: Theory and Practice, Shimla, IIAS, 1989;
5. Claudio Guille The Challenge of Comparative Literature, Cambridge, Harvard UP, 1993.