SRI RAMAKRISHNA INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

(Approved by AICTE, New Delhi :: Affiliated to Anna University, Chennai)

Pachapalayam, Perur Chettipalayam, Coimbatore - 641010

CURRICULUM AND SYLLABI

Designed for

CHOICE BASED CREDIT SYSTEM

Under

UG REGULATION 2017

(For students admitted during 2017 – 2018 and onwards)

B.E. (COMPUTER SCIENCE AND ENGINEERING)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CURRICULUM STRUCTURE
B.E. – COMPUTER SCIENCE AND ENGINEERING
(BATCH 2017–2021)

SEMESTER I										
Sl. No.	Course Code	Course Title	Category	Credit			Total	CA	FE	Total
				L	T	P	C			
1	UICH001	Technical English	HS	2	0	1	3	40	60	100
2	UICH006	Computer Science Engineers and Society	HS	2	0	0	2	40	60	100
3	UICM001	Engineering Mathematics - I	BS	3	1	0	4	40	60	100
4	UICP001	Engineering Physics	BS	3	0	1	4	40	60	100
5	UICC001	Engineering Chemistry	BS	3	0	1	4	40	60	100
6	UICE001	Basic Civil and Mechanical Engineering	ES	4	0	0	4	40	60	100
7	UICE004	Computing Fundamentals & C Programming	ES	2	0	2	4	40	60	100
8	UICE015	Engineering Workshop	ES	0	0	2	2	40	60	100
			Total	**19**	**1**	**7**	**27**			

SEMESTER II										
Sl. No.	Course Code	Course Title	Category	Credit			Total	CA	FE	Total
				L	T	P	C			
1	UICH002	Business English	HS	2	0	1	3	40	60	100
2	UICC002	Ecology and Environmental Sciences	HS	3	0	0	3	40	60	100
3	UICM002	Engineering Mathematics - II	BS	3	1	0	4	40	60	100
4	UICE010	Engineering Graphics	ES	2	0	2	4	40	60	100
5	UICE013	Engineering Materials	ES	3	0	0	3	40	60	100
6	UICE002	Basic Electrical and Electronics Engineering	ES	4	0	0	4	40	60	100
7	UICE017	Object Oriented Programming with C++ and Java	ES	2	0	2	4	40	60	100
			Total	**19**	**1**	**5**	**25**			

SEMESTER III										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Credit**			**Total**	**CA**	**FE**	**Total**
				L	**T**	**P**	**C**			
1	UICM006	Probability and Random Processes	BS	3	1	0	4	40	60	100
2	UCSC001	Analog and Digital Communication	PCC	3	0	0	3	40	60	100
3	UCSC006	Data structures and Algorithms	PCC	3	0	1	4	40	60	100
4	UCSC007	Database Management System	PCC	3	0	1	4	40	60	100
5	UCSC008	Design of Computer Networks	PCC	3	0	1	4	40	60	100
6	UCSC009	Digital System	PCC	3	0	1	4	40	60	100
7	UCSC014	Operating System	PCC	3	0	1	4	40	60	100
		Total		**21**	**1**	**5**	**27**			

SEMESTER IV										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Credit**			**Total**	**CA**	**FE**	**Total**
				L	**T**	**P**	**C**			
1	UICM008	Discrete Mathematics	BS	3	1	0	4	40	60	100
2	UCSC004	Computer Organization and Design	PCC	3	0	0	3	40	60	100
3	UCSC013	Object Oriented Software Engineering	PCC	3	0	1	4	40	60	100
4	UCSC015	Theory of Computation	PCC	3	1	0	4	40	60	100
5	UCSC101	Artificial Intelligence: Principles and Techniques	PCC(TR)	3	0	1	4	40	60	100
6	Elective	Professional Elective I	PE	3	0	0	3	40	60	100
7	Elective	Professional Elective II	PE	3	0	0	3	40	60	100
		Total		**21**	**2**	**2**	**25**			

SEMESTER V										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Credit**			**Total**	**CA**	**FE**	**Total**
				L	**T**	**P**	**C**			
1	UICM003	Transforms and Partial Differential Equations	BS	3	1	0	4	40	60	100
2	UICH003	Economics for Engineers	HS	3	0	0	3	40	60	100
3	UCSC012	Internet Programming	PCC	3	0	1	4	40	60	100
4	UCSC103	Neural Network and Fuzzy Logic	PCC (TR)	3	0	1	4	40	60	100
5	Elective	Generic Elective I	GE	3	0	0	3	40	60	100
6	Elective	Professional Elective III	PE	3	0	0	3	40	60	100
			Total	**18**	**1**	**2**	**21**			

SEMESTER VI										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Credit**			**Total**	**CA**	**FE**	**Total**
				L	**T**	**P**	**C**			
1	UCSC002	Compiler Design	PCC	3	0	1	4	40	60	100
2	UCSC003	Computer Graphics	PCC	3	0	0	3	40	60	100
3	UCSC010	Distributed Systems	PCC	3	0	0	3	40	60	100
4	UCSC102	Computational Linguistics	PCC(TR)	3	0	0	3	40	60	100
5	Elective	Generic Elective II	GE	3	0	0	3	40	60	100
6	Elective	Professional Elective IV	PE	3	0	0	3	40	60	100
7	UCSC016	Industrial Design Project (Course Work)	IDP	4	0	0	4	40	60	100
8	UCSC017	Industrial Design Project (Practical)	IDP	0	0	2	2	40	60	100
			Total	**22**	**0**	**3**	**25**			

SEMESTER VII										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Credit**			**Total**	**CA**	**FE**	**Total**
				L	**T**	**P**	**C**			
1	UCSC005	Cryptography and Network Security	PCC	3	0	0	3	40	60	100
2	UCSC104	Pattern Recognition	PCC(TR)	3	0	1	4	40	60	100
3	Elective	Professional Elective V	PE	3	0	0	3	40	60	100
4	Elective	Generic Elective III	GE	3	0	0	3	40	60	100
5	UCSC018	Industrial Design Project (Phase II)	IDP	0	0	6	6	60	40	100
6	UCSC019	Final Year Project Phase I	FYP	0	0	2	2	60	40	100
		Total		**12**	**0**	**9**	**21**			

SEMESTER VIII										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Credit**			**Total**	**CA**	**FE**	**Total**
				L	**T**	**P**	**C**			
1	Elective	Generic Elective IV	GE	3	0	0	3	40	60	100
2	Elective	Professional Elective VI	PE	3	0	0	3	40	60	100
3	UCSC020	Final Year Project Phase II	FYP	0	0	6	6	60	40	100
		Total		**6**	**0**	**6**	**12**			

LIST OF PROFESSIONAL ELECTIVES

Sl. No	Code	Course Title	L	T	P	Total Credits
1	UCSE001	Ad hoc and Sensor Networks	3	0	0	3
2	UCSE002	Foundation Skills in Integrated Product Development	3	0	0	3
3	UCSE003	Game Programming	3	0	0	3
4	UCSE004	Information Retrieval	3	0	0	3
5	UCSE005	Natural Language Processing	3	0	0	3
6	UCSE006	Network Analysis and Management	3	0	0	3
7	UCSE007	Soft Computing	3	0	0	3
8	UCSE008	Software Project Management	3	0	0	3
9	UCSE009	Software Engineering	3	0	0	3
10	UCSE010	Design and Analysis of Algorithms	3	0	0	3
11	UCSE011	Mobile Computing	3	0	0	3
12	UCSE012	Grid and Cloud Computing	3	0	0	3
13	UCSE013	Principles of Microprocessors and Microcontrollers	3	0	0	3
14	UCSE101	Computer Vision: Foundations and Applications	3	0	0	3
15	UCSE102	Data Mining and Analysis	3	0	0	3
16	UCSE103	Decision Making under Uncertainty	3	0	0	3
17	UCSE104	IT Security and Ethical Hacking	3	0	0	3
18	UCSE105	Genetic Algorithm and Machine Learning	3	0	0	3
19	UCSE106	Probabilistic Graphical Models: Principles and Techniques	3	0	0	3
20	UCSE107	Support Vector Machines	3	0	0	3

LIST OF GENERIC ELECTIVES

OFFERED BY DEPARTMENT OF CIVIL ENGINEERING

COURSE CODE	COURSE NAME	L	T	P	C
UCEG001	ENVIRONMENTAL IMPACT ASSESSMENT	3	0	0	3
UCEG002	DISASTER MITIGATION AND MANAGEMENT	3	0	0	3
UCEG003	GLOBAL WARMING AND CLIMATE CHANGE	3	0	0	3
UCEG004	GIS FOR NATURAL RESOURCES MANAGEMENT	3	0	0	3
UCEG005	PRINCIPLES OF REMOTE SENSING	3	0	0	3

OFFERED BY DEPARTMENT OF ELECTRICAL AND ELECTRONICS AND ENGINEERING

SL. NO	CODE	COURSE TITLE	L	T	P	C
1	UEEG001	ENERGY MANAGEMENT SYSTEMS	3	0	0	3
2	UEEG002	MEDICAL INSTRUMENTATION	3	0	0	3
3	UEEG003	PLC PROGRAMMING	3	0	0	3
4	UEEG004	RENEWABLE ENERGY SYSTEMS	3	0	0	3
5	UEEG005	VIRTUAL INSTRUMENTATION & DATA ACQUISITION	3	0	0	3

OFFERED BY DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE CODE	COURSE NAME	L	T	P	C
UECG001	ELECTRONIC MEASUREMENTS	3	0	0	3
UECG002	INTRODUCTION TO EMBEDDED SYSTEMS	3	0	0	3
UECG003	MICROCONTROLLERS AND ITS APPLICATIONS	3	0	0	3
UECG004	NANO ELECTRONICS AND SENSORS	3	0	0	3
UECG005	PRINCIPLES OF VLSI SYSTEMS	3	0	0	3

OFFERED BY DEPARTMENT OF MECHANICAL ENGINEERING

COURSE CODE	COURSE NAME	L	T	P	C
UMEG001	AUTOMOTIVE FUNDAMENTALS	3	0	0	3
UMEG002	COMPUTER AIDED DESIGN	3	0	0	3
UMEG003	INTRODUCTION TO POWER PLANT ENGINEERING	3	0	0	3
UMEG004	INTRODUCTION TO ROBOTICS	3	0	0	3
UMEG005	3D PRINTING	3	0	0	3

OFFERED BY DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE CODE	COURSE NAME	L	T	P	C
UITG001	BIG DATA ANALYTICS AND ITS APPLICATIONS	3	0	0	3
UITG002	CLOUD COMPUTING FUNDAMENTALS	3	0	0	3
UITG003	FUNDAMENTALS OF INTERNET OF THINGS	3	0	0	3
UITG004	INTRODUCTION TO DATA BASE MANAGEMENT SYSTEM	3	0	0	3
UITG005	WEB INTERFACE DESIGN AND DEVELOPMENT	3	0	0	3

OFFERED BY DEPARTMENT OF SCIENCE AND HUMANITES

COURSE CODE	COURSE NAME	L	T	P	C
UGCC001	INDIAN CONSTITUTION, DEMOCRACY AND WORLD AFFAIRS	3	0	0	3
UGCC002	FUNDAMENTALS OF ASTROPHYSICS	3	0	0	3
UGCC003	FUNDAMENTALS OF BIOCHEMISTRY	3	0	0	3
UGCC004	STATISTICAL INFERENCES AND APPLICATIONS	3	0	0	3

OFFERED BY DEPARTMENT OF MASTER OF BUSINESS ADMINISTRATION

COURSE CODE	COURSE NAME	L	T	P	C
UMGG001	ENTREPRENEURSHIP DEVELOPMENT	3	0	0	3
UMGG002	INTELLECTUAL PROPERTY RIGHTS	3	0	0	3
UMGG003	TOTAL QUALITY MANAGEMENT	3	0	0	3
UMGG004	HUMAN RIGHTS AND HUMAN VALUES	3	0	0	3
UMGG005	SUPPLY CHAIN MANAGEMENT AND LOGISTICS	3	0	0	3

SEMESTER I

UICH001	TECHNICAL ENGLISH	L	T	P	C
		2	0	1	3

Course Objectives

- To equip the students with the LSRW skills.
- To perceive the art of effective speaking and writing through various grammar exercises.
- To enable the act of interpreting Comprehension passages and essays.
- To develop test-taking strategies and skills for BEC Prelims.

Importance of Communication

Listening: Listening to audio files and answering the given questions, Speaking: Self-introduction and Peer introduction, Speak about one's native place/important festivals/ History of a company, Reading: Note-Making on the given text, Skimming and Scanning for specific information, Writing: Parts of Speech, Word formation with Prefix and Suffix, Regular and Irregular verbs, Articles, Tenses, Countable and Uncountable Nouns, Set phrases for e-mails and Letters, sending a group e- mail.

Formal Communication

Listening: Listening to motivational talks / TED talks, Telephone Conversation (information about orders and deliveries), Speaking: Role-Play (a telephone call to a supplier), Describing a product and how it is advertised, Reading: Reading Comprehension exercise, Writing: Subject-Verb Agreement, Comparative Adjectives, Expansion of Compound Nouns, Prepositions, Formal letter writing (A letter responding to an invitation and promotional letters), E-mail to Manager.

Writing Strategies

Listening: Listening to statistical information (short extracts), Speaking: Role-Play (Making an appointment), Planning a sales event, Reading: Finding key points from the given text, Writing: Cause and Effect, Compare and Contrast, Gerunds and Infinitives, Paragraph writing, Instructions, E-mail (confirming a booking/requesting information), Translating and interpreting written or spoken content from one language to another.

Presentation Skills

Listening: Listening to Mock Group Discussion and evaluating, Speaking: Making presentation on the given topic / Describing the given data and trends, Sales talk (Discussing on company information), Reading: Interpreting pictures of Flowchart/Pie chart/Bar chart, Writing: Letter to express an interest in a new product, Process Description, Recommendations.

Technical Communication

Listening: Listening to interviews (frequently asked questions and responses), Speaking: Giving impromptu talks, Giving a summary of an article, Reading: Business Report, E-mail to a Recruitment Agency, Writing: Resume Writing, Purpose and Function, Wh- questions.

List of Exercises

1. Self and Peer Introduction
2. Telephonic Conversation
3. Listening Comprehension
4. Oral Presentation on a given topic
5. Mock interview

References

1. Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Preliminary", 2nd Edition, Cengage Learning, 2015.
2. Whitby, Norman, "Business Benchmark Pre-intermediate to Intermediate Business preliminary", Cambridge University Press, 1st Edition, 2014.
3. Rizvi M.Ashraf, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, 4th Edition, 2010.
4. Gerson Sharon J, Steven M.Gerson, "Technical Writing-Process and Product", Pearson Education Pvt. Ltd, 3rd Edition, 2009.
5. Douglas Stone, Bruce Patton, Sheila Heen, "Difficult Conversations: How to Discuss" Kindle Publication, 1st Edition, 2010.

UICH006	COMPUTER SCIENCE ENGINEERS AND SOCIETY	L	T	P	C
		2	0	0	2

Course Objectives

- To understand the knowledge of scientific and educational activities towards the advancement of the theory and practice of Computer Science and information processing for the service of mankind and the advancement of general welfare.
- To improve the common man's life by developing new innovative Engineering ideas, Technical tools or models or products of their need.

Engineering – Definition – Engineering Education – Graduate Attributes – Engineering functions – Role and Responsibilities of Engineers – Professional Societies and their codes of ethics – Constraints in engineering.

Introduction to Computer Science and Engineering, Overview of Software and Hardware Industry, Professional Skills needed for industries, Career Ladder for CSE graduates, Professional Societies, Industrial Associations, Work culture in MNCs, Interview Patterns, Social Networking ethics, Coding Conventions and standards, Technologies for future.

The concept of profession – Importance of ethics in engineering – Role of codes of ethics – Professional responsibilities of engineers – Overview of ethical theories and applications -Social and ethical responsibilities of Engineers - Whistle blowing and beyond, Case studies.

Reliability, risk and safety – Risk management – Engineering and the environment – Ethics and the environment – Sustainable Engineering – Global and Cultural considerations – Specific case examples – Challengers Incidents.

References

1. Kim Strom Gottfried, "Straight Talk about Professional Ethics", Lyceum Books, 2nd Edition, 2014.
2. Ramesh Chandra Das, "Social, Health, and Environmental Infrastructures for Economic Growth", IGI Global Disseminator of Knowledge, 2017.
3. Steven P. Nichols, "Professional responsibility: The role of the engineer in society", Science and Engineering Ethics, September 1997, Volume 3, Issue 3, pp 327–337.
4. Kenneth K. Humphreys, "What Every Engineer Should Know about Ethics", CRC Press, 1999.
5. "Information Technology Curricula 2017", Association for Computing Machinery, 2017.

UICM001	ENGINEERING MATHEMATICS - I	L	T	P	C
		3	1	0	4

Course Objectives

- Able to adopt the concepts of Eigenvalues and Eigenvectors of matrices and apply them in various Engineering fields.
- Able to make the student knowledgeable in the area of infinite series and their convergence.
- Able to develop the skills of solving problems under several variable calculus.

Matrices

Eigenvalue and Eigenvectors – Properties – Cayley-Hamilton Theorem (without proof) - Diagonalization – Similarity and Orthogonal transformation – Quadratic forms – Orthogonal reduction– Applications.

Sequences and Infinite Series

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) – Alternating series – Series of positive and negative terms – Leibnitz rule (statement only) - Absolute and conditional convergence.

Differential Calculus

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals – Applications.

Functions of Several Variables

Partial derivatives – Total derivative – Differentiation of implicit functions – Change of variables – Jacobian – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

Multiple Integrals

Double Integrals (Cartesian and polar) – Change of order of integration – Change of variables – Triple integrals – Transformation – Spherical and Cylindrical coordinates – Applications to area and volume.

References

1. Grewal. B.S, “Higher Engineering Mathematics”, 43rd Edition, Khanna Publications, Delhi, 2016.
2. Srimanta Paul and Subodh C. Bhunia, “Engineering Mathematics”, Oxford University Press, 1st Edition, 2015.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, Wiley India, 2016.
4. James Stewart, “Calculus, Early Transcendental”, 7th Edition, Cengage learning, New Delhi, 2015.
5. Ramana B.V, “Higher Engineering Mathematics”, 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2010.
6. Ravish R Singh and Mukul Bhatt, “Engineering Mathematics”, 1st Edition, Tata McGraw Hill Education, New Delhi, 2016.

UICP001	ENGINEERING PHYSICS	L	T	P	C
		3	0	1	4

Course Objectives

- To understand the properties of materials, concept of quantum mechanics, working of lasers and fiber optics.
- To perform experiments using semiconductor, laser and fiber optics.
- To apply the concept of physics in different engineering application and to solve scientific problems.

Properties of Matter

Hooke's law - stress - strain diagram - modulus of elasticity - elastic constants - relation between elastic moduli - Poisson's ratio - expressions for Poisson's ratio in terms of elastic constants - work done in stretching a wire - work done in twisting a wire - Applications: twisting couple on a cylinder, rigidity modulus of a wire.

Thermal Physics

Fundamental modes of heat transfer - effect of temperature on thermal conductivity of solids, liquids and gases - Conduction in solids - Lee's disc method - flow of heat through a compound material -Application: Thermal insulation of buildings.

Principles of Quantum Mechanics

Blackbody Radiation - Quantum of energy and Planck's hypothesis - Rayleigh-Jeans Law - Photoelectric effect - Concept of photon mass - Compton effect - de-Broglie hypothesis - Davisson and Germer experiment - Schrödinger wave equations - Applications: Particle in one dimensional box - Quantum tunneling in p-n junction diode.

Laser and Fiber optics

Spontaneous emission - stimulated emission - Types of laser - pumping - ND-YAG laser - CO_2 laser- semiconductor laser (homojunction and heterojunction) - Engineering applications: holography (construction and reconstruction of hologram).Fiber optic materials - concept of light flow – modes of propagation of light through different media - types of optical fibers – acceptance angle - Applications: Temperature and displacement sensor, Fiber endoscope.

Fundamentals of Nan Science

Introduction – classification – density of states of 1D, 2D, 3D – morphology (particles, nanowires and nanotubes) – Optical properties.

List of Experiments

1. Determination of moment of inertia of the metallic disc and rigidity modulus of the Wire using Torsional Pendulum.
2. Determination of thermal conductivity of a bad conductor using Lee's Disc method.
3. Determination of energy band gap in a semiconductor by using p-n junction diode.
4. Determination of thickness of a thin sheet of paper using Air Wedge method.
5. (i) Determination of particle size using laser.
   (ii) Determination of acceptance angle and numerical aperture of an optical fiber.

References

1. Dattu R Joshi, "Engineering Physics", Tata McGraw Hill Publications, New Delhi, 1st Edition, 2010.
2. Vijayakumar S, "Engineering Physics – I", Wiley Publications, 2014.
3. Halliday, Resnick and Walker, "Fundamentals of Physics", Wiley International Publications, Extended 10th Edition, 2015.
4. Edelstein A S and Cammearata R C., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
5. Marikani A, "Engineering Physics", PHI Learning Pvt. Ltd., New Delhi, 2nd Edition, 2013.
6. Mani Naidu S, "Engineering Physics", Pearson Education, Delhi, 2010.

UICC001	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	1	4

Course Objectives

- To learn the electrochemical principles, various types of electrodes and understand the mechanism of corrosion and prevention methods.
- To conversant with Principles and generation of energy in batteries and fuel cells.
- To acquire knowledge on the quality of water and its treatment method for domestics and industrial applications.
- To be able to develop experimental skill in quantitative analysis of materials by volumetric and instrumental methods and apply in engineering industries.

Electrochemistry

Electrolytic Conductance – Specific, Equivalent and Molar conductance (Definitions only) – Conductance measurement – Conductometric titrations – Electrochemical cells – Nernst Equation (Problems), Electrode potential – Electrodes – Standard Hydrogen Electrode (SHE), Saturated Calomel Electrode (SCE) and Glass Electrode – EMF Series and its applications.

Corrosion science and prevention

Definition – Impact in Industries – Mechanism (Dry and Electrochemical) – Types – Galvanic and Differential aeration corrosion – Corrosion prevention – Impressed current technique, sacrificial anodic protection – Inhibitors – Synthetic and Green.

Batteries

Batteries – Characteristics – Current, Power, Capacity, Classification of batteries – Primary (Alkaline battery) – Secondary batteries (Lead acid and Nickel – Cadmium) and Flow batteries (Hydrogen – Oxygen and Methanol – Oxygen fuel cells) – Modern batteries – Lithium Ion batteries – Applications.

Water treatment

Importance of water – Water sources – Impurities – Carbonate and Non Carbonate Hardness (simple problems) – Potable water and its specifications, Steps involved in treatment of potable water – Disinfection of potable water by Chlorination, UV treatment and Ozonization. Industrial water treatment methods – Demineralisation – Desalination (Reverse Osmosis).

Polymers

Polymers – Types (Natural and Synthetic) – Functionality – Degree of polymerization – Engineering polymers – Acrylonitrile Butadiene Styrene (ABS) , Polystyrene and Teflon – Structure and Industrial applications – Compounding of plastics – Fabrication – Extrusion moulding only – Management of waste plastics.

List of Experiments

1. Estimation of acidity of industrial effluent by conductometric titration.
2. Estimation of iron by Potentiometry.
3. Determination of corrosion rate by weight loss method.
4. Determination of percentage purity of bleaching powder.
5. Estimation of hardness of water by Complexometric method.

References

1. Vairam.S, Kalyani P, Suba Ramesh, "Engineering Chemistry", John Wiley & Sons, 1st Edition, 2016.
2. Palanna O G, "Engineering Chemistry", Tata McGraw – Hill Education, 1st Edition, 2009.
3. Renu Bapna and Renu Gupta, Engineering Chemistry, Macmillan Publishers India, 1st Edition, 2010.
4. Jeffery G. H, and Basset J., "Vogel's text book of quantitative chemical analysis", Prentice Hall, 5th Edition, 2012.
5. Qanungo, Kushal, "Engineering Chemistry", Prentice Hall India Limited, 1st Edition, 2009.

UICE001	BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	C
		4	0	0	4

Course Objectives

- To enable the students to acquire fundamental knowledge in Civil and Mechanical Engineering disciplines.
- To understand and acquire knowledge about Construction materials, Roads, Surveying and Sources of water.
- To understand and acquire knowledge about various power plants, IC Engines and Refrigeration and Air Conditioning.

Civil Engineering

Properties and uses of construction materials – stones, bricks, cement, concrete and steel. Site selection for buildings – Component of building – Foundation– Shallow and deep foundations – Brick and stone masonry – Plastering – Lintels, beams and columns – Roofs.

Roads–Classification of Rural and urban Roads– Pavement Materials–Traffic signs and road marking – Traffic Signals. Surveying –Classification–Chain Survey–Ranging–Compass Survey– exhibition of different survey equipment.

Sources of Water – Dams– Water Supply–Quality of Water–Wastewater Treatment – Sea Water Intrusion – Recharge of Ground Water.

Mechanical Engineering

Introduction, Classification of Power Plants – Working principle of Steam, Gas, Diesel, Hydro–electric and Nuclear Power plants – OTEC cycle, solar power generation and geo thermal energy.

Introduction, working principle of Petrol and Diesel Engines. Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.

Terminology of Refrigeration and Air Conditioning. Overview of Refrigerants. Principle of vapour compression and absorption system. Types of air conditioners (Window, Split, Centralized)

References

1. Palanichamy, M.S, “Basic Civil Engineering”, Tata Mc Graw Hill, New Delhi, 2010.
2. Suresh Gobi, “Basic Civil Engineering”, Pearson Publishers, 1st Edition, 2009.
3. EI– Wakil M.M, “Power Plant Technology”, McGraw–Hill, 2012.
4. Joseph Heitner, “Automotive Mechanics,” 2nd Edition, East–West Press, 1999.
5. Arora, C.P., "Refrigeration and Air Conditioning", 3rd edition, McGraw Hill, New Delhi, 2010.

UICE004	COMPUTING FUNDAMENTALS AND C PROGRAMMING	L	T	P	C
		2	0	2	4

Course Objectives

- To learn the fundamental components and operating principles of digital computer
- To find solutions to complex engineering problems by developing computer programs using C language

Introduction

Generation and Classification of Computers - Basic Organization of a Computer – Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

C Programming Basics

Problem formulation – Problem Solving – Introduction to C programming – fundamentals – structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements – Solution to complex Engineering, Scientific and statistical problems using appropriate control flow statements.

Arrays and Strings

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays. String – String operations – String Arrays. Simple programs – sorting – searching – matrix operations.

Functions and Pointers

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic – Pointers and arrays – Example Problems.

Structures and Unions

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives – File Handling.

List of Experiments

1. Experiments to solve domain specific complex Engineering problems using appropriate control structures and expressions. Proper formatting of Input / Output statements is mandatory.
2. Experiments to manipulate strings using appropriate data types and string handling functions.
3. Experiments to represent and perform operations on domain specific Engineering, Scientific data using arrays. Proper formatting of Input / Output statements is mandatory.
4. Experiments to represent and perform memory aware operations on domain specific Engineering, Scientific data using pointers. Proper formatting of Input / Output statements is mandatory.
5. Experiments to demonstrate the power of modular programming using functions.
6. Experiments to represent complex scientific data using user defined data types and perform operations to generate required output.
7. Experiments that demonstrate the use of operating system files to store output of computation through C language file handling features.

References

1. Paul Deitel, Harvey Deitel "C How to Program", 3rd Edition, Pearson Education Asia, 2000.
2. Behrouz A. Forouzan, Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", 3rd Edition, Course Technology Inc, 2005.
3. E Balagurusamy, "Computing Fundamentals and C Programming", McGraw Hill Education; 1st Edition, 2008
4. Greg Perry, Dean Miller, "C Programming Absolute Beginner's Guide", Pearson Education, 3rd Edition, 2014.
5. Henry S. Warren Jr., "Hacker's Delight", 2nd Edition, Pearson Education, 2013.

UICE015	ENGINEERING WORKSHOP	L	T	P	C
		0	0	2	2

Course Objectives

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To impart the knowledge of Electronic Components, functionality of measuring equipment and building circuits on PCB Board.

Civil Engineering Practice lab

Buildings:

1. Study of plumbing and carpentry components of residential and industrial buildings.

Plumbing Works:

1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connections requirements for pumps and turbines.
3. Preparation of plumbing line sketches for water supply and sewage works.

Hands–on–exercise:

1. Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
2. Demonstration of plumbing requirements of high–rise buildings.

Carpentry using Power Tools only:

1. Study of the joints in roofs, doors, windows and furniture.

Hands–on–exercise:

1. Wood work, joints by sawing, planning and cutting.

Mechanical Engineering Practice lab

Welding & Sheet metal

1. Preparation of arc welding of butt joints, lap joints, tee joints and corner joints.
2. Forming of simple objects using sheet metal – Trays, funnels.

Machining practices

1. Simple turning, taper turning, drilling taping practice.

Study

1. Study of centrifugal pump
2. Study of air conditioner

Demonstration

1. Demonstration on foundry operations.

Electrical engineering practice lab

Familiarization of wiring tools, lighting and wiring accessories, various types of wiring systems; Wiring of one lamp controlled by one switch; Study of Electric shock phenomenon, precautions, preventions and earthing; Wiring of one lamp controlled by two SPDT Switch and one 3 pin plug socket independently; Familiarization of types of Fuse, MCB; Wiring of fluorescent lamp controlled by one switch from panel with MCB; Familiarization with measuring instruments to measure current, voltage and power in AC/DC circuits.

Electronics Engineering Practice lab

1. Study of Electronic Components and instruments– Resistors, Capacitors, Inductors, Diodes and millimetre.
2. Measurement of AC signal parameters (voltage, period, frequency) using CRO
3. Measurement of ripple factor of half wave rectifier and full wave rectifier.
4. Study of logic gates –AND, OR, XOR and NOT.
5. Soldering practice using general purpose PCB – Components, Devices and Circuits.

References

1. Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, New Delhi, 2007.
2. W A J Chapman, "Workshop Technology", Oxford IBH, 2007.
3. Uppal S. L., "Electrical Wiring & Estimating", Khanna Publishers,5th edition, 2003.
4. John H. Watt, Terrell Croft: American Electricians' Handbook: A Reference Book for the Practical Electrical Man ", McGraw Hill, 2002.
5. Thomas L. Floyd and Steve Wetterling, "Laboratory Exercises for Electronic Devices", Pearson Education Limited, 10th Edition, 2017.

SEMESTER II

UICH002	BUSINESS ENGLISH	L	T	P	C
		2	0	1	3

Course Objectives

- To comprehend the techniques of correspondence that improves the listening and drafting skills.
- To facilitate the students to use the language efficiently at work place.
- To improve decision making and problem solving skills through reading practice.
- To develop test-taking strategies and skills for BEC Vantage.

Fundamentals of Communication

Listening: Listening and noting specific information, Speaking: Extempore, Taking and Leaving Voice mail messages, Reading: scanning for gist and specific information, Writing: Discourse Markers, Writing a message, a memo (communicating policies, procedures within an organisation) or an email (business e-mail for appointment, enquiry, email with attachments).

Written Business Correspondence

Listening: Listening to identify topic, context, function, Speaking: Talking about present circumstances, past experiences and future plans, Reading: understanding text structure, Writing: Formal Letters (Calling for quotation, Placing Order, Complaint, Enquiry), Reports, Introduction to Blogs, Tweet, Social Networks, If Conditional, Adverbs / Adjectives.

Career Oriented Communication

Listening: Listening to different Accents/Intonation/Vowels/Consonants, Speaking: speculating about Brands and Marketing, Reading: Reading Comprehension (vocabulary and structure), Writing: Tag Questions, Modal Verbs, Writing Business Correspondence (explaining, apologising, reassuring, complaining), Reports (describing, summarising), Preparation of Agenda, Notices and Minutes of the Meeting.

Oral Presentation and Professional Speaking

Listening: Listening for details and main ideas, Speaking: Giving personal information, Making a longer speech, Giving information and expressing and justifying opinions, Reading: Reading different kinds of texts, Interpretation of Graphics, Writing: Active / Passive Voice, Set phrases (requesting information, agreeing to requests).

Personality Development

Listening: Listening to longer conversations/Monologues, Speaking: Expressing and justifying opinions, speculating, comparing and contrasting, agreeing and disagreeing. A 'mini-

presentation' on a business theme, Reading: understanding sentence structure and finding errors, Writing: Reported Speech, Proposals (describing, summarising, recommending, persuading).

List of Exercises

1. Extempore
2. Social Networking
3. Technical Presentation
4. Marketing a product
5. Group Discussion

References

1. Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Vantage", 2nd Edition, Cengage Learning, 2015.
2. Brook-Hart, Guy, "Business Benchmark", Cambridge University Press, 1st Edition, 2014.
3. Stephen E. Lucas, "The Art of Public Speaking", McGraw Hill Publications, 5th Edition, 2014.
4. Emilia Hardman, "Active Listening 101: How to turn down your volume to turn up your Communication Skills", Kindle Publication, 2nd Edition, 2012.
5. Patterson, Kerry, Joseph Grenny, Ron McMillan, Al Switzler, "Crucial Conversations Tools for Talking When Stakes Are High", Kindle Publication, 2nd Edition, 2011.

UICC002	ECOLOGY AND ENVIRONMENTAL SCIENCES	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the functions of natural system and various man induced activities that are affecting the nature in a destructive manner.
- To generate awareness about strategies to control, reduce and monitor all environmental threats.
- To manage various natural resources to attain environmental sustainability.

Ecology and Biodiversity

Ecology – ecosystem – biomes – physical and chemical components of ecosystem – biological components of ecosystem – forest ecosystem – desert ecosystem and pond ecosystem – Energy flow in ecosystem – nitrogen cycle – carbon dioxide cycle – phosphorous cycle – food pyramid – Ecological succession – types – Biodiversity – need for biodiversity – values of biodiversity – hot spots of biodiversity – endangered and endemic species – Conservation of biodiversity – in – situ and ex – situ conservation.

Natural Resources

Earth structure – internal and external earth processes – plate tectonics – erosion – weathering – deforestation – Anomalous properties of water – hydrological cycle – Effect of modern agriculture – fertilizers & pesticides – eutrophication – biomagnifications – Land degradation and mining –Desertification – soil erosion, methods of control of soil erosion – Renewable energy resources – wind, solar, geothermal, tidal and OTEC.

Case Studies: Loss of Forest Cover and Land Degradation in Jhum in India's North – East, Bijolia mining area in Rajasthan, Landslides in Nilgiris.

Environmental Pollution

Introduction – 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 municipal solid wastes – Role of an individual in prevention of pollution – pollution case studies.

Case Studies: Polluted Rivers – Ganga, Yamuna and Noyyal River, Foundries in Haora, Zero waste management in Vellore.

Environmental Threats

Acid rain, greenhouse effect, global warming – Disaster management – flood, drought, earthquake, tsunami – Threats to biodiversity – destruction of habitat, habitat fragmentation, hunting, over exploitation, man – wildlife conflicts – The IUCN red list categories, status of threatened species. **Case Studies:** Neutrino Project in Tamil Nadu.

Social Issues and Environmental Legislations

Environmental Protection – Role of Government, Legal aspects, Initiatives by Non–governmental Organizations – Sustainable development – sustainable technologies, need for energy and water conservation, rain water harvesting, water shed management, waste land reclamation, environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation – central and state pollution control boards – Public awareness, women and child welfare programs – Role of information technology in human and health.

Case Studies: Save the Children India, Rain water harvesting in urban areas – Women empowerment.

References

1. Tyler Miller G., "Environmental Science", Cengage Learning, 11th Edition, 2015.
2. Benny Joseph., "Environmental Studies", Tata McGraw Hill Education, 2nd Edition, 2008.
3. George Tchobanoglous, Howard S. Peavy, Donald R. Rowe., "Environmental Engineering", McGraw Hill Education, 1st Edition, 2013.
4. Henry J.G. and Heinke G.W., "Environmental Science and Engineering", Prentice Hall, 2nd Edition, 2007.
5. Masters G.B., "Introduction to Environmental Engineering and Science", Pearson Education, 3rd Edition, 2008.

UICM002	ENGINEERING MATHEMATICS - II	L	T	P	C
		3	1	0	4

Course Objectives

- Able to build mathematical models in terms of differential equations.
- Able to acquaint the knowledge on vector calculus, complex variables, conformal mappings and complex integration to solve various Engineering problems.
- Able to understand Laplace transform to represent system dynamic models and evaluate their time responses.

Ordinary Differential Equations

Homogeneous linear ODEs of second order – Non-homogeneous linear ODEs of second order with constant coefficients – Euler Cauchy's equation – Wronskian – Variation of Parameters – Modelling with Differential Equations.

Vector Calculus

Gradient of scalar field – Directional derivative – Divergence of vector field – Curl of vector field – Line integrals – Green's theorem in the plane – Gauss divergence theorem – Stokes theorem – (without proof) – Applications.

Analytic Functions

Analytic functions – Necessary and sufficient conditions – Cauchy-Riemann equations – Properties – Construction of analytic functions – Bilinear transformation – Conformal mapping: $w = z + c$, $w = c\,z$, $w = 1/z$ – Applications.

Complex Integration

Complex integration – Statement of Cauchy's integral theorem – Cauchy's integral formula – Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Application of complex integration : Evaluation of real Integrals.

Laplace Transforms

Laplace transform – Properties – Initial and Final Value Theorems – Periodic functions: sine wave, square and triangular waves - Inverse Laplace Transform – Simple system dynamic models - Transfer Functions – Poles and Zeroes - Response of First-Order Systems - Solution of RC Free, Step and Sinusoidal Responses - Convolution theorem.

References

1. Grewal. B.S, “Higher Engineering Mathematics”, 43rd Edition, Khanna Publications, Delhi, 2016.
2. Srimanta Paul and Subodh C. Bhunia, “Engineering Mathematics”, Oxford University Press, 1st Edition, 2015.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, Wiley India, 2016.
4. Ravish R Singh and Mukul Bhatt, “Engineering Mathematics”, 1st Edition, Tata McGraw Hill Education, New Delhi, 2016.
5. Ramana B.V, “Higher Engineering Mathematics”, 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2010.

UICE010	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	4

Course Objectives

- To enable the students to communicate the concepts, ideas, and basic designs through graphical representations as per standards and
- Impart knowledge to interpret engineering drawings.

Geometrical Constructions and Free Hand Sketching

Lettering – Types of lines – Dimensioning – Geometrical constructions – Principles of Orthographic projection – Orthographic projection of simple Engineering components using first angle Projection – Free Hand sketching only.

Projection of Points, Lines and Plane Surfaces

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method – Projection of planes inclined to both the principal planes by rotating object method.

Projection of Solids

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

Projection of Sectioned Solids and Development of Surfaces

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

Isometric and Perspective Projections

Principles of isometric projection – isometric scale – isometric projections of simple solids and Truncated solids – Prisms, pyramids, cylinders, cones – combination of two solid objects in simple vertical positions – Perspective projection of simple solids by visual ray method - Introduction to CAD and their use.

References

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
2. Gary Bertoline., and Eric Wiebe.,“Technical Graphics Communication”,McGraw–Hill, 4th Edition, 2009.

3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 2014.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2009.
5. David E. Goetsch, William S. Chalk, Raymond L. Rickman and John Nelson, “Technical Drawing and Engineering Communication”, Delmar Cengage Learning, 6th Edition, 2005.

UICE013	ENGINEERING MATERIALS	L	T	P	C
		3	0	0	3

Course Objectives

- To impart knowledge on structure of engineering materials and their influence on mechanical, chemical, electrical and magnetic properties.
- To acquire scientific understanding of engineering materials for relevant engineering applications.

Semiconducting materials

Fermi-Dirac distribution function – effect of temperature – density of states – carrier concentration in metals – elemental – compound semiconductor – Concept of Fermi level and its variation with temperature and impurity – Position of Fermi level in intrinsic semiconductor and in extrinsic semiconductor – Conductivity of semiconductor – band gap energy and their determination – Hall effect in semiconductor.

Superconducting materials

Super Conductor: Properties, types and occurrence: BCS theory (qualitative) – applications (SQUID, cryotron, magnetic levitation).

Magnetic materials

Classification of magnetic materials based on spin – Hard and soft magnetic materials – Ferrites, garnets and magnetoplumbites – Magnetic bubbles and their applications – Magnetic thin films – Introduction to spintronics and devices (Giant magnetoresistance, Tunnel magnetoresistance and colossal magnetoresistance).

Dielectric materials

Polarization mechanisms in dielectrics - Frequency and temperature dependence of polarization mechanism – Dielectric loss – Dielectric waveguide and dielectric resonator antenna – Piezoelectric, pyroelectric and ferroelectric materials and their applications.

Nanomaterials

Introduction – surface area to volume ratio – quantum confinement – properties of nano materials – synthesis of nano materials by ball milling – plasma arcing-pulsed laser deposition and sol-gel methods – carbon nanotubes – properties and applications – applications of nano materials in environmental and health care.

References

1. Banerjee G K, “Electrical and Electronics Engineering Materials”, Prentice Hall of India Pvt. Ltd, New Delhi, 2015.
2. Marikani A, “Materials Science”, Prentice Hall of India Pvt. Ltd, Delhi, 2017.
3. Raghavan V, “Material Science and Engineering”, Prentice Hall of India Pvt. Ltd, 6th Edition, Delhi, 2015.
4. William D. Callister, “Material Science and Engineering”, Jr. Wiley India Ltd, 9th Edition, 2014.
5. Vijaya M S and Rangarajan G, “Materials Science”, Tata McGraw – Hill, New Delhi, 3rd Edition, 2006.

UICE002	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		4	0	0	4

Course Objectives

- To impart the basic knowledge about the Electric and Magnetic circuits.
- To inculcate the knowledge on the AC fundamentals.
- To understand the working of various Electrical Machines and Electronic Components.

Review of Ohm's Law & Kirchhoff's laws–series and parallel circuits, equivalent resistance, star/delta conversion. Concepts of AC circuits – RMS value, average value, form and peak factors – real and reactive power – power factor, Mesh and Nodal Analysis.

Construction, Principle of operation and characteristics of DC generator and motor, transformer, synchronous machines and Induction machines. Basic ideas about energy audit and importance of energy saving.

Introduction to different types of electronic components (Diode, Transistor), Half and full wave rectifier (Qualitative analysis only), capacitive filters, zener voltage regulator, RC coupled amplifier, frequency response, colpitts oscillator.

References

1. A Fitzgerald, Charles Kingsley, Stephen Umans, "Electric Machinery", 7th edition, McGraw–Hill, 2013.
2. Robert Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall, 11th Edition 2015.
3. Mahmood Nahvi, Joseph A Edminister, "Electric Circuits", McGraw Hill Education, 5th Edition, 2010.
4. Bhattacharya.S.K, "Basic Electrical and Electronics Engineering", 1st Edition, Pearson Education, 2011.
5. P.S. Dhogal, "Basic Electrical Engineering – Vol. I& II", 42nd Reprint, McGraw–Hill, 2012.

UICE017	OBJECT ORIENTED PROGRAMMING WITH C++ AND JAVA	L	T	P	C
		2	0	2	4

Course Objectives

- To program using more advanced C++ features such as composition of objects, operator overloads, Dynamic memory allocation, inheritance, polymorphism, file I/O and exception handling.
- To solve moderate complex problems using Object oriented concepts in Java.

Introduction to Object Oriented Programming

Basic Concepts and benefits of OOP – Tokens – Keywords - Identifiers - Basic data types - Derived data types - Reference variables - Type modifiers - Type casting - Operators and control statements - Input and output statements. Classes and Objects - Class specification - Member function definition - Constructors - Parameterized constructors - Overloaded Constructors - Constructors with default arguments - Copy constructors - access qualifiers - Static data members and member functions - Instance creation - Array of objects - Introduction to friend function - Destructors.

Polymorphism and Inheritance

Operator Overloading: Operator function - Overloading unary and binary operator - Overloading the operator using friend function - Stream operator overloading - Data Conversion. Inheritance: Basic Principle - Use of Inheritance - Defining Derived classes - Single Inheritance - Protected Data with private inheritance - Multiple Inheritance - Multi level inheritance - Hierarchical Inheritance - Hybrid Inheritance. Virtual Functions: Need for virtual function - Pointer to derived class objects - Definition of virtual functions - Pure virtual functions - Abstract classes - Virtual destructors - Dynamic Binding.

I/O Streams and Generic Programming

Streams: Streams in C++ - Stream classes - Formatted and unformatted data - Manipulators - User defined manipulators - File streams - File pointer and manipulation - File open and close - Sequential and random access. Generic Programming With Templates: Introduction - Function templates - Class templates.

Overview of Java

Data types, variables and arrays, operators, control statements, classes, objects, method Inheritance – Packages and Interfaces – Exception handling – Multi-threaded programming – Strings – Input/Output.

List of Experiments

Simple application problems that can be solved using the following concepts.

C++

1. Objects, Classes, Constructors and Destructors
2. Function and Operator Overloading, Inheritance
3. Virtual functions and Pointers
4. Files, Streams and Exception handling
5. Templates

JAVA

6. References to an instant of a class and handling strings
7. Package creation
8. Interfaces developing user defined interfaces
9. Creation of threads
10. Exception handling mechanism

References

1. Herbert Schildt, "C++ The Complete Reference", 5th Edition, Tata McGraw Hill, New Delhi, 2014.
2. Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley, May 2013.
3. Deitel and Deitel, "C++ How to Program", 9th Edition, Prentice Hall India Learning Private Limited, 2014.
4. Herbert Schildt, "The Java Complete Reference", 10th Edition, McGraw-Hill Education, 2017.
5. Deitel and Deitel, "Java How to Program", 10th Edition, Pearson Education India, 2016.

SEMESTER III

UICM006	PROBABILITY AND RANDOM PROCESSES	L	T	P	C
		3	1	0	4

Course Objectives

- To understand the fundamental knowledge of the basic probability concepts and apply them in Engineering Problems.
- To acquaint with two dimensional random variables and its transformations.
- To know about the behavior of Random Processes in various applications.

Probability and Random Variables

Axioms of probability – Conditional probability – Total probability – Baye's theorem – Random variable – Probability mass function – Probability density functions – Properties – Moments – Moment generating functions and their properties – Binomial – Poisson – Uniform – Exponential and Normal distributions and their properties – Functions of a random variable– Application: Entropy of discrete sources.

Two Dimensional Random Variables

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables – Central limit theorem (without proof) Application: Mutual Information.

Random Processes

Random Processes – first order, second order, strictly stationary, wide sense stationary and Ergodic processes – Markov process – Poisson and Normal processes – Sine wave process.

Correlation and Spectral Densities

Auto correlation – Cross correlation – Properties – Power spectral density – Cross spectral density – Properties – Wiener-Khintchine relation – Relationship between cross power spectrum and cross correlation function – Application: Digital Modulation Techniques.

Linear Systems with Random Inputs

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output – Application: Noise in Analog and Digital Communications systems.

References

1. Ibe.O.C.,"Fundamentals of Applied Probability and Random Processes", Elsevier, Second Edition, 2014.

2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw Hill, Fourth Edition, New Delhi, 2016.
3. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", Second Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
4. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Second Edition, 2012.
5. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", Third Indian Edition, Oxford University Press, New Delhi, 2012.

UCSC001	ANALOG AND DIGITAL COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the concepts of analog and digital communication techniques.
- To learn data and pulse communication techniques.
- To learn source and error control coding.
- To gain knowledge on multi-user radio communication.

Analog Communication

Introduction to Communication Systems: Modulation – Types – Need for Modulation, Theory of Amplitude, Frequency and Phase Modulation – Comparison of Analog Communication System (AM – FM – PM).

Digital Communication

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) – Phase Shift Keying (PSK) - Quadrature Amplitude Modulation (QAM) – Bandwidth Efficiency – Comparison of Digital Communication System (ASK – FSK – PSK – QAM).

Data and Pulse Communication

Introduction to Data Communication – Standards Organizations for Data Communication – Data Communication Circuits – Data Communication Codes. Pulse Communication – Types – Pulse code Modulation (PCM) – Comparison of Pulse Communication System (PAM – PPM – PCM – PWM).

Source and Error Control Coding

Entropy, Mutual Information, Source encoding theorem, Shannon-Fano coding, Huffman coding, convolution codes.

Multi-User Radio Communication

Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand off – Bluetooth.

References

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2011.
2. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2010.
3. Rappaport T.S, "Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, 2010.
4. H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3rd Edition, Pearson Education, 2014.
5. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2011.

UCSC006	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	0	1	4

Course Objectives

- The course focuses on strategies and techniques to efficiently store data (Data Structures) and to perform processing on such data in efficient ways (Algorithms), as well as on the analysis and design of such techniques.
- Students will gain an in-depth understanding of the various types of data structures as well as types of situations where they're applicable; this includes sequential storage (lists, queues, and stacks), hierarchical storage (trees), and association/adjacency storage (graphs).
- Students will also become familiar with algorithm analysis and design techniques. This will include familiarity with some of the fundamental sorting techniques.

Linear Data structures

Linear Data structures: Abstract data types-lists-arrays-linked list- stacks-queues. Complexity and asymptotic notations- Searching-Trivial sorting algorithms of quadratic complexity- Merge sort – quicksort- understanding their memory behavior on statically allocated arrays- Heap sort- Stability.

Non Linear Data structures

Non Linear Data structures: Binary search tree- AVL tree- Splay Tree- Red-black tree- B tree- Hash tables- heaps. Graph representations- BFS and DFS- Topological sort- Minimum spanning tree and algorithms- shortest path algorithms: Single source and All-pairs shortest path.

Applications

Computational Geometry-Convex Hull-Degeneracies and Robustness - Application Domains-Line Segment Intersection- The Doubly Connected Edge List- Computing the Overlay of Two Subdivisions

List of Experiments

1. Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc.
2. Implementation of (Infix, Prefix, Postfix) transformations and its evaluation program.
3. Implementation of Binary Tree algorithm.
4. Implementation of Shell sort, Radix sort and Insertion sort
5. Implementation of searching methods (Index Sequential, Interpolation Search)

References

1. Cormen, T.H., Leiserson, C.D., Rivest, R.L. & Stein, C, “Introduction to Algorithms”, MIT Press, Third Edition, 2009.
2. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, ”Computational Geometry” Springer-Verlag, Third Edition, 2008.
3. Knuth, D.A., “The Art of Computer Programming”, Addison-Wesley, Third revised Edition, 2011.
4. Bjarne Stroustrup, “The C++ Programming Language”, Addison-Wesley ISBN 978-0321563842., Fourth Edition, May 2013.
5. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, the Hardcover edition, Pearson Education, Fourth Edition, 2013.

UCSC007	DATABASE MANAGEMNET SYSTEM	L	T	P	C
		3	0	1	4

Course Objectives

- To expose the students to the fundamentals of Database Management Systems.
- To familiarize students with relational model and ER diagrams.
- To make students to fetch data from the database using structured query language.
- To make students understand the basics of indexing and transaction processing.

Introduction

Database and Information Systems – Database System Concepts and Architecture – ER modelling Concepts – ER diagrams – Cardinality constraints – Weak Entity types – subclasses – Inheritance – Specialization and Generalization

Relational Model Languages and Systems

Relational model Concepts – Relational Integrity Constrains – Relational Algebra model ER to relational mapping – SQL: Data definition language in SQL – Queries and Update statements – views – Integrity Constraints – Specifying Indexes Embedded SQL – Query Optimization

Database Design

Keys in a relational model – Concept of functional dependencies – Normal form based on primary keys – Boyce-Codd Normal forms – Multivalued Dependencies and Fourth normal form – Join dependencies and fifth normal form – Other dependencies and Normal Forms

Storage and Indexing Structures

Secondary Storage devices – Buffering of blocks – File organization – heaps – sorted files – Hashing and its types – primary indexes – Clustering index – secondary index – multilevel index – B-trees – B+ trees – inserting and searching on B+ trees

Transaction Processing and Concurrency Control

Need for transactions – Necessary properties of transaction – Transaction states – Serializability –Testing for serialiazability – Locking – Lock Compatibility matrix - Deadlocks and starvation –Two phase locking protocol – Deadlock prevention protocols.

List of Experiments

1. Creation of a database and writing SQL queries to retrieve information from the Database performing Deletion, Modifying, Altering, Updating and Viewing Database records based on conditions
2. Creation of Views, Synonyms, Sequence, Indexes, save point
3. Creation of Procedures with proper exception handling mechanisms
4. Creation of database triggers and functions

References

1. RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education, 2008.
2. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011.
3. C.J.Date, A.Kannan and S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
4. AtulKahate, "Introduction to Database Management Systems", Pearson Education, New Delhi, 2006.
5. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2010.

UCSC008	DESIGN OF COMPUTER NETWORKS	L	T	P	C
		3	0	1	4

Course Objectives

- To explore the requirements that different applications and different communities place on the computer network.
- To understand the idea of network architecture.
- To Introduce Media Access Control problems and Reliable Transmission
- To understand the concept of routing, Internet Protocol and multicasting
- To explore end to end data delivery and byte stream protocols.
- To explore application protocols and the services they deliver.

Fundamentals

Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance metrics – Topology Design

Link Layer and Media Access Control

Link layer Services - Framing - Error Detection - Flow control - Media access control – LAN and WAN - IEEE LAN Standards, Logical Link Control protocols, HDLC, ALOHA, SLOTTED ALOHA, FDDI and Client Server model - Wireless LANs – 802.11 – Switching and bridging

Network Layer Level Services

Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP) - Routing (RIP, OSPF, metrics) – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM).

Transport Layer Services

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED)– QoS – Application requirements

Application Layer Services

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP - DNS – SNMP

List of Experiments

1. Design and configuration of network topologies using simulation tools
2. Simulation of ARP/RARP protocol

3. Implementation of applications that uses TCP as network layer protocol
4. Implementation of applications that uses UDP in network layer protocol
5. Performance comparison of LAN protocols
6. Simulation of Congestion control algorithm using network simulation tools
7. Implementation of Remote Procedure Call

References

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
3. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.
5. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw–Hill, 2011

UCSC009	DIGITAL SYSTEM	L	T	P	C
		3	0	1	4

Course Objectives

- To introduce the basics of binary systems, and implementations of logic functions, Karnaugh map minimization.
- To learn the implementation of combinational and sequential circuits. The course also emphasizes intuitive understanding on the RAM organization and the types of ROM.

Number Systems

Review of binary, decimal, octal and hexadecimal number systems – Interconversion between number Systems-Number representations- complement's additions, subtraction - Computer codes: BCD, Gray code - Error detection and correction codes - parity codes- Hamming codes.

Simplification of Boolean expression

Positive and Negative Logic-Implementations of Logic Functions using gates, NAND–NOR implementations. Boolean postulates and laws – Principle of Duality - De-Morgan's Theorem - Truth tables and Boolean expression -Minimization of Boolean expressions – Sum of Products (SOP) Product of Sums (POS) – Karnaugh map Minimization

Combinational Circuits

Adder, subtractor, decoder, encoder, multiplexer and de-multiplexer - Implementation of combinational circuits, magnitude comparator.

Sequential Circuits

Flip-flops - triggering, - Master slave configuration- Shift registers - Asynchronous Counters –- Ring counter

Programmable logic devices

Classification and characteristics of memories – RAM organization – Types of ROM. PLA, PAL.

List of Experiments

1. Familiarizations and verification of the truth tables of basic gates and universal gates
2. Implementation of adder, subtractor circuits using logic gates.
3. Implementation of multiplexer and demultiplexer circuits using logic gates. Familiarization with various multiplexer and demultiplexer ICs.
4. Implementation of shift registers using flip flop Integrated Circuits.
5. Implementation of ring counter and Johnson counter using flip flop Integrated Circuits.

References

1. Morris Mano M, “Digital Design ", Prentice-Hall of India, New Delhi, 2006.
2. Floyd T L, “Digital Fundamentals ", Pearson Education, New Delhi, Eighth Edition, 2009.
3. Tokheim R L., “Digital Electronics - Principles and Applications ", Tata McGraw Hill Publishing Company, New Delhi, 2001.
4. William I Fletcher, “An Engineering Approach to Digital Design ", Prentice-Hall of India, New Delhi, 1996.
5. Ronald J. Tocci, “Digital Systems”, Pearson, 10th edition, 2009.

UCSC014	OPEARTING SYSTEM	L	T	P	C
		3	0	1	4

Course Objectives

- Study the basic concepts, structure and functions of operating systems
- Learn about Processes, Threads and Scheduling algorithms
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems

Operating Systems Overview

Operating System application scenarios, kind of resource support needed by applications in terms of hardware and software layers - operational view of a computing system with resources like processor, memory, input and output, issues in resource management - a bare-bone operating system, introduction to the issues in communication with devices, kernel and shell of an operating system, processes and file - Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot. Case study: Linux System Administration.

Process Management

Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; Threads- Overview, Multicore Programming, Multithreading Models; Windows 7 - Thread and SMP Management. Process Synchronization - Critical Section Problem, Mutex Locks, Semophores, Monitors; CPU Scheduling and Deadlocks.

Storage Management

Main Memory-Contiguous Memory Allocation, Segmentation, Paging, 32 and 64-bit architecture Examples; Virtual Memory- Demand Paging, Page Replacement, Allocation, thrashing; Allocating Kernel Memory.

I/O systems

Mass Storage Structure- Overview, Disk Scheduling and Management; File System Storage-File Concepts, Directory and Disk Structure, Sharing and Protection; File System Implementation-File System Structure, Directory Structure, Allocation Methods, Free Space Management, I/O Systems Case study: Setting up a Linux multifunction server, Setting VMware on Linux host

List of Experiments

1. Basic Shell Programming
2. Implement of CPU scheduling algorithms
3. Implementation of file allocation strategies
4. Implementation of Semaphores
5. Implementation of file organization techniques
6. Implementation of Algorithms for Deadlock detection and deadlock avoidance
7. Implementation of all page replacement algorithms
8. Implementation of shared memory and IPC
9. Implementation of Paging Technique of memory management
10. Implementation of threading & Synchronization Applications

References

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, "Operating Systems – Internals and Design Principles", 7 th Edition, Prentice Hall, 2011.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
4. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education", 1996.
5. D M Dhamdhere, "Operating Systems: A Concept-Based Approach", Second Edition, Tata McGraw-Hill Education, 2007.

SEMESTER IV

UICM008	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	4

Course objectives

- Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.
- Be able to use effectively algebraic techniques to analyse basic discrete structures and algorithms.

Logic and Proofs

Propositional Logic – Propositional Equivalences – Predicate and Quantifiers – Nested Quantifiers – Rules of Inference – Normal Forms – Methods of Proofs – Proof methods and Strategy – Program Correctness.

Functions and Counting

Functions – Mappings – Injection and Surjections – Composition of Functions – Inverse Functions – Special Functions – Mathematical Induction – Permutation – Combinations – Pigeonhole Principle –Counting Techniques – Recurrence Relation – Generating Functions and Applications.

Algebraic Structures

Structure of Algebra – Semigroups – Monoids – Groups – Homomorphisms – Normal subgroups – Congruence Relations – Rings – Integral domains and fields – Elementary applications in coding theory.

Lattices and Boolean algebra

Partially Ordered Set – Hasse Diagrams – Lattices – Sub Lattices – Properties of Lattices – Algebraic Systems – Direct Product – Boolean algebra - Direct Product – Homorphisms Boolean Sub – Algebra – Boolean Rings – Applications of Boolean algebra in Logic Circuits and Switching Functions.

References

1. K.H.Rosen, Discrete Mathematics and applications, Tata McGraw Hill publishing Company, Seventh Edition, 2012.
2. Tremblay and Manohar, “Discrete mathematical structures with applications to computer science”,McGraw Hill, Thirty Fifth reprint, 2008.
3. Liu C. L., “Introduction to combinatorial mathematics”, McGraw Hill, 2006.
4. Susanna S. EPP, “Discrete mathematics with applications”, Cengage Learning, Fourth Edition, 2011.

5. Mott J. L., Kandel A. and Baker T. P., “Discrete mathematics for Computer Scientists and Mathematicians”, PH, 2016.

UCSC004	COMPUTER ORGANIZATION AND DESIGN	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the basic components of a system, the instructions used in a system along with its format.
- To design an ALU and its various operations are discussed such as addition, subtraction, multiplication and division.
- To understand the concepts of pipelining along with the various pipeline hazards.
- To understand the various memory technologies, concepts related to buses, bus standards such as PCI, ISA and SCSI are described.

Introduction

Eight ideas – Components of a computer system – Technology – Performance – Power wall– Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions.

Computer Arithmetic

Logical operations – control operations – Addressing and addressing modes. ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism - Basic MIPS implementation – Building datapath – Control Implementation scheme.

Pipelining, Hazards and Parallel Processing

Pipelining –Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.
Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – VLIW – Superscalar processors - Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs – Buses – Bus standards - PCI, ISA, SCSI

Memory Organization: Memory Hierarchy

Main memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory – Memory management hardware.

References

1. David A. Patterson and John L. Hennessey, “Computer organization and design’, Morgan Kauffman /Elsevier, Fifth edition, 2014.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organisation“, Mc Graw-Hill Inc,Sixth edition, 2012.

3. William Stallings, Computer Organization and Architecture – Designing for Performance, 6th Edition, Pearson Education, 2003.
4. Nicholas Carter, Schaum's outline of Computer Architecture, Tata McGraw Hill, 2006,
5. John L. Hennessy and David A Patterson, Computer Architecture A quantitative Approach, Morgan Kaufmann / Elsevier, Fourth Edition, 2007

UCSC013	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
		3	0	1	4

Course objectives

- Be able to provide students with a working knowledge of the underlying foundations of object-oriented design and analysis and the current state of practice.
- Be able to involving in developing models of the software solution to the problem clarified during analysis, and constructing programs that implement the design models.

What is Object Orientation? (Introduction to class, Object, inheritance, polymorphism) Model, Importance of Modelling, Object Oriented Modelling, Object oriented system development, Function/data methods, Object oriented analysis, Object oriented construction, Object oriented testing Identifying the elements of an object model Identifying classes and objects, Specifying the attributes, Defining operations, Finalizing the object definition

Introduction to UML Overview of UML, Conceptual Model of UML, Architecture, S/W Development Life Cycle, Classes Relationship, Common mechanism, Diagrams, Class diagram, Advanced classes,, Advanced Relationship, Interface, Types and Roles, Packages, Object Diagram. Basic Behavioral Modelling, Interactions, Use cases, Use Case Diagram, Interaction Diagram, Activity Diagram, State chart Diagram Architectural Modelling, Component, Components Diagram, and Deployment Diagram

Object Oriented Analysis, Iterative Development, Unified process & UP Phases, Understanding requirements, UP Disciplines, Agile UP Object Oriented Testing, Software Requirement Specification, Overview of Testing and object oriented, Testing, Types of Testing, Object oriented Testing strategies, Test case design for OO software, Inter class test case design

List of Experiments

1. Introduction to UML and use case diagrams
2. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems
3. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required).
4. Develop Structured design for the DFD model develop

Sample Experiments

Academic domain
- Course Registration System
- Student marks analysing system

Railway domain
- Online ticket reservation system
- Platform assignment system for the trains in a railway station

Medicine domain
- Expert system to prescribe the medicines for the given symptoms
- Remote computer monitoring

References

1. Ivar Jacobson, James Rumbaugh, Grady Booch, “The Unified Modeling Language User Guide”, Addison-Wesley Professional, 2005.
2. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd edition, Pearson Education, 2004.
3. Craig Larman, Applying UML and Patterns 3rd ed, Pearson Education, 2005.
4. Ivar Jacobson, Grady Booch, James Rumbaugh, “The Unified Software Development Process”, Pearson Education, 1999.
5. Alistair Cockburn, “Agile Software Development” Pearson Education, 2nd edition, 2007.

UCSC015	THEORY OF COMPUTATION	L	T	P	C
		3	1	0	4

Course Objectives

- Understand various Computing models like Finite State Machine, Pushdown Automata, and Turing Machine.
- Be aware of Decidability and Un-decidability of various problems. Learn types of grammars.

Finite Automata

Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA & NDFA – Finite Automaton with €- moves – Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA's with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- Pumping Lemma for Regular sets – Problems based on Pumping Lemma.

Grammars

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions - Null productions – Greiback Normal form – Chomsky normal form – Problems related to CNF and GNF.

Pushdown Automata

Pushdown Automata- Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL - pumping lemma for CFL – problems based on pumping Lemma. Application Layer Services

Turing Machines

Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine- Chomskian hierarchy of languages.

Unsolvable Problems and Computable Functions

Unsolvable Problems and Computable Functions – Primitive recursive functions – Recursive and recursively enumerable languages – Universal Turing machine. MEASURING AND CLASSIFYING COMPLEXITY: Tractable and Intractable problems- Tractable and possibly intractable problems - P and NP completeness - Polynomial time reductions.

References

1. Hopcroft J.E., Motwani R. and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Second Edition, Pearson Education, 2008.
2. John C Martin, “Introduction to Languages and the Theory of CoNader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. Mishra K L P and Chandrasekaran N, “Theory of Computer Science - Automata, Languages and Computation”, Third Edition, Prentice Hall of India, 2004.
4. Harry R Lewis and Christos H Papadimitriou, “Elements of the Theory of Computation”, Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
5. Peter Linz, “An Introduction to Formal Language and Automata”, Third Edition, Narosa Publishers, New Delhi, 2002.

UCSC101	ARTIFICIAL INTELLIGENCE -PRINCIPLES AND TECHNIQUES	L	T	P	C
		3	0	1	4

Course Objectives

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems and machine learning.

Introduction to Artificial Intelligence

Introduction and historical perspective, Hard and Soft AI –disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, the prepare-deliberate engineering trade-off, Procedural v/s Declarative knowledge, Criticism of symbolic AI, Knowledge representation, desirable properties of KR schemata, Use of predicate calculus in AI.

Machine Learning

Linear classification Loss minimization Stochastic gradient descent Features and non-linearity Neural networks, nearest neighbours Generalization Unsupervised learning, K-means-Search Tree search A*, consistent heuristics Relaxation

Markov decision processes and Bayesian networks

Policy evaluation, policy improvement Policy iteration, value iteration Reinforcement learning Monte Carlo, SARSA, Q-learning Exploration/exploitation, function approximation Constraint satisfaction problems]Factor graphs Backtracking search Dynamic ordering, arc consistency-Beam search, local search Conditional independence, variable elimination -Bayesian inference Marginal independence Hidden Markov models-[Logic] clauses First Deep learning auto encoders, CNNs, RNNs.

List of Experiments

1. Study of PROLOG. Write the following programs using PROLOG
2. Write a program to solve 8 queens problem
3. Solve any problem using depth first search and best first search.
4. Solve 8-puzzle problem using best first search
5. Solve Robot (traversal) problem using means End Analysis
6. Application development using NN/Fuzzy logic

References

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill- 2008.
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
3. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
4. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.
5. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.

SEMESTER V

UICM003	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

Course Objectives

- To impart knowledge in solving first and higher order partial differential equations.
- To construct full range and half range Fourier series expansion including Harmonic analysis.
- To develop methods to solve PDE using Fourier series solutions.
- To understand different types of Fourier transform and apply them to solve complex engineering problems.
- To familiarize Z transforms techniques to solve engineering problems.

Partial Differential Equations

Formation of PDE by elimination of arbitrary constants and functions – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's linear equation – Solution of second and higher order homogeneous and non-homogeneous linear equations with constant coefficients – Nonlinear equations of first order – Charpit's method.

Fourier series

Dirichlet's conditions – Expansion of periodic functions into Fourier series – Change of interval – Fourier series for even and odd functions – Half-range expansions – Root mean square value of a function – Parseval's identity – Harmonic analysis.

Applications to Partial Differential Equations

Classification of second order linear partial differential equations – Solutions of one dimensional wave equation – one dimensional heat equation – Steady state solution of two-dimensional heat equation –Fourier series solutions.

Fourier Transform

Statement of Fourier integral theorem (without proof) – Fourier transform pairs – Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity – Finite Fourier Sine and Cosine transform.

Z - Transform

Z-transforms – Elementary properties – Inverse Z-transform (using partial fraction and residues) – Convolution theorem – Formation of difference equations – Solution of difference equations using Z - transform.

References

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2016.
2. Bali N., Goyal M, “Transforms and Partial differential equations” University Science Press, New Delhi, 2010.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley India, 10th Edition, 2016.
4. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 2012.
5. Dennis G. Zill, “Advanced Engineering Mathematics”, Jones and Bartlett Learning, LLC, an Ascend Learning Company, 6th Edition, 2016.
6. Peter V. O’Neil, “Advanced Engineering Mathematics”, Cengage Learning, Boston, USA, 8th Edition, 2016.
7. Donald. A. McQuarrie, “Mathematical Methods for Scientists and Engineers”, Viva Books Pvt. Ltd, New Delhi, 1st Edition, Reprint 2015.

UICH003	ECONOMICS FOR ENGINEERS	L	T	P	C
		3	0	0	3

Course Objectives

- To provide a broad understanding of various perspectives of economics.
- To equip the students with necessary knowledge of economic concepts that can be applied in the engineering field.

Introduction

Introduction: Basic Economic Problems - Circular flow in an economy - Concepts of engineering economics - Scarcity and Efficiency - Micro and macroeconomics.

Production and Demand

Production: Factors of production - Production Possibility Curve - Demand analysis: Law of Demand - Exceptions- Price Elasticity of Demand.

Supply

Supply: Law of Supply - Determinants of Supply – Supply function - Supply Schedule - Supply Curve – Market Equilibrium.

Elements of Cost

Elements of Cost: Marginal Cost, Average Cost, Opportunity cost, Sunk cost, Life cycle cost - Inflation - Causes and types - Break even analysis.

Replacement and Maintenance

Replacement and Maintenance: Types of maintenance - Determination of economic life of an asset, Replacement of an asset with a new asset - Concept of challenger and defender.

References

1. John A. White, Kellie S. Grasman, Kenneth E. Case, Kim LaScola Needy, and David B. Pratt, “Fundamentals of Engineering Economic Analysis”, Wiley, August 2013.
2. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 2011.
4. Gupta, G.S., “Managerial Economics”, 2nd Edition, Tata McGraw Hill , 2013
5. Joel Dean, “Managerial Economics”, Prentice Hall India, 2014.

UCSC012	INTERNET PROGRAMMING	L	T	P	C
		3	0	1	4

Course Objectives

- To learn about java basics and the main programming elements of Java.
- Understand different Internet Technologies - Web page design
- To learn server side and client side script and database connectivity
- To learn about PHP and XML to create web services.

Data Types – Variables and Arrays – Operators – Control Statements – Classes – Objects – Methods – Inheritance - Packages – Abstract classes – Interfaces and Inner classes – Exception handling - Introduction to Threads – Multithreading – String handling – Streams and I/O – Applets.

Basics-RIA Rich Internet Applications - Collaborations tools - Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.

An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions-Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript. Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions-Connecting to Database – Using Cookies-Regular Expressions; XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

References

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2011.
2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional,2011.Mike W. Martin, Roland Schinzinger, “Ethics In Engineering”, McGraw Hill, 2005.
3. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999.
4. Chris Bates, “Web Programming – Building Intranet Applications”, 3rd Edition, Wiley Publications, 2009.

5. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.

UCSC103	NEURAL NETWORK AND FUZZY LOGIC	L	T	P	C
		3	0	1	4

Course Objectives

- To understand the knowledge on Fuzzy Logic Principles
- To study the various models of ANN
- To use the Fuzzy Logic and Neural Network for Application related to Design and Manufacture

Fundamentals of Neural Networks – Model of an Artificial Neuron – Neural Network Architectures – Learning Methods – Taxonomy of Neural Network Architectures – Standard Back Propagation Algorithms – Selection of Various Parameters – Variations Applications of Back Propagation Algorithms.

Associative Memory – Exponential BAM – Associative Memory For Real Coded Pattern Pairs – Applications Adaptive Resonance Theory – Introduction – ART 1 – ART2 – Industrial Applications.

Basic Concepts Of Fuzzy Set Theory – Operations of Fuzzy Sets – Properties of Fuzzy Sets – Crisp Relations – Fuzzy Relational Equations – Operations on Fuzzy Relations – Fuzzy Systems – Propositional Logic

Inference – Predicate Logic – Inference In Predicate Logic – Fuzzy Logic Principles – Fuzzy Quantifiers – Fuzzy Inference – Fuzzy Rule Based Systems – Fuzzification and Defuzzification – Types. Various Industrial Applications

List of Experiments

1. Learning rules and activation functions in NN
2. Development of fuzzy membership functions and fuzzy set properties
3. Verification of logic using fuzzy relations
4. Design of a fuzzy controller systems using fuzzy tool of Matlab
5. Application development using NN/Fuzzy logic

References

1. Rajasekaran. S.. Vijayalakshmi Pai. G.A. “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall of India Private Limited, 2003
2. Timothy J.Ross, “Fuzzy Logic With Engineering Applications”, McGraw Hill, 1995
3. Zurada J.M. “Introduction to Artificial Neural Systems”, Jaico Publishing House, 1994.
4. Klir.G, Yuan B.B. “Fuzzy Sets and Fuzzy Logic Prentice Hall of India Private Limited, 1997.
5. Chennakesava, R. Alavala, “Fuzzy Logic and Neural Networks: Basic Concepts & Applications”, New Age International Private Limited, 2007.

SEMESTER VI

UCSC002	COMPILER DESIGN	L	T	P	C
		3	0	1	4

Course Objectives

- To learn the design principles of compiler.
- To learn the various parsing techniques and different levels of translation.
- To acquire knowledge on code optimization and to generate machine codes.

Introduction

Translators-Compilation and Interpretation, Language processors, The Phases of Compiler-Errors Encountered in Different Phases, The Grouping of Phases-Compiler Construction Tools, Programming Language basics.

Lexical Analysis

Need and Role of Lexical Analyzer, Lexical Errors, Expressing Tokens by Regular Expressions, Converting regular expression to DFA. Minimization of DFA, Language for Specifying Lexical Analyzers, LEX-Design of Lexical Analyzer for a sample Language.

Parsing Techniques

Need and Role of the Parser-Context Free Grammars, Top Down Parsing -General Strategies, Recursive Descent Parser - Predictive Parser-LL(1) Parser, Shift Reduce Parser-LR Parser - LR (0)Item, Construction of SLR Parsing Table. Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer, YACC-Design of a syntax Analyzer for a Sample Language

Storage Allocation

Type Systems - Specification of a simple type checker, Equivalence of Type Expressions-Type Conversions, Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing, Symbol Tables, Dynamic Storage Allocation

Code Generation and Optimization

Principal Sources of Optimization-DAG, Optimization of Basic Blocks, Global Data Flow Analysis-Efficient Data Flow Algorithms - Issues in Design of a Code Generator, A Simple Code Generator Algorithm, Peephole Optimization.

List of Experiments

1. Implementation of Symbol Table.
2. Implementation of Lexical Analyzer using Lex Tool.
3. Implementation of Simple Code Optimization Techniques (Constant Folding, etc.).

4. Implement Bottom Up Parsing Technique (SLR/LALR Parsing).
5. Implement any one storage allocation strategies.

References

1. Alfred V Aho, Monica S.Larn Ravi Sethi and Jeffrey D Ullman, "Compilers - Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
4. Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
5. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

UCSC003	COMPUTER GRAPHICS	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce the use virtual reality of the components of a graphics system and become familiar with building of graphics system components and algorithms related with them.
- To learn the basic principles of 2D, 3D dimensional computer graphics.
- To learn the basic of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
- Provide an understanding of various techniques in computer animation.

Introduction

Application Areas of Computer Graphics - Overview of Graphics Systems - Video Display Devices -Raster Scan Systems - Random Scan Systems - Graphics Monitors and Work Station - Input Devices - Output Primitives: Points and Lines - Line Drawing Algorithms - Mid-Point Circle and Ellipse Algorithms - Attributes of Output Primitives.

2D and 3D Dimensional Concepts

Two-Dimensional Geometric Transformations - Two-Dimensional Viewing - Two-Dimensional Point and Line Clipping - Sutherland-Hodgernan Polygon Clipping - Weiler-Atherton Polygon Clipping - Text Clipping - Exterior Clipping. Three-Dimensional Display Methods - Three-Dimensional Object Representations - Three-Dimensional Geometric and Modeling Transformations - Three-Dimensional Viewing and Clipping.

Visible Surface Detection Methods

Classification - Back-Face Detection - Depth-Buffer - Scan-Line - Depth Sorting – BSP - Tree Methods - Area Sub-Division - Octree Methods.

Computer Animation

Design of Animation Sequence - General Computer Animation Functions - Raster Animation - Computer Animation Languages - Key Frame Systems - Motion Specifications - Color Models.

References

1. Donald Hearn and M.Pauline Baker, “Computer Graphics C Version”, Pearson Education, 2003.
2. Prabhat K Andleigh and Kiran Thakrar, ”Multimedia Systems and Design”, PHI, 2003.
3. Pakhira, “Computer Graphics, Multimedia and Animation”,2nd Edition,PHI 2010.

4. Foley, Vandam, Feiner, Huges, “Computer Graphics: Principles & Practice”, Pearson Education, 2nd edition 2003.
5. Peter Shirley, Michael Ashikhmin, Steve Marschner, “ Fundamentals of Computer Graphics”, CRC Press, 3rd edition, 2009.

UCSC010	DISTRIBUTED SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To expose students about the foundations of distributed systems.
- To guide the students to understand the issues involved in process and resource management.

Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. System Model – Inter process Communication - the API for internet protocols. External data representation and Multicast communication. Network virtualization: Overlay networks.

Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Routing overlays. Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control.

Process Management: Process Migration, Features, Mechanism – Threads. Resource Management: Introduction – Features of Scheduling Algorithms – Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

References

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
4. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
5. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

UCSC102	COMPUTATIONAL LINGUISTICS	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce some basic concepts in Computational Linguistics.
- To understand the concept of artificial intelligence and information system.
- To understand the characterization of natural language processing and representation.
- To enable the students to retrieve information and extraction.

Man-Machine Interface

Concept of Artificial Intelligence (AI) - information system and information processing-concept of formal language- Natural Language (NL) and real language- natural language as man-machine interface.

Natural Language Processing

Basic characteristic of NL- knowledge representation- level of representation in NL- function of natural language.

Computational Linguistics

Relationship between linguistics and NLP- computational models for phonology- unphology - lexicography- syntax,-semantics and discourse.

Processes and Methods

Pursuing applications – machine translation- information retrieval-information extraction-natural language in multimodal and multimedia systems-computer assisted language learning-multilingual on-line natural language processing.

References

1. A.M. Andrew, Artificial Intelligence. Kent: Abacus Press, 1983.
2. R., Grishman, Computational Linguistics, Cambridge: Cambridge University Press, 1986.
3. G. Keith, and M. Glover, Primary Language Learning with Microcomputers. London: Croom Helm, 1987.
4. S.Nirenburg, (ed) Machine Translation: I Theoretical and Methodological Issues. Cambridge, Cambridge University Press, 1987.
5. W.A. Sedlow, and S.Y. Sedlow, (eds.) Computer in Language Research, Hillsdale: N.S. Lawrence Erlbawn, 1979.

SEMESTER VII

UCSC005	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

Course Objectives

- Understand OSI security architecture and classical encryption techniques
- Acquire fundamental knowledge on the concepts of finite fields and number theory
- Understand various block cipher and stream cipher models
- Describe the principles of public key cryptosystems, hash functions and digital signature

Introduction & number theory

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid's algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat's and Euler's theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms

Block ciphers & public key cryptography

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography

Hash functions and digital signatures

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS – EI Gamal – Schnorr

Security practice & system security

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

E-Mail, IP & web security

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE

Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3-Exportability-Encoding-Secure Electronic Transaction (SET)

List of Experiments

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts.
   a. Caesar Cipher
   b. Playfair Cipher
   c. Hill Cipher
   d. Vigenere Cipher
   e. Rail fence – row & Column Transformation
2. Implement the following algorithms.

a. DES
b. RSA Algorithm
c. Diffiee-Hellman
d. MD5
e. SHA-1

3. Implement the SIGNATURE SCHEME - Digital Signature Standard and Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
4. Setup a honey pot and monitor the honeypot on network (KF Sensor) and Installation of rootkits and study about the variety of options.
5. Perform wireless audit on an access point or a router and decrypt WEP and WPA. (Net Stumbler) and Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

References

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.
2. Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002.
3. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
4. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
5. Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006.
6. Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000.
7. Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Second Edition, Private Communication in Public World", PHI 2002.

UCSC104	PATTERN RECOGNITION	L	T	P	C
		3	0	1	4

Course Objectives

- Understand the knowledge of learning and adaptation in supervised modes of learning
- To know the knowledge of recognition, decision making and statistical learning problems.
- Provide knowledge of current research topics and issues in Pattern Recognition and Machine Learning
- Provide experience in conducting and presenting a literature review on a research topic.

Baye's Decision Theory

Discriminant Functions and Services -the Normal Distribution-Bayesian Classification -Estimating Probability Density Functions -Nearest Neighbor Rules -Bayesian Networks

Linear Classifiers

Perceptron Algorithm -Least-Squares Methods -Nonlinear Classifiers -Multilayer Perceptron's - Back Propagation Algorithm Pattern Recognition -Decision Trees -Combinations of Classifiers - Boosting

Feature Selection

Data Preprocessing -ROC Curves -Class Separability Measures -Feature Subset Selection -Bayesian Information Criterion -Dimensionality Reduction -Basis Vectors -Singular Value Decomposition - Independent Component Analysis -Kernel PCA –Wavelets.

List of Experiments

1. Feature Representation
2. Linear Perceptron Learning
3. Generation of Random Variables.
4. Data Clustering using K-Means and MST
5. Learning the Classifier from Data

References

1. Christopher Bishop. M., "Pattern Recognition and Machine Learning", Springer, 2007.
2. Barber D., "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.
3. Theodoridis, S. and Koutroumbas, K. "Pattern Recognition". Edition 4. Academic Press, 2008.
4. Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Interscience. 2nd Edition. 2001.
5. Schalkoff, "Pattern Recognition: Statistical, Structural and Neural Approaches", Wiley, 2007.

PROFESSIONAL ELECTIVES

UCSE001	AD HOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- To analyze the various design goals in ad hoc and sensor networks.
- To learn the various protocols in MAC
- Become familiar with the different types of adhoc routing protocols.
- Learn the architecture and protocols of wireless sensor networks.

Cellular and ad hoc wireless networks - Applications of ad hoc wireless networks - Issues in ad hoc wireless networks-medium access scheme, routing, transport layer protocols - Design goals of a MAC protocol - Contention based protocols - Contention based protocols with reservation mechanisms and scheduling mechanisms - MAC protocols using directional antennas.

Table driven routing protocols - On demand routing protocols - hybrid routing protocols - Hierarchical routing protocols - Power aware routing protocols - Tree based and mesh based multicast routing protocols

Introduction to Sensor Networks - Advantage of Sensor Networks - Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks. Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints - Network architecture - Deployment and Configuration: Localization and positioning, Coverage and connectivity, Single-hop and multihop localization, self-configuring localization systems, sensor management

Network Protocols: Issues in designing MAC protocol for WSNs - Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee. Routing protocols: Issues in designing routing protocols, Classification of routing protocols, Energy-efficient routing, Unicast, Broadcast and multicast, Geographic routing.

References

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, 2008.
2. Holger Kerl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Network”, John Wiley and Sons, 2005 (ISBN: 978-0-470-09511-9)
3. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, “Wireless Sensor Network”, Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).
4. Feng Zhao, Leonidas Guibas, “ Wireless Sensor Network”, Elsevier, 1st Ed. 2004 (ISBN: 13-978-1-55860-914-3)

5. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.

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UCSE002	FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Objectives

- Understand the global trends and development methodologies of various types of products and services.
- Conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- Understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- Understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- Gain knowledge of the Innovation & Product Development process in the Business Context

Fundamentals of Product Development

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends - Introduction to Product Development Methodologies and Management - Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies - Product Life Cycle - Product Development Planning and Management.

Requirements and System Design

Requirement Engineering - Types of Requirements - Requirement Engineering - Traceability Matrix and Analysis - Requirement Management - System Design & Modeling - Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design

Design and Testing

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification – Mechanical, Electronics and Software Subsystems - High Level Design/Low Level Design of S/W Program - Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping - Introduction to Rapid

Prototyping and Rapid Manufacturing - System Integration, Testing, Certification and Documentation

Sustenance Engineering and End-Of-Life (Eol) Support

Introduction to Product verification processes and stages - Introduction to Product validation processes and stages - Product Testing standards and Certification - Product Documentation - Sustenance - Maintenance and Repair – Enhancements - Product EoL - Obsolescence Management - Configuration Management - EoL Disposal

Business Dynamics Engineering Services Industry

The Industry - Engineering Services Industry - Product development in Industry versus Academia - The IPD Essentials - Introduction to vertical specific product development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and S/W systems – Product development Trade-offs - Intellectual Property Rights and Confidentiality - Security and configuration management.

References

1. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", TataMcGraw Hill, Fifth Edition, New Delhi, 2011
2. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill,Eleventh Edition, New Delhi, 2005. 106
3. Peter F Drucker, “People and Performance”, Butterworth – Heinemann [Elsevier],Oxford, UK, 2004.
4. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Conceptsand Practice”, Prentice Hall India, New Delhi, 2003
5. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design",McGraw Hill Education, Seventh Edition, New Delhi, 20

UCSE003	GAME PROGRAMMING	L	T	P	C
		3	0	0	3

Course Objectives

- Ability to understand the concepts of Game design and development.
- Learn the processes, mechanics and issues in Game Design.
- Learn about Game programming platforms, frame works and engines.
- Ability to effectively use technical, conceptual and appropriate technology tools.

Introduction to Game Design

Basic Game Loop- Input Handling and Movement Monogame- Input Handling and Movement Unity- Unity Input, Input Controller and Sprite Renderer- Monogame Game Components and Game Services- Unity Components, Composition vs Construction-Quaternions and Input and Sound-Euler Rotations and Quaternions-Human Input Devices and Event-Based Input Systems-Sound basics-Collision Detection and Game Physics-Camera Systems-User Interface Systems-Event Based Systems and Scripting Languages-Animation and Assorted Gameplay.

3D Computer graphics

The graphics pipeline-OpenGL-WebGL-and GLSL Shader programming-JavaScript with Three Js - Stereoscopic perception and rendering- Head mounted display optics and Electronics Inertial measurement units- Gyros- Accelerators- Magnetometers-Sensor fusion- Complementary filter- Kalman filter - Human perception- Visual-audio-Vestibular-Tactile, Vector Math and Games.

Game Engine Design

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

Virtual Reality

OpenGL-real-time rendering-3D display systems- display optics & electronics-IMUs and sensors-tracking-haptics-rendering pipeline- multimodal human perception and depth perception-stereo rendering-presence.-Emphasis on VR technology.

References

1. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, The Art of Game Design: A book of lenses, 1st Edition, CRC Press, 2008.
   Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning,PTR,2012.
4. David H. Eberly, “3D Game Engine Design,: A Practical Approach to Real-Time Computer Graphics” 2nd Edition,Springer,2011.
5. Penndy De Byl,“Holistic Game Development with Unity: All in one Guide to implementing Game Mechanics, Art, Design and Programming”, Unity Publishers,2011.

UCSE004	INFORMATION RETRIEVAL	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce the students to Information Retrieval systems.
- Expose them to various retrieval models with emphasis on pros and cons of these models.
- Discuss mechanisms of web search along with the details of ranking algorithms.
- To introduce the basic concepts of text categorization and recommender systems.

Introduction to Information Retrieval: Goals and history of IR - The impact of the web on IR - unstructured and semi-structured text - Basic IR Models Inverted index and Boolean queries - Boolean and vector-space retrieval models - ranked retrieval – text - similarity metrics - TF-IDF (term frequency/inverse document frequency) weighting - cosine similarity - Basic Tokenizing – Indexing and Implementation of Vector-Space Retrieval: Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors

Experimental Evaluation of IR: Performance metrics – recall – precision and F-measure - Query Operations - Relevance feedback - Query expansion - Query languages - Text Representation - Word statistics - Porter stemmer - index term selection - using thesauri metadata and markup languages (SGML, HTML, XML)

Web Search: Introduction – Spidering – Interfaces - Link Analysis Text Categorization: Categorization algorithms - Language-Model Based Retrieval - Text Clustering - Applications to web search and information organization.

Recommender Systems: Collaborative filtering and content-based recommendation of documents and products - Information Extraction and Integration: Extracting data from text - semantic web - collecting and integrating specialized information on the web.

References

1. C. Manning, P. Raghavan, and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro - Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, 2nd Edition, ACM Press Books 2011.
3. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, 2010.

4. Mark Levene, “An Introduction to Search Engines and Web Navigation”, 2nd Edition Wiley, 2010.
5. Ophir Frieder “Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series “, 2nd Edition, Springer, 2004.

UCSE005	NATURAL LANGUAGE PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the fundamentals of natural language processing and to understand the use of Context Free Grammer in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

Regular Expressions - Disjunction, Grouping, and Precedence - Finite-State Automata – English Morphology - Text Normalization- Collapsing words: Lemmatization and Stemming - Byte-Pair Encoding- Sentence Segmentation, Tokenization, Detecting and Correcting Spelling Errors - Minimum Edit Distance

N-grams - Evaluating Language models – Smoothing - Interpolation and Backoff – Part-of-Speech Tagging – English Word Classes - The Penn Treebank PoS Tagset – PoS Tagging - HMM PoS Tagging - Maximum Entropy Markov models – Bidirectionality – PoS Tagging for other languages.

Context-Free Grammars - Grammar rules for English – Tree banks – Grammar Equivalence and Normal Form – Lexicalized Grammars - Syntactic Parsing – Ambiguity - Dynamic Programming – Statistical parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – First-Order Logic - Description Logics – Semantic Parsing

Word Senses – WordNet - Word Similarity – Word Sense Disambiguation – WSD: Dictionary and Thesaurus Methods – Semi- Supervised WSD – Unsupervised Word Sense Induction

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

References

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009.
3. Breck Baldwin, "Language Processing with Java ", Atlantic Publisher, 2015.
4. Richard M Reese, "Natural Language Processing with Java", OReilly Media, 2015.
5. Nitin Indurkhya and Fred J. Damerau, "Handbook of Natural Language Processing", Second Edition, Chapman and Hall/CRC Press, 2010.

UCSE006	NETWORK ANALYSIS AND MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives

- Learn to analyze network traffic and protocols
- Be aware of network-troubleshooting concepts.
- Understand network security concepts.

A system approach to network design and requirement analysis

Introduction-Network Service and Service based networks- Systems and services-characterizing the Services, Requirement Analysis: Concepts, Background, User Requirements - Application Requirements- Host Requirements-Network Requirements, Requirement Analysis: Guidelines, Requirements gathering and listing, developing service metrics to measure performance, Characterizing behavior, developing performance threshold – Distinguish between service performance levels, Requirement Analysis: Practice, Template, table and maps, simplifying the requirement analysis process.

Flow Analysis

Background- Flows, Data sources and sinks, Flow models, Flow boundaries, Flow distributions, Flow specifications, Applying the flow model, Establishing flow boundaries, Applying flow distributions, Combining flow models, boundaries and distributions, Developing flow specifications, prioritizing flow simplifying, flow analysis process, examples of applying flow specs

Logical Design

Background, Establishing design goals, Developing criteria for technology evolution, Making technology choices for design, Shared Medium- Switching and Routing: Comparison and contrast, Switching, Routing-Hybrid Routing/Switching Mechanisms, Applying Interconnection Mechanism to Design, Integrating Network management and security into the Design, Defining Network Management, Designing with manageable resources, Network Management Architecture, Security, Security mechanism-Examples

Network design: physical, addressing and routing

Introduction- Evaluating cable plant design options – Network equipment placement-diagramming the physical design- diagramming the worksheet –case study. Introduction to Addressing and routing establishing routing flow in the design

environments- manipulating routing flows-developing addressing strategies-developing a routing strategy

Network Management and SNMP Protocol Model

Network and System management, Network management system platform, Current SNMP Broadband and TMN management, Network management standards - SNMPV1, SNMPV2, SNMP V3, MIB, security user based security model, access control RMON

References

1. James.D.McCabe, “Practical Computer Network Analysis and Design”, 1st Edition, Morgan Kaufaman, 1997.
2. Mani Subramanian, “Network Management – Principles & Practice” – 2nd Edition Prentice Hall, 2012.
3. J.Radz,”Fundamentals of Computer Network Analysis and Engineering: Basic Approaches for Solving Problems in the Networked Computing Environment”, Universal Press, 2005.
4. Laura Chappel and Gerald Combs, “Wireshark 101: Essential Skills for Network Analysis”, Kindle Edition, 2013.
5. William Stallings., “SNMP, SNMP2, SNMP3 and RMON1 and 2”, Pearson Education, 2004.

UCSE007	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives

- Ability to apply mathematical background for understanding and implementing soft computing techniques such as genetic algorithms, neural networks and fuzzy systems.
- Learn about the introduction to the basic practical techniques of soft computing.
- Emphasis will be given to the basics of an evolutionary computing paradigm and its application to engineering optimization problems.
- Become familiar with the use of a wide variety of optimization problems and will be able to apply these methods to research problems.

Soft Computing: Introduction, requirement, different tools and techniques, usefulness and applications. Fuzzy sets and Fuzzy logic: Introduction, Fuzzy sets versus crisp sets, operations on fuzzy sets, Extension principle, Fuzzy relations and relation equations, Fuzzy numbers, Linguistic variables, Fuzzy logic, Linguistic hedges, Applications, fuzzy controllers, fuzzy pattern recognition, fuzzy image processing, fuzzy database.

Artificial Neural Network: Introduction, basic models, Hebb's learning, Adaline, Perceptron, Multilayer feed forward network, Back propagation, Different issues regarding convergence of Multilayer Perceptron, Competitive learning, Self-Organizing Feature Maps, Adaptive Resonance Theory, Associative Memories, Applications.

Evolutionary and Stochastic techniques: Genetic Algorithm (GA), different operators of GA, analysis of selection operations, Hypothesis of building blocks, Schema theorem and convergence of Genetic Algorithm, Simulated annealing and Stochastic models, Boltzmann Machine, Applications. Rough Set: Introduction, Imprecise Categories Approximations and Rough Sets, Reduction of Knowledge, Decision Tables, and Applications.

Hybrid Systems: Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm for Neural Network Design and Learning, Fuzzy Logic and Genetic Algorithm for Optimization, Applications.

References

1. S. Rajasekaran and G.A.VijaylakshmiPai.. “Neural Networks Fuzzy Logic, and Genetic Algorithms”, Prentice Hall of India, 2003.
2. Toshinori Munakata, “Fundamentals of the New Artificial Intelligence: Neural, Evolutionary, Fuzzy and More”, Springer, 2008.

3. J.S.R.Jang, C.T.Sun and E.Mizutani,,"Neuro-Fuzzy and Soft Computing",Pearson Education,2004.
4. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
5. Davis E.Goldberg," Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
6. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools, AP Professional", Springer,1996.

UCSE008	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives

- Deliver successful software projects that support organization's strategic goal
- Match organizational needs to the most effective software development model
- Plan and manage projects at each stage of the software development life cycle (SDLC)
- Create project plans that address real-world management challenges
- Develop the skills for tracking and controlling software deliverables

Conventional Software Management – Evolution of Software Economics – Improving Software Economics–Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Iterative Process Planning— Tailoring the Process

Network Planning Models – Forward Pass –Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management .Resource allocation – Cost Monitoring –Contract Management – Acceptance.

Understanding Behavior – Organizational Behaviour - Selecting the Right Person for the Job – Instruction in the Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Case Studies.

References

1. Walker Royce, "Software Project Management A Unified Framework", Pearson Education, Fifth Edition, 2009.
2. Ramesh Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, First Edition, 2006.
3. Bob Hughes, Mikecotterell, "Software Project Management", Tata McGraw Hill, Third Edition, 2004.
4. Robert T. Futrell, Donald F. Shefer and Linda I. Shefer, "Quality Software Project Management", Pearson Education, 2003.
5. S. A. Kelkar," Software Project Management" PHI, 2012.

UCSE009	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives

- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To understand the major considerations for enterprise integration and deployment.Course Outcomes.

Introduction to Software Engineering

Introduction – Evolving role of software – Software Myths – Characteristics of Software – software development and life cycle: Software Development Process – The Code-and – Fix model – The Waterfall model – The Evolutionary Model – The Incremental Implementation –Prototyping – The Spiral Model – Software Reuse – Critical Comparisons of SDLC models

Requirements analysis and specification

Requirements: Importance of Requirement Analysis – Functional and Non – Functional – User requirements – System requirements – Software Requirements Document – Barriers to Eliciting User requirements – The software requirements document and SRS standards – Requirements Engineering – Case Study of SRS for a Real Time System – Tools for Requirements Gathering: Document Flow Chart, Decision Table, Decision Tree.

Software design

Software Design: Goals of good software design – Design strategies and methodologies – Data oriented software design – Structured Design – Design heuristics – Software architecture – Software Measurement and Metrics: Various Size Oriented Measures: Halstead's software science – Function Point (FP) based measures – Cyclomatic Complexity Measures.

Software testing strategies – Unit testing –Integrating testing – validation technique – System testing – debugging – Software Maintenance: Management of maintenance, Maintenance process – Maintenance models – Regression testing – Reverse engineering – Software reengineering – Configuration management – Documentation.

References

1. R. S. Pressman, “Software Engineering: A Practitioner's Approach” McGraw Hill, Seventh Edition, 2010.
2. G. G. Schulmeyer, “Zero Defect Software”, McGraw-Hill 1992.
3. J. Rumbaugh, “Object Oriented Modelling and Design”, Prentice Hall, 1991

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6. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning PrivateLimited , 2009.

UCSE010	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the algorithm analysis techniques.
- To become familiar with the different algorithm design techniques.
- To understand the limitations of algorithm power.

Introduction

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

Divide and Conquer

Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication - Closest-Pair and Convex-Hull Problems.

Dynamic Programming and Greedy Technique

Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm-Dijkstra's Algorithm-Huffman Trees.

Backtracking and Branch-and-Bound

Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem**.**

Coping with Limitations of Algorithm Power

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems--Coping with the Limitations - Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

References

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
4. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1 & 3, Pearson Education, 2009.
5. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.

UCSE011	MOBILE COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives

- Use simulator tools and design Ad hoc networks and develop a mobile application.
- Became familiar with basics of mobile telecommunication systems and choose the required functionality at each layer for given application.
- Develop solution for each functionality at each layer.

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

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

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

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

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

References

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012.
2. Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi,2007.
3. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

5. William.C.Y.Lee,“Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition, Tata Mc Graw Hill Edition ,2006.
6. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

UCSE012	GRID AND CLOUD COMPUTING	L	T	P	C
		3	0	0	3

Course Objective

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers – Grid computing Infrastructures – cloud computing – service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

Cloud deployment models - Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Virtualization For Cloud – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties – Interpretation and binary translation, HLL VM – Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper-V.

Main components and Programming model – Introduction to Hadoop Framework – Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.

References

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Bart Jacob, "Introduction to Grid Computing", IBM Red Books, Vervante, 2005
3. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann.
4. Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005.

5. Barry Wilkinson, “Grid Computing: Techniques and Applications”, Chapman and Hall, CRC, Taylor and Francis Group, 2010.

UCSE013	PRINCIPLES OF MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

Course Objectives

- To study the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To understand about communication and bus interfacing.
- To study the Architecture of 8051 microcontroller.

The 8086 Microprocessor

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

8086 System Bus Structure

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

I/O Interfacing

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

Microcontroller

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

References

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson Education, 2011.

3. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware:, TMH, 2012.
4. A.K.Ray,K.M.Bhurchandi,”Advanced Microprocessors and Peripherals”, 3rd edition, Tata McGrawHill, 2012.
5. K.Uma Rao, Andhe Pallavi, “The 8051 Microcontrollers, Architecture and programming and Applications”, Pearson, 2009.

UCSE101	COMPUTER VISION: FOUNDATIONS AND APPLICATIONS	L	T	P	C
		3	0	0	3

Course Objectives

- To provide an introduction to computer vision, including fundamentals and deep learning with neural networks.
- To develop basic methods for applications that include known models in images and recognition.

Introduction

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

Image Perception

Image Perception and Color Representation - Image Data Compression - Image Filtering and restoration - Image Segmentation - Image Registration - Medical Imaging – Transformation models - rigid, affine, quadratic, etc. - Similarity/Cost functions - point correspondence

Image Construction

Regularization methods - continuum mechanics - Landmark registration, Curve registration, Surface registration, Volumetric registration - Empirical models/ Point distribution models - Image Reconstruction from Projections - Mathematical Morphology - 3D Vision, Geometry, and radiometry - Other Topics of Class Interest.

Image Enhancement

Binary shape analysis– connectedness– object labeling and counting– size filtering– distance functions – skeletons and thinning – deformable shape analysis–boundary tracking procedures.

Application

Photo album – Face detection – Face recognition – Eigen faces Active appearance and 3D shape models of faces Application: Surveillance – combining views from multiple cameras human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

References

1. Sonka M., Hlavac V. and Boyle R., "Image Processing, Analysis, and Machine Vision', Second Edition, Brooks/Cole, Pacific Grove, 1999.
2. Jain A.K., "Fundamentals of Digital Image Processing", Prentice-Hall, New Jersey, 1989.
3. E. R.Davies,"Computer &MachineVision",FourthEdition,AcademicPress,2012.
4. R.Szeliski,"ComputerVision:Algorithms and Applications", Springer2011.
5. SimonJ.D.Prince,"ComputerVision:Models,Learning,andInference",CambridgeUniversiy Press,2012.

UCSE102	DATA MINING AND ANALYSIS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the application of data mining in Social Networks
- To understand types of data and to improve the quality of data and efficiency and the ease of the mining process.

Introduction

Data Mining, Motivation, Application, Data Mining- On What Kind of Data? Data Mining Functionalities, Data Mining Task Primitives, Major Issues in Data Mining. Data pre-processing: Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Association Rule and Classification and Prediction

Association Rule: Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Association Rules, the Apriori Algorithm Classification and Prediction: Classification: Classification, Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Metrics for Evaluating Classifier Performance, Holdout Method and Random Sub sampling Prediction: Prediction, Issues Regarding Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

Clustering

Cluster Analysis, Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic, Evaluation of Clustering. Case study: Mining Social Network sitesSequence Mining-Text Mining- WebSearch- Multivariate Time Series (MVTS) Mining- Multi-relational Data Mining (MRDM)

References

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007.
3. K.P. Soman, Shyam Diwakar and V. Aja, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.

4. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
5. David L. Olson and Dursun Delen “Advanced Data Mining”, Springer, 2008.

UCSE103	DECISION MAKING UNDER UNCERTAINITY	L	T	P	C
		3	0	0	3

Course Objectives

- Become aware of the scope of management problems that can be addressed with stochastic optimization models; and learn to identify opportunities for creating value using these models
- Develop models that can be used to improve decision making under uncertainty within an organization
- Sharpen their ability to structure problems and to perform logical analyses
- Know how to assess the significance of model outputs for managerial insights and action

Modelling Approach to Decision Making

Characteristics and Benefits of Modeling-Mathematical Models -Categories of Mathematical Models-The Problem-Solving Process- Applications of Mathematical Optimization- Characteristics of Optimization Problems-Expressing Optimization Problems Mathematically- The General Form of an LP Model-Solving LP Problems: An Intuitive Approach- Solving LP Problems: A Graphical Approach

Sensitivity Analysis and the Simplex Method

The Purpose of Sensitivity Analysis-Approaches to Sensitivity Analysis -An Example Problem - The Answer Report -The Sensitivity Report- The Transshipment Problem-Goal Programming-Multiple Objective Optimizations

Regression Analysis

Regression Models-Simple Linear Regression Analysis-Defining “Best Fit”-Solving the Problem Using Solver -Solving the Problem Using the Regression Tool -Evaluating the Fit- Making Predictions-Binary Independent Variables-Statistical Tests for the Population Parameters-Polynomial Regression

Decision Analysis

Good Decisions vs. Good Outcomes-Characteristics of Decision Problems- Decision Rules-Nonprobabilistic Methods- ProbabilisticMethods- Computing Conditional Probabilities-Multicriteria Decision Making

References

1. Cliff T. Ragsdale, “Spreadsheet Modeling and Decision Analysis,” 7th edition.
2. Mykel J. Kochenderfer,”Decision making and uncertainty: Theory and application”, 1st edition, The MIT Press, July 2015.

3. Charles A. Holloway, “Decision Making under Uncertainty: Models and Choices”, Prentice Hall, 1979.
4. Edi Karni, “Decision Making under Uncertainty: The Case of State-Dependent Preference”, Harvard University Press, 1985.
5. Charles Yoe, “Principles of Risk Analysis: Decision Making under Uncertainty”, CRC Press, 2011.

UCSE104	IT SECURITY AND ETHICAL HACKING	L	T	P	C
		3	0	0	3

Course Objectives

- To be aware of the different types of data security threats in IT domain.
- To have knowledge regarding different security policies and their implementation challenges.
- To be familiar with hacking methodologies for security threat auditing

The Security Environment-Threats, vulnerabilities, and Consequences -Advanced persistent threats-The state of security today-Why security matters to DoD-Principles of Cyber security-The interrelated components of the computing environment-Cyber security models (the CIA triad, the star model, the Parkerian hexad)- Variations on a theme: computer security, information security, and information assurance

Cyber security Management Concepts-Security Governance-Management models, roles, and functions-Security Governance-Management models, roles, and functions-Security Plans and Policies-Levels of planning-Planning misalignment-The System Security Plan (SSP)-Policy development and implementation- Cyber security Management Concepts-Security Governance-Management models, roles, and functions

Introduction to Ethical Hacking – Foot printing and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers – Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms

References

1. “CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.
2. Jennifer L. Bayuk, J.Healey, P.Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss, “Cyber Security Policy Guidebook” ,John Wiley & Sons 2012.
3. Ankit Fadia ,” Ethical Hacking”, Macmillan India Ltd, Second Edition ,2006
4. Kenneth C.Brancik ,”Insight to Computer Fraud”, Auerbach Publications ,Taylor & Francis Group,2008.
5. Rick Howard, “Cyber Security Essentials” Auerbach Publications, 2011.

UCSE105	GENETIC ALGORITHM AND MACHINE LEARNING	L	T	P	C
		3	0	0	3

Course Objectives

- To familiarize with Mathematical foundations for Genetic algorithm, operators
- To study the Applications of Genetic Algorithms
- To understand and analyses the Genetic based machine learning and its applications

Introduction to Evolutionary Computation

Biological and artificial evolution - Evolutionary computation and AI - Different historical branches of EC-GAs- EP- ES- GP - A simple evolutionary algorithm.

Search and Selection Operators

Recombination/Crossover for strings-one-point-multi-point-uniform crossover operators-Mutation for strings-bit-flipping--Recombination/Crossover and mutation rates – Recombination for real- valued representations-Fitness proportional selection and fitness scaling – ranking methods – Tournament selection.

Evolutionary Combinatorial Optimization

TSP - Evolutionary algorithms for TSPs – Hybrid evolutionary and local search algorithms. Schema theorems - Convergence of EAs - Computational time complexity of EAs - No free lunch theorem. Common techniques- penalty methods-repair methods -Analysis-Some examples. Pareto optimality - Multiobjective evolutionary algorithms

Machine Learning

The concept learning task. General-to-specific ordering of hypotheses. Version spaces. Inductive bias. Decision Tree Learning. Rule Learning: Propositional and First-Order, Over-fitting, Cross-Validation. Experimental Evaluation of Learning Algorithms Instance-Based Learning: k-Nearest neighbor algorithm, Radial basis functions. Case-based learning. Computational Learning Theory: probably approximately correct (PAC) learning. Sample complexity. Computational complexity of training. Vapnik-Chervonenkis dimension. Artificial Neural Networks: Linear threshold units, Perceptrons, Multilayer networks and back-propagation, recurrent networks

References

1. David E Goldberg, “Genetic Algorithms in Search, Optimization & Machine Learning”, Pearson Education India, 1st edition, 2008.
2. Man, Kim-Fung, TANG, “Genetic Algorithms Concepts and Designs”, Springer-Verlag London, 2018.
3. Melanie Mitchell, “An Introduction to Genetic Algorithms”,MIT Press, 2018.
4. Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning From Theory to Algorithms”, Cambridge University Press, 2014.

5. Stephen Marsland, “Machine Learning An Algorithmic Perspective”, CRC Press, 2014.

UCSE106	PROBABILISTIC GRAPHICAL MODELS:PRINCIPLES AND TECHNIQUES	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the estimation of parameters and structure of graphical models.
- To familiarize the concept of probability and statistics.
- To understand the issues involved in optimizing the graphical models.

Foundations and Representations

Probability Theory, Probability Distribution, Random Variables and Joint Distribution, Independence and Conditional Independence, Querying a Distribution, Graphs, Bayesian Network Representation, The Exponential Family.

Inference

Exact Inference, Variable Elimination, Analysis of Complexity, Complexity and Graph Structures, Inference with Structured CPDs, Inference as Optimization, Exact Inference as Optimization, Propagation-Based Approximation, Approximate Inference.

Graphical Models and Sampling Methods

Bayesian Networks, Conditional Independence, Markov Random Fields, Inference in Graphical Models, Basic Sampling Algorithms, Markov Chain Monte Carlo, Gibbs Sampling, Slice Sampling, The Hybrid Monte Carlo Algorithm.

Learning Graphical Models

Motivation, Goals of Learning, Learning as Optimization, Learning Tasks, Parameter Estimation, MLE for Bayesian Networks, Bayesian Parameter Estimation, Learning Models with Shared Parameters, Generalization Analysis.

References

1. Daphne Koller and Nir Friedman, “Probabilistic Graphical Models: Principles and Techniques”,MIT Press, 2009.
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
3. David J.C Makay, “Information Theory, Inference and Learning Algorithms”, Cambridge University Press, 2003.
4. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
5. Sucar, Luis Enrique, “Probabilistic Graphical Models Principles and Applications”, Springer-Verlag London, 2015.

UCSE107	SUPPORT VECTOR MACHINES	L	T	P	C
		3	0	0	3

Course Objectives

- To provide students with an in-depth introduction to two main areas of Machine Learning: supervised and unsupervised.
- To understand some of the main models and algorithms for regression, classification, clustering and Markov decision processes.

Introduction- Learning

Supervised Learning, Learning and Generalisation, Improving Generalisation, Attractions and Drawbacks of Learning, Support Vector Machines for Learning

Linear Learning Machines

Linear Classification, Rosenblatt's Perceptron, Other Linear Classifiers, Multi-class Discrimination, Linear Regression, Least Squares, Ridge Regression, Dual Representation of Linear Machines

Support Vector Classification

The Maximal Margin Classifier, Soft Margin Optimization, Linear Programming Support Vector Machines

Regression

Epsilon-Insensitive Loss Regression, Quadratic epsilon-Insensitive Loss, Linear epsilon-Insensitive Loss, Kernel Ridge Regression

Applications of Support Vector Machines

Text Categorization, A Kernel from IR Applied to Information Filtering, Image Recognition, Hand-written Digit Recognition, Bioinformatics

References

1. K P Soman, R Loganathan and V Ajay, "Machine Learning with SVM and other Kernel Methods", PHI, 2011.
2. CHERKASSKY, Vladimir and Filip MULIER, "Learning from Data: Concepts, Theory, and Methods", Wiley-IEEE Press; 2nd edition, 2007.
3. Igor Griva, Stephen G. Nash, "Linear and Nonlinear Optimization", Society for Industrial Mathematics, 2nd edition, 2008.
4. Cristianini, N. and Shawe-Taylor J, "An Introduction to Support Vector Machines and other kernel-based learning methods", Cambridge University Press, 1st edition, 2000.
5. Wang, Lipo," Support Vector Machines: Theory and Applications", Springer, 2005.

GENERIC ELECTIVES

GENERIC ELECTIVES OFFERED BY CIVIL ENGINEERING

UCEG001	ENVIRONMENTAL IMPACT ASSESSMENT	L	T	P	C
		3	0	0	3

Course Objectives

- To provide an overview of the concepts, methods, issues and various forms and stages of the EIA process.
- To learn and understand principles, process and necessary techniques for EIA, mitigation and monitoring.
- To expose the students to the methods of qualitative and quantitative assessment of environmental impacts due to developmental activities.

Impact of Development projects on Environment and Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) – Objectives – EIA Types – EIA in project cycle – capacity and limitations – Legal provisions on EIA – Environmental Impact Assessment Notifications – Environmental Impact Assessment Consultants – Legal provisions on EIA. Methods of Categorization of industries for EIA - Elements of EIA – Process screening, baseline studies, mitigation, matrices, checklist - Methods of EIA – Strengths, weaknesses and applicability – appropriate methodology solution. Prediction and Assessment of Impact on land, water, air, noise and energy, flora and fauna, Socio Economic Impact, Mathematical models for Impact prediction, Rapid EIA, Public participation – Post Environmental Audit.

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, water, energy, flora and fauna; Addressing the issues related to the Project Affected People – Environment management Plan – ISO 14000. EIA case studies for new and expansion projects - wastewater treatment plants, water supply and drainage, Highways and bridges, Railways, Dams, Irrigation projects, Power plants.

References

1. Bram F. Noble, “Introduction to Environmental Impact Assessment: A Guide to Principles and Practice”, Oxford University Press; 3 edition, 2014.
2. Canter, R.L. “Environmental impact Assessment”, 2nd Edition, McGraw Hill Inc., New Delhi.
3. Anjaneyulu, Y, “Environmental Impact Assessment methodologies”, B.S. Publications, Hyderabad, 2012.
4. S.K. Shukla and P.R. Srivastava, “Concepts in Environmental Impact Analysis”, Common Wealth Publishers, New Delhi, 1992.
5. John G. Rao and David C. Hooten (Ed.), “Environmental Impact Analysis Handbook”, McGraw Hill Book Company, 2010.

UCEG002	DISASTER MITIGATION AND MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives

- To provide students an exposure to disasters, their significance and types.
- To distinguish between disaster management and risk management.
- To develop skills in various stages of disaster preparedness, mitigation and management.
- To explain selected models of disaster management and strategies for risk mitigation.
- To learn about organizational and administrative strategies for managing disasters.

Natural Disasters around the world; Principles, Elements, and Systems; Natural disasters- Cyclones, Floods, Drought and Desertification - Earthquake, Tsunami, Landslides and Avalanche. Man -made Disasters- Chemical industrial hazards, major power breakdowns, traffic accidents, Fire, War, Atom bombs, nuclear disaster, and Forest Fire-Oil fire –accident in Mines, Disaster risk analysis - prevention and mitigation.

Applications of Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems, Disaster Monitoring and Support Centre– Information Dissemination, mobile communication etc., post disaster recovery & rehabilitation, Relief & Logistics Management, Disaster related infrastructure development- Post Disaster, Emergency Support Functions and their coordination mechanism, Education and Training, Establishment of capacity building among various stake holders, Government - Educational institutions, Use of Multi-media knowledge products for self-education.

References

1. Mukesh Kapoor, “Disaster Management”, Dhanpat Rai, 2012.
2. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012
3. Gupta Anil K, Sreeja S. Nair. “Environmental Knowledge for Disaster Risk Management”, NIDM, New Delhi, 2011
4. Claudia G. Flores Gonzáles , “Risk Management of Natural Disasters”, KIT Scientific Publishing, 2010.
5. Rajdeep Dasgupta, “Disaster Management and Rehabilitation”, Mittal Publishers, New Delhi, 2010.

UCEG003	GLOBAL WARMING AND CLIMATE CHANGE	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the complex interrelationship of the physical, chemical and biological systems found in nature and the impact upon them of human activity.
- To provide an overview of contemporary changes to our global environment, current responses to environmental and social problems.
- To develop knowledge on the possibilities and challenges associated with transformative change processes.
- To understand the role of citizens, public land management agencies, and non-governmental organizations in protecting and conserving natural resources.

Introduction –Sources and impact of resource degradation, social insecurity, industrialization and Globalization on environment, Global Environmental Problems. Changes in Lithosphere – Soil and agriculture, erosion, mining and pollution, urban pollution. Atmosphere - Global warming, Ozone layer depletion, Acid rains, desertification. Hydrosphere – Water use and pollution. Water abuse and control. Biosphere -Loss of Biodiversity, urbanization. Introduction to historical global climate change, Attribution of change, Perceptions of climate change. Projections of future climate - Introduction to climate models, Scenarios, Climate projections, Uncertainty. Impact of climate change - Observed impacts, Future climate impacts.

Adaptation to climate change - Terminology and history, Types of adaptation, Adaptation approaches, Adaptive capacity, Selecting and evaluating adaptation options, Opportunities limits, and constraints to adaptation, Indigenous knowledge and gender issues in adaptation, International and national adaptation strategies. Sustainable progress, Concept of sustainable development, Components of sustainability, carrying capacity, public participation, Energy generation and efficiency, conserving ecosystems and their services. Sector specific mitigation opportunities, Types of policy instruments, International climate change agreements.

References

1. Edmond Mathez. “Climate Change: The Science of Global Warming and Our Energy Future”, Columbia University Press, 1st edition, 2009.

2. K. Jain, “A Practical Guide to Disaster Management”, 2013.
3. Ann Henderson-Sellers & Kendal McGuffie, “The future of the world’s climate, Elsevier”, 2012.
4. “Intergovernmental Panel on Climate Change: The Third Assessment Report)”, Cambridge University Press, 2007.
5. Russell D. Thomson, “Atmospheric processes and systems”, Taylor and Francis, 2002.

UCEG004	GIS FOR NATURAL RESOURCES MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives

The students will be introduced to the components of GIS, Data models and analysis.

- To comprehend the raster and vector data processing and eliminate errors of sources in GIS.
- To apply the GIS techniques for natural resources management, planning and mitigation.

GIS - History of Development - Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Data Input Sources— DBMS – Data Output - Data models - Raster and Vector data structures – Data compression – Raster vs. vector comparison. Analysis using Raster and Vector data – Operations – Overlaying - Buffering – Modeling in GIS - Digital Terrain Modeling, Analysis and application – Products of DEMs and their uses – Sources of errors in GIS and their elimination.

Advanced applications of GIS in natural resource management; ecosystem inventory and monitoring - forests, wetlands, Water resource, Land use – Land cover – land use planning, urban planning, snow and glaciers, potential ground water mapping, coastal zone management, protected area management- Disaster management.

References

1. Jenson, John R, “Remote Sensing of the environment: An earth resource perspective”, 2 nd edition, Pearson Education, 2013.
2. Jones, Hamlyn G., and Robin A. Vaughan, “Remote Sensing of Vegetation: Principles, Techniques, and Applications”, Oxford University Press, 2010.
3. Lo, Chor Pang, and Albert K. W. Yeung, “Concepts and Techniques of Geographic Information Systems”, 2 nd Edition, Pearson Education, 2016.
4. Awange, Joseph L., and John B. Kyalo Kiema, “Environmental Geoinformatics: Monitoring and Management”, Springer, 2013.
5. Gomarasca, Mario A, “Basics of Geomatics”, Springer, 2009.

UCEG005	PRINCIPLES OF REMOTE SENSING	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce to the students about the basic principles of remote sensing as a tool for mapping.
- To learn about the electromagnetic interactions with earth surface materials and their spectral signatures.
- To comprehend the satellite and sensor parameters.
- To employ digital image interpretation and analysis.

Remote Sensing – History - Principle - Electro-magnetic energy, spectrum - EMR interaction with atmosphere – Atmospheric Windows and its Significance – EMR interaction with Earth Surface Materials – Spectral Signature. Aerial photography / aerial cameras / photographic process – Satellites - Classification – Satellite Sensors – satellite and sensor parameters - Resolution – Types of Remote Sensing - Elements of visual interpretation – Image data interpretation and Analysis – Photogrammetric process / softcopy photogrammetry – Digital Image processing. Characteristics of different platforms: Landsat, SPOT, IRS series, IKONOS, QUICKBIRD – Radar, LIDAR, SAR, MODIS, AMSRE, Sonar remote sensing systems. Applications - Remote sensing of vegetation – Remote sensing of Water resources – Remote sensing of urban landscapes – Remote sensing of soils and geomorphology.

References

1. Lillesand, Kiefer, and Chipman, “Remote Sensing and Image Interpretation”, 7th (Student) edition, Wiley, 2014.
2. Jenson, John R, “Remote Sensing of the environment: An earth resource perspective”, Second. Pearson Education, 2013.
3. Jones, Hamlyn G., and Robin A., Vaughan, “Remote Sensing of Vegetation: Principles, Techniques, and Applications”, Oxford University Press, 2010.
4. Richards, John A, “Remote Sensing Digital Image Analysis: An Introduction”, 5th edition, Springer, 2012.
5. Anji Reddy M, “Remote Sensing and Geographical Information System”, 4th edition, B S Publications, 2012.

GENERIC ELECTIVES OFFERED BY ELECTRICAL AND ELECTRONICS ENGINEERING

UEEG001	ENERGY MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To train the students for energy auditing and managing the energy demand by analyzing the energy issues and concern.

Introduction to Energy Management, Buildings assessment, Electrical Systems-Supply Demand Side-Economic operation.

Electric motors-Energy efficient controls and Load Analysis, Efficient Control strategies-Optimal operation, Transformer Loading- Efficiency analysis, Feeder and cable loss evaluation, Optimal Load scheduling, Energy conservation in Lighting Schemes, Power quality issues. Cogeneration-Types and Schemes, Electric loads of Air conditioning & Refrigeration, case studies.

Electricity tariff types; Computer Controls- software- EMS- Energy conservation opportunities in electrical power supply sector.

References

1. Leon K. Kirchmayer, “Economic Operation of power system”, Wiley India Pvt Ltd, July 2010.
2. Jean-Claude SabonnadiAre, “Low emission power generation technologies and energy management”, John Wiley & Sons, August 2010
3. Rik DeGunther, “Alternative energy for dummies”, John Wiley & Sons, May 2010.
4. Donald R Wulfinghoff, “Energy Efficiency Manual”, Energy Institute Press, USA, 1999.
5. Tripathy S C, “Electrical Energy Utilization and Conservation”, Tata McGraw-Hill, New Delhi, 1991.

UEEG002	MEDICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Objective

- To impart knowledge on operation of instruments used for various physiological measurements and the blood flow measurement techniques.

Components of Medical Instrumentation; System Origin of Bio potential; Bioamplifiers: Isolation Amplifier, Differential amplifier, Chopper Amplifier, Instrumentation Amplifier, Bioelectric signals:ECG, EMG,EEG, EOG & ERG and their characteristics; Electrodes for ECG, EEG and EMG; Einthoven triangle; Standard 12-lead configurations; ECG Machine; EMGmachine; 10-20 electrodes placement system for EEG; Heartsound and characteristics; PCG.

Measurement of Blood pressure: Direct Methods and Indirect Methods; Temperature; Respiration rate; Heart rate measurement; Oximetry: Pulse-oximeter; Computerized patient monitoring system; Biotelemetry: Basics components, andits different types; Cardiac output Measuring techniques: Dye Dilution method, Thermo dilutionMethod.

Blood flow measuring techniques: Electromagnetic Type; Ultrasound Blood Flow meter; CardiacArrhythmias; Plethysmography; Cardiac Pacemakers; Defibrillator: ACandDC-types; Heart- Lung Machine; Optical method: Colorimeter, Spectro photometer, Flame photometer; Safety in medical field: Electrical hazard, Micro and Macro shock; Patient safetyprocedures.

References

1. Joseph J.carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wileyand sons, New York, 4th Edition, 2012.
2. Khandpur.R.S., “Hand book of Bio-Medical Instrumentation”, Tate McGraw – Hill 2015.
3. Duane Knudson, “Fundamentals of Biomechanics”, Springer, 2013.
4. Robert B. Northrop, “Introduction to Instrumentation and Measurements”, Taylor and Francis group , New York, 3rd Edition, 2014.
5. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 2010.

UEEG003	PLC PROGRAMMING	L	T	P	C
		3	0	0	3

Course Objectives

- To understand Programmable Logic Controller and its functions.
- To impart knowledge in various PLC programming methods.

Programmable Logic controller-Brief history, difference between PC & PLC, architecture, benefits, PLC cycle Application.

Overview of PLC programming methods, ladder diagram, various examples of PLC application, a basic relay type instruction, timer and counter instructions, logical and arithmetic instructions, data handling instructions. Comparison and manipulation instructions, PID instructions, PTO / PWM generation.

Applications of PLC- Case studies of Machine automation, Process automation, Selection parameters for PLC. Introduction to Programmable Automation Controller.

References

1. John W Webb, Ronald A Reis, “Programmable logic controllers: Principles and Applications”, Prentice Hall India, 2003.
2. Frank D Petruzella, “Programmable Logic Controllers ", McGraw Hill Inc, 2005.
3. Kelvin T Erikson, “Programmable Logic Controllers ", Dogwood Valley Press, 2005.
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5. W. Bolten, “Programmable Logic Controller”, Elsevier Newnes Publication fifth Edition, 2009.

UEEG004	RENEWABLE ENERGY SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To provide knowledge about various renewable energy technologies.
- To gain knowledge about application of various renewable energy technologies.

Primary energy sources, renewable vs. non-renewable primary energy sources, renewable energy resources in India, Current usage of renewable energy sources in India, future potential of renewable energy in power production and development of renewable energy technologies.

Solar and wind Power Generation, Energy from Biomass Bio gas generation, types of biogas plants, Application of biomass and biogas plants and their economics.

Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, Principles utilization, setting of OTEC plants. Tidal and wave energy: Potential and conversion techniques, mini hydal power plants and their economics.

References

1. John Twidell and Tony Weir, “Renewable Energy Resources” Tyalor and Francis Publications, 2005.
2. Clark W Gellings, “The Smart Grid, Enabling Energy Efficiency and Demand Side Response”, CRC Press, 2009.
3. Krzysztof Iniewski, “Smart Grid & Infrastructure networking”, TATA Mc Graw Hill, 2012 edition.
4. Bin Wu, Yongqiang Lang, Navid Zargari, Power Conversion and Control of Wind Energy Systems. WILEY 2011.
5. J. W. Tester, E. M. Drake, M. W. Golay, M. J. Driscoll, and W. A. Peters, Sustainable Energy: Choosing Among Options. The MIT Press, ISBN 978-0-262-20153-7.

UEEG005	VIRTUAL INSTRUMENTATION & DATA ACQUISITION	L	T	P	C
		3	0	0	3

Course Objectives

- To impart the knowledge about software and the programming structure of LabVIEW.
- To introduce various techniques of interfacing of external instruments of PC.

Virtual Instrumentation: Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, and comparison with conventional programming; VI programming techniques: VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers.

Data acquisition basics: Introduction to data acquisition, Sampling fundamentals and Input/Output techniques: ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements, VI Chassis requirements;Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB; Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, PXI system controllers, Ethernet control of PXI.

Analysis tools & Applications of VI: Fourier transforms, Power spectrum, Correlation methods, Windowing and flittering; Industrial applications: Instrument Control, Simulation of systems using VI, Development of Control system, Image acquisition and processing, Motion control.

References

1. 1. Jane W. S. Liu," Real-time Systems", Pearson Education, 2001.
2. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", Prentice Hall of India, New Delhi, 2011.
3. Gary Johnson, "LabVIEW Graphical Programming", McGraw Hill,1997.
4. Kevin James, "PC Interfacing and Data Acquisition: Techniques for Measurement", Instrumentation and Control, Newnes, 2000.
5. Gupta S and Gupta J P, "PC Interfacing for data acquisition and Process control", Instrument Society of America.

GENERIC ELECTIVES OFFERED BY ELECTRONICS AND COMMUNICATION ENGINEERING

UECG001	ELECTRONIC MEASUREMENTS	L	T	P	C
		3	0	0	3

Course Objectives

- To impart knowledge on the functional elements of instrumentation.
- To learn the fundamentals of electrical and electronic instruments.
- To understand the operation of transducers, data acquisition systems, storage and display devices.

Electronics Instruments

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement — Standards and calibration – Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss.

Measuring Instruments

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

Storage and display Devices

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display – Data Loggers.

Transducers and Data Acquisition Systems

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters – Smart sensors.

References

1. A.K. Sawhney, “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai and Co, 2004.
2. J. B. Gupta, “A Course in Electronic and Electrical Measurements”, S. K. Kataria & Sons, Delhi, 2003.
3. J Doebelin E.O. and Manik D.N., “Measurement Systems – Applications and Design”, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
4. H.S. Kalsi, “Electronic Instrumentation”, Tata McGraw Hill, II Edition 2004.
5. D.V.S. Moorthy, “Transducers and Instrumentation”, Prentice Hall of India Pvt Ltd, 2007.

UECG002	INTRODUCTION TO EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the architecture and programming concepts of embedded systems.
- To impart the knowledge on embedded computing platform design and analysis.
- To learn the basic concepts of real time operating systems and embedded system applications.

Architecture of Embedded Systems

Categories of Embedded Systems – Specifications of Embedded systems – Recent trends in Embedded Systems – Detailed Hardware and Software Design – ARM Processor – CPU: programming input and output - supervisor mode, exceptions and traps – Co-processors – Memory system mechanisms – CPU performance – CPU power consumption.

Embedded Computing Platform Design

The CPU Bus-Memory devices and systems – Designing with computing platforms – Host and target machines – consumer electronics architecture – platform-level performance analysis - Components for embedded programs – Models of programs – Assembly, linking and loading – compilation techniques – Program level performance analysis

Processes and Operating Systems

Introduction – Multiple tasks and multiple processes – Multi rate systems – Preemptive real-time operating systems – Priority based scheduling – Inter process communication mechanisms –Semaphores and Shared Data – Message Queues – Mailboxes and Pipes – Interrupt Routines in RTOS Environment – Evaluating operating system performance – power optimization strategies for processes.

Hardware/Software Integration & Programming

Cross-Compilers – Cross-Assemblers – Linker/Locator – Debugger – Emulator – Simulators – Introduction to Integrated Development Environment (IDE) – Getting Embedded Software into Target System: In-Circuit Emulators –Serial Port Programming and Interrupts Programming.

Embedded System Applications

Applications of Embedded systems – Case study of Embedded systems like automatic chocolate vending machine, Adaptive Cruise Control Systems in a Car, Digital camera, Smart card and ATM.

References

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Third Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2. Jonathan W. Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
3. Raj Kamal, “Embedded Systems Architecture Programming and Design”, Pearson, 2011.
4. K.V.K.K.Prasad “Embedded /Real-Time Systems: Concepts, Design and Programming” Dream tech, Wiley 2012.
5. Daniel W Lewis, “Fundamentals of Embedded Software” Pearson Education, 2013.

UECG003	MICROCONTROLLERS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the architecture and programming of 8051 and PIC microcontrollers.
- To familiarize with the concept of interfacing the microcontrollers for various applications.

8051 Microcontroller

Architecture of 8051 – Register set - I/O Pins, Ports and Circuits - Instruction set - Addressing modes - Assembly language programs for arithmetic and Logical operations.

Interfacing 8051 Microcontroller

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - Stepper Motor Interfacing – Application of 8051 in power optimization- Power and real-world constraints.

PIC Microcontroller

CPU Architecture – Register – I/O pins, Ports -Instruction set – addressing modes - Interrupts

Interfacing PIC Microcontroller

PIC: Timers- I2C Interfacing –UART- A/D Converter –Pulse Width Modulation

References

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson Education, 2011
2. Subrata Ghoshal, “8051 Microcontrollers: Internals, Instructions, Programming &Interfacing”, Second Edition, Pearson education, 2014.
3. John. B. Peatman, “Design with PIC Microcontroller”, Prentice Hall, 2011.
4. Gene .H.Miller, “Micro Computer Engineering”, Pearson Education, 2013.
5. Subrata Ghoshal, “8051 Microcontrollers: Internals, Instructions, Programming &Interfacing”, Second Edition, Pearson education, 2014.

UECG004	NANO ELECTRONICS AND SENSORS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the basics of Nano electronics.
- To learn characteristics and operation of the basic components of nanoelectronic systems.
- To familiarize with characteristics of Sensors, Actuators and Memory Devices.

Overview of Nano-Electronics

Nano-scale electronics; Foundation of nano-electronics – low dimension transport, quantum confinement, Coulomb blockade and quantum dot; Ballistic transport and Quantum interferences; Landauer formula, quantization of conductance, example of Quantum point contact.

Two-Terminal Junction Transistors

Basic CMOS process flow; MOS scaling theory; Issues in scaling MOS transistors; Requirements for non-classical MOS transistor; PMOS versus NMOS; Design and construction of MOS capacitor; Integration issues of high-k MOS – interface states, bulk charge, band offset, stability, reliability; MOS transistor and capacitor characteristics.

Gate Transistors

Metal gate transistors – motivation, basics and requirements; quantum transport in nano MOSFET; Ultrathin body silicon on insulator (SOI) – double gate transistors; Vertical transistors – FinFET and surround gate FET; compound semiconductor MOSFET – Hetero-structures MOSFET.

Sensors and Actuator Characteristics

Basics: types and working principles of sensors and actuators; Characteristic features: Range, Resolution, Sensitivity, Error, Repeatability, Linearity and Accuracy, Impedance, Nonlinearities, Static and Coulomb Friction, Eccentricity, Backlash, Saturation, Dead-band, System Response, First Order System Response, Under-damped Second Order System Response, Frequency Response.

Memory Devices and Sensors

Nano ferroelectrics – Ferroelectric random access memory –Fe-RAM circuit design – ferroelectric thin film properties and integration – calorimetric -sensors – electrochemical cells – surface and bulk acoustic devices – gas sensitive FETs – resistive semiconductor gas sensors –electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

References

1. W. Ranier, “Nano Electronics and Information Technology”, Wiley, 2003.
2. K.E. Drexler, “Nano systems”, Wiley, 1992.

3. M.C. Petty, “Introduction to Molecular Electronics”, Oxford University Press, New York, 1995.
4. Handbook of Nanoscience, Engineering and Technology”, Kluwer publishers, 2002.
5. G. Cao, “Nanostructures & Nanomaterials: Synthesis, Properties &Applications” Imperial College Press, 2014.

UECG005	PRINCIPLES OF VLSI SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the principles of operation of MOS transistors
- To impart knowledge on the design of digital VLSI circuits using MOS transistors.
- To learn the basics of FPGA implementation.

MOS Transistor Principle

NMOS and PMOS transistor operations, MOS DC Equations, Electrical properties of CMOS circuits and device modeling, Scaling principles CMOS inverter, Second Order Effects, Stick diagram.

Combinational Logic Circuits

MOSFETs as switches, Basic Logic Gates in CMOS, Examples of Combinational Logic Design, RC Delay Model, Linear Delay Model, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design.

Sequential Logic Circuits

Static and Dynamic Latches and Registers, Timing issues, Memory architecture and memory control circuits.

Arithmetic Building Blocks

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, Multipliers, speed and area tradeoff

Implementation Strategies

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures, Xilinx FPGA.

References

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2013.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 2001.
3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2009.
4. Weste and Harris, "CMOS VLSI DESIGN: A Circuits and Systems Perspective", Fourth edition, Pearson Education, 2010.
5. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addison Wesley, 2009.

GENERIC ELECTIVES OFFERED BY MECHANICAL ENGINEERING

UMEG001	AUTOMOTIVE FUNDAMENTALS	L	T	P	C
		3	0	0	3

Course Objectives

- To provide knowledge on IC Engines, braking, transmission, suspension, starting systems.
- To import knowledge in new combustion techniques used for various fuels and alternative sources.

Vehicle structure, Engine

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics, IC engines –components function and materials

Engine auxiliary systems

Electronically controlled gasoline injection system for SI engines and diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Variable valve timing (VVT), Firing order.

Transmission Systems

Types of transmission, Clutch: Types diaphragm clutch, single and multi-plate clutch, centrifugal clutch and construction, Gear box: Types - gear selector and shifting mechanism, over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle.

Brakes and Suspension Systems

Suspension system: Types of Suspension Systems-front and rear suspension, Braking system: Types of brakes, Mechanical, Hydraulic, and Air brakes, Disc & Drum brakes, Engine brakes, anti-lock braking system (ABS).

Alternative Energy Sources and Emission Control

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles. Electric and Hybrid Vehicles, Fuel Cell. Engine emission: Automotive air pollution, emission control, Engine emission control by three-way catalytic converter system, Emission norms (Euro and BS).

References

1. Kirpal Singh, “Automobile Engineering”, Standard Publishers, Vol-I & II. 13th edition. New Delhi, 2014.

2. R. K. Rajput, “A Text book of Automobile Engineering”, Lakshmi publication, 2nd edition. 2014
3. Heniz Heisler, “Vehicle and Engine Technology”, SAE, 2nd edition. 2009.
4. Julian Happian Smith, “An Introduction to Modern Vehicle Design”, Butterworth-Heinemann, New Delhi, 2002.
5. Gupta R B, “Automobile Engineering", Satya Prakashan, 2015.
6. C.R. Ferguson, A. T. Kirkpatrick, “Internal Combustion Engines”, 2nd edition, John Wiley & Sons, 2016.

UMEG002	COMPUTER AIDED DESIGN	L	T	P	C
		3	0	0	3

Course Objectives

- To provide an overview of how computers are being used in engineering component design
- To provide knowledge on different CAD standards

Fundamentals of Computer Graphics

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations homogeneous coordinates - Line drawing -Clipping- viewing transformation

Geometric Modeling

Representation of curves - Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches. Solid modeling techniques- CSG

Visual Realism

Hidden – Line-Surface-Solid removal algorithms – shading – colouring – computer animation.

Assembly of Parts

Assembly modelling – interferences of positions and orientation – tolerance analysis- mass property calculations – mechanism simulation and interference checking.

CAD Standards

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images - Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CAL Setc. Communication standards.

References

1. Ibrahim Zeid, “Mastering CAD CAM”, Tata McGraw-Hill Publishing Co.2007
2. Chris McMahon and Jimmie Browne, “CAD/CAM Principles", "Practice and Manufacturing management”, 2nd edition, Pearson Education, 1999.

3. William M Neumann and Robert F.Sproul, “Principles of Computer Graphics”, McGraw Hill Book Co. Singapore, 1989.
4. Donald Hearn and M. Pauline Baker, “Computer Graphics”, Prentice Hall, Inc, 1992.
5. Foley, Wan Dam, Feiner and Hughes,"Computer graphics principles & practice", Pearson Education - 2003.

UMEG003	INTRODUCTION TO POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives

- To providing an overview of power plants and detailing the role of Engineers in their operation and maintenance.
- To impart knowledge on renewable power sources and operating cost.

Layout of power plants

Layout of Steam, Hydel, Diesel, Nuclear and Gas Turbine Power Plants - Combined Power Cycles – Comparison and Selection

Nuclear and Hydro power plants

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, Waste Disposal and safety. Hydroelectric power plants – runoff storage and pumped storage type, Selection of Turbines

Diesel and Gas Power plants

Types of Diesel Plants, Components, Selection of Engine Type, Applications, environmental hazards – Gas Turbine Power Plant – Fuels – Gas Turbine Material – Regeneration and Intercooling.

Solar, tidal, wind power plants and economic issues of power plants

Geo thermal –Fuel cells – Tidal - Solar thermal central receiver system – wind power plants -Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs.

References

1. EI- Wakil M. M, “Power Plant Technology”, McGraw-Hill, 2nd edition, 2014.
2. Arora S. C and Domkundwar S, “A course in Power Plant Engineering”, Dhanpatrai, Third Edition, 2012.
3. Nag P.K, “Power Plant Engineering”, Tata McGraw-Hill, 2014.
4. G. D. Rai, “Introduction to Power Plant Technology”, Khanna Publishers, Third Edition, 2014.
5. T. Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, Third Edition, 2014.
6. Culp A. W., “Principles of Energy Conversion”, McGraw Hill, Second Edition, 2014.

UMEG004	INTRODUCTION TO ROBOTICS	L	T	P	C
		3	0	0	3

Course Objectives

- To impart knowledge about automation, various sensors and their applications in robots.
- To learn about Robot Programming methods & Languages of robot.

Introduction

Automation and robotics –History of robotics - Definition of a Robot - Basic concepts - Robot configurations - Types of Robot drives - Basic robot motions - Point to point control - Continuous path control.

Components and Operations

Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators - direct and inverse kinematics, Coordinate transformation - Brief Robot dynamics. Types of Robot and effectors - Grippers - Tools as end effectors - Robot/End - effort interface.

Sensing and Machine Vision

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis.

Robot Programming

Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - A1 and Robotics.

Industrial Applications

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments.

References

1. S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2010
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications”, McGraw Hill, 2012.

3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, “Robotics Engineering an Integrated Approach”, PHI Learning, 2011.
4. K.S. Fu., R.C.Gonalez, C.S.G.Lee, “Robotics Control Sensing ", Vision and Intelligence, McGraw Hill International Edition, 2000.
5. Craig J.J., “Introduction to Robotics Mechanics and Control”, Pearson Education, 2008.

UMEG005	3D PRINTING	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the various RPT processes adopted to produce parts.
- To impart knowledge on three dimensional printing, reverse engineering, new technologies and their influence in manufacturing.

Fundamentals of RPT

RPT History, Development of RP systems, Applications in Product Development, Rapid Tooling, Rapid Manufacturing- Principle –Fundamental – File format – Other translators – medical applications of RP- Materials for Rapid Prototyping Systems

Liquid Based and Solid based Rapid Prototyping Systems

Liquid based system - Stereolithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

Powder Based Rapid Prototyping Systems

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses.

Three Dimensional Printing

Process, major applications, research and development. Direct shell production casting – key strengths, process, applications and uses, case studies, research and development

Reverse Engineering and New Technologies

Reverse Engineering - Introduction, measuring device- contact type and non-contact type, CAD model creation from point clouds-preprocessing, point clouds to surface model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, and other applications.

References

1. Douglas Bryden, “CAD and Rapid Prototyping for Product Design”, Laurence King, 2014.
2. Kalani Kirk Hausman, Richard Horne, “3D Printing For Dummies”, Wiley Publications, 2014.

3. Chee Kai Chua, Kah Fai Leong, Chu Sing Lim “Rapid Prototyping: Principles and Applications” World Scientific Publication Pvt Ltd, 2011.
4. Chua C. K, Leong K. F and Lim C. S, “Rapid Prototyping: Principles and Applications”, World Scientific, Second edition, 2010.
5. Ian Gibson, “Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping”, Wiley, 2006.

GENERIC ELECTIVES OFFERED BY INFORMATION TECHNOLOGY

UITG001	BIG DATA ANALYTICS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

Course Objectives

- Understand various basic concepts related to big-data analytics.
- Understand the basics of Hadoop
- Gain knowledge on the real-time applications of big data.

INTRODUCTION TO BIG DATA

Introduction – distributed computing – Need of distributed computing for Big Data– Evolution of data management–Understanding the data – Defining big data – characteristics of Big Data – Big Data and its importance– Big Data analytics– Traditional and advanced analytics. Big Data Types - Structured data - Unstructured data - Semi structured data.

INTRODUCTION TO HADOOP

Big Data – Apache Hadoop & Hadoop Ecosystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce - Data Serialization.

BIG DATA APPLICATIONS

Big Data in Health care – Big Data contributions to Education - Big Data contributions to Insurance Services - Big Data Contributions to Industrial and Natural Resources - Big Data Contributions to Transportation - Big Data Contributions to Banking Zones and Fraud Detection.

References

1. Chris Eaton, Dirk deroos, “Understanding Big data”, McGraw Hill, 2012.
2. Judith Hurwitz, Alan Nugent et al., “Big Data for Dummies”, John Wiley & Sons, Inc, 2013.
3. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013.
4. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.
5. Jy Liebowitz, “Big Data and Business Analytics”, CRC press, 2013.

UITG002	CLOUD COMPUTING FUNDAMENTALS	L	T	P	C
		3	0	0	3

Course Objectives

- Understand various basic concepts related to cloud computing technologies.
- Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
- Gain knowledge on the concept of cloud virtualization, cloud storage, data management and data visualization.
- Understand different cloud programming platforms and tools.

CLOUD COMPUTING AND CLOUD SERVICES

Introduction to Cloud Computing - History of Cloud computing - Types of Clouds Characteristics of Cloud Computing - Cloud Architecture - Cloud Storage - Cloud Services Benefits from Cloud Computing - Pros and Cons of Cloud Computing - Applications of Cloud Computing. Web based applications - Advantages of cloud development - Disadvantages of cloud development - Types of Cloud Service Development: Software as a Service - Platform as a Service Web Services - On demand Computing - Discovering Cloud services development services and tools.

VIRTUALIZATION TECHNOLOGY AND SERVICES

Introduction - Virtualization Defined - Virtualization benefits - Server Virtualization - Virtualization for x86Architecture - Hypervisor Management Software - Virtual Infrastructure Requirements. Exploring Online Calendar Applications: Google Calendar - Yahoo Calendar - Windows Live Calendar - Apple MobileMe calendar - Exploring Online Scheduling Applications - Exploring Online Planning.

COLLABORATING WITH CLOUD

Evaluating Web mail services - Evaluating Instant Messaging Services - Evaluating Web Conferencing Tools – Collaborating via social networks and group ware - Collaborating on budgets.

References

1. Rajkumar Buyya, Christian Vacchiola, S Thamarai Selvi, “Mastering Cloud Computing”, First Edition ,McGraw Hill Publications, 2013.
2. Michael Miller, “Cloud Computing: Web-Based Applications that Change the way you Work and collaborate Online”, Pearson publications Aug 2008.
3. Dr.Kumar Saurabh, “Cloud Computing”, Wiley India Publictions, Second Edition Aug 2014.
4. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, “Distributed and Cloud Computing: From Parallel Processing to the Internet of Things”, First Edition Morgan Kaufmann Publisher, an imprint Elsevier 2012.
5. Arshdeep Bahga, Vijay K.Madisetti, “Cloud Computing: A Hands on Approach", First Edition, VPT Publisher 2014.

UITG003	FUNDAMENTALS OF INTERNET OF THINGS	L	T	P	C
		3	0	0	3

Course Objectives

- Understand various basic concepts related to Internet of Things.
- Understand the elements involved in Internet of Things.
- Explore the various real-time applications which can be automated using Internet of Things.

FUNDAMENTALS OF IOT

Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs - IoT Architectural view - IoT and M2M- difference between IoT and M2M - IoT systems management – Needs - NETCONF, YANG - IoT design methodology.

ELEMENTS OF IOT

Sensors and actuators - Communication modules – Zigbee - LoRa - RFID - Wi-Fi - Power sources-IoT platforms – Introduction to Arduino and Raspberry Pi - Cloud Computing in IoT - Cloud Connectivity - Big Data Analytics-Data Visualization.

CHALLENGES IN IOT AND CASE STUDIES

Security Concerns and Challenges - Real time applications of IoT – Home automation – Automatic lighting – Home intrusion detection – Cities – Smart parking – Environment – Weather monitoring system – Agriculture – Smart irrigation.

References

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things-A hands-on approach", Universities Press, 2015.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: Key applications and Protocols”, Wiley Publications 2nd edition, 2013.
3. Raj Kamal, “Internet of Things – Architecture and Design Principles”, Mc Graw Hill Education Pvt. Ltd., 2017.
4. “Internet of Things and Data Analytics”, HwaiyuGeng, P.E, Wiley Publications, 2017.
5. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.

UITG004	INTRODUCTION TO DATABASE MANAGEMENT SYSTEM	L	T	P	C
		3	0	0	3

Course Objectives

- Understand various basic concepts related to database.
- Understand the importance of relational modeling and normalization.
- Familiarize with the various queries that can be used for data retrieval.

INTRODUCTION TO DBMS

Overview - Purpose of Database System -– Views of data – Data Models – Database Languages — Database System Architecture – Database users and Administrator – Entity–Relationship model (E-R model) – E-R Diagrams -- Introduction to relational databases

RELATIONAL MODEL

The relational Model – The catalog- Types– Keys - Relational Algebra – Domain Relational Calculus – Tuple Relational Calculus – Normalization - Fundamental operations – Additional Operations- SQL fundamentals - Integrity – Triggers - Security – Advanced SQL features –Embedded SQL– Dynamic SQL- Missing Information– Views

DATABASE APPLICATIONS

Proprietary DBMS vs Open Source DBMS –NoSQL – Databases for Social Networks – Introduction to Multimedia Databases.

References

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill Education India Pvt. Ltd., 2016.
2. Atul Kahate, “Introduction to Database Management Systems”, Pearson Education, New Delhi, 2006.
3. Alexis Leon and Mathews Leon, “Database Management Systems”, Vikas Publishing House Private Limited, New Delhi, 2003.
4. Raghu Ramakrishnan, “Database Management Systems”, McGraw-Hill, Third Edition, 2014.
5. Bipin C Desai, “An Introduction to Database Systems”, Galgotia Publications Pvt Limited, Revised edition 2012.

UITG005	WEB INTERFACE DESIGN AND DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Objectives

- Understand various basic concepts related to web designing.
- Understand the role of CSS in designing web pages.
- Understand the role of Java script in the design of interactive web pages.

HTML5

Introduction, New Elements, Canvas, SVG, Drag/Drop, Geolocation, Video, Audio, Input Types, Form Elements, Attributes, Semantic, Web Storage, App Cache, Web Workers, SSE.

CASCADING STYLE SHEETS

Introduction, Syntax, Id & Class, Backgrounds, Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attribute Selectors, CSS3 Introduction, Gradients, Text Effects, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns.

JAVASCRIPT

Introduction, Comment, Variable, Global Variable, Data Types, Operators, If Statement, Switch, Loop: for and while, Function, Objects, Array, Browser Object Model, Validation. JQuery: Introduction, Selectors, Events, CSS Classes, Dimensions.

References

1. Harvey Deitel, Abbey Deitel, “Internet and World Wide Web: How To Program”, 5th Edition, Pearson Education 2012.
2. DJ Editorial Services, “HTML5 Black Book”, Second Edition, Dream tech Press 2016.
3. Thomas A.Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, Tata McGraw-Hill 2010 .
4. Thomas A.Powell and Fritz Schneider, “JavaScript: The Complete Reference”, Third Edition, Tata McGraw-Hill, 2013.
5. Thomas A.Powell, “Web Design: The Complete Reference”, Second Edition, Tata McGraw-Hill, 2003.

GENERIC ELECTIVES OFFERED BY SCIENCE AND HUMANITIES

UGCC001	INDIAN CONSTITUTION, DEMOCRACY AND WORLD AFFAIRS	L	T	P	C
		3	0	0	3

Course Objectives

- To the study the Indian political system is a window to understanding politics in society.
- To learn the idea of political system and the account of the making and working of constitutional institutions
- To expose the students to the methods of qualitative and quantitative assessment of environmental impacts due to developmental activities.

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

Current World Political Leaders- World Geography Issue Analysis - international politics -international security issues, nuclear proliferation, arms control, environmental politics, foreign policy analysis – Migration - Global wealth and poverty – Globalization - an overview - Territorial Conflicts.

References

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. Granville Austin, "Indian Constitution Cornerstone of a Nation", Oxford Publication.
3. Granville Austin (1999), "Working Democratic Constitution: The Indian Experience", Oxford Publication.
4. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
5. Timothy Dunne and Steve Smith, eds., "International Relations Theories: Discipline and Diversity", Oxford University Press, 2007.

UGCC002	FUNDAMENTALS OF ASTROPHYSICS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the fundamental concepts in astrophysics that will equip in better understanding of the stellar classification, spectroscopy, solar system and planetary motion.
- To provide students with a detailed overview of galactic and extragalactic astronomy as well as solar system studies.

Historical Astronomy of Indian and western - astronomy - Aryabhatta, Tycho Brahe, Copernicus, Galileo - Olbers paradox - solar system satellites, planets, comets, meteorites, asteroids.

Size and Time Scales - Stars – Spectra – Classification - Stellar Structure Equations and Survey of Stellar Evolution - Stellar Oscillations - Degenerate and Collapsed Stars - Radio Pulsars.

Interacting Binary Systems - Accretion Disks - X-ray Sources - Gravitational Lenses - Dark Matter - Interstellar Medium - HII Regions - Supernova Remnants - Molecular Clouds – Dust - Radiative Transfer - Jeans' Mass - Star Formation.

High-energy Astrophysics - Compton Scattering – Bremsstrahlung - Synchrotron Radiation - Cosmic Rays - Galactic Stellar Distributions and Populations - Oort Constants - Oort Limit.

White Dwarfs - Neutron Stars - Black Holes - Hubble Expansion - Charting the Expansion - Astronomical Instrumentation -Telescopes & Observations.

References

1. Hansen, Carl J, Steven D. Kawaler, and Virginia Trimble, “Stellar Interiors: Physical Principles, Structure and Evolution”, New York, NY: Springer, 2004. ISBN: 9780387200897.
2. Carroll, Bradley W, and Dale A. Ostlie, “An Introduction to Modern Astrophysics. Reading”, MA: Addison-Wesley Pub., 1995. ISBN: 9780201547306.
3. Kippenhahn, Rudolf, and Alfred Weigert, “Stellar Structure and Evolution”, New York, NY: Springer-Verlag, 1990. ISBN: 9780387502113.
4. Shapiro, Stuart L, and Saul A. Teukolsky, “Black Holes, White Dwarfs, and Neutron Stars”, New York, NY: Wiley, 1983. ISBN: 9780471873167.
5. William Marshall Smart, and Robin Michael Green, “On Spherical Astronomy”, (Editor) Carroll, Bradley W Cambridge University Press, 1977.

UGCC003	FUNDAMENTALS OF BIOCHEMISTRY	L	T	P	C
		3	0	0	3

Course Objectives

- To provide an integrated knowledge to understand the structure and functions of biomolecules.
- To interpret the biochemical process using analytical techniques.

Proteins and Amino acids: Introduction to amino acid, structure, properties (physical, chemical) Titration of amino acid. Essential and non-essential amino acid. Protein Introduction to protein, classification of protein based on solubility, shape, composition, function and polarity. Peptide bond – Structure of peptide bond. Denaturation– renaturation of protein, properties of protein. Introduction to lipoprotein, glycoprotein and nucleoprotein. Biological function of protein. Protein structure-Primary, Secondary, tertiary and Quaternary type.

Carbohydrates: Monosaccharides, disaccharides, oligosaccharides- and polysaccharides- types, characteristics and properties, biological significance. Lipids- Classification, structure, properties, biological significance.

Separation techniques: Chromatography- Thin-layer, paper chromatography, Column chromatography, High Performance Liquid Chromatography (HPLC)- Analytical techniques - Basic principle, laws of absorption (Lambert - Beers law). Instrumentation for UV -Visible and IR Spectrophotometry and their applications.

References

1. Sadasivam S and Manickam A, “Biochemical methods”, New Age International Pvt Ltd, Revised Edition, 2018.
2. Albert Lehninger, Michael Cox and David L. Nelson, “Principles of Biochemistry”, W. H. Freeman & Company, 2017
3. Elsa Lundanes, Leon Reubsaet and Tyge Greibrokk, “Chromatography”, Wiley VCH Revised Edition 2013
4. Donald Voet, Judith G. Voet and Charlotte W. Pratt, “Principles of Biochemistry”, John Wiley & Sons,2012
5. Rastogi S C, “Biochemistry”, McGraw Hill Inc., New Delhi, 2nd edition,2003.

UGCC004	STATISTICAL INFERENCES AND APPLICATIONS	L	T	P	C
		3	0	0	3

Course Objectives

- To provide students with theoretical foundations and methods of theory of statistics.
- Understand basic theory behind the development and assessment of statistical analysis techniques in the areas of point and interval estimation, as well as hypothesis testing
- To learn basic theoretical knowledge about fundamental principles for statistical inference.

Data collection and treatment: Data Collection and organization, diagrammatic representation of data (bar, pie, 2-D and 3-D diagrams), standard deviation and standard error of means, co-efficient of variation, Correlation and regression analysis. Probability and Distributions: Bayer's theorem, probability theorem, elements of binomial and Poisson distribution, normal distribution curve and properties.

Point Estimation: : Estimator and methods of estimation, Properties of an estimator: Consistency, Unbiasedness, Efficiency and Sufficiency- Neyman Factorization, Cramer-Rao Bound Testing of Hypotheses: Tests of hypotheses, simple and composite hypotheses, types of error, Neyman-Pearson Lemma, families with monotone likelihood ratio, UMP, UMP unbiased and UMP invariant tests. Likelihood ratio tests - applications to one sample and two sample problems, Chi-square tests. Wald's sequential probability ratio test.
Interval estimation: methods for finding confidence intervals, shortest length confidence intervals.

Classical inference: Frequentist and Bayesian inference, maximum likelihood estimation. Traditional computer-based methods: Empirical Bayes, ridge regression, generalized linear models, regression trees, survival analysis and the EM-algorithm. Computer-intensive methods as resampling, resampling based confidence intervals, cross validation, large-scale hypothesis testing, sparse regression models, random forests, and boosting. Bioinformatic application examples.

References

1. Roger E. Kirk, Statistics an introduction, Thomson Wadsworth, 2008.
2. V.K. Rohatgi & A.K. Md. E.Saleh, "An Introduction to Probability and Statistics", 3rd Edition, Wiley, 2015
3. E.J. Dudewicz & S.N. Mishra, "Modern Mathematical Statsitics", Wiley, 1988.
4. Introduction to the Theory of Statistics by A.M. Mood, F.A. Graybill and D.C. Boes, McGraw-Hill 1974.

5. Efron, Bradley; Hastie, Trevor, “Computer age statistical inference: algorithms, evidence, and data science”, New York, NY: Cambridge University Press, 2016.

GENERIC ELECTIVES OFFERED BY MASTER OF BUSINESS ADMINISTRATION

UMGG001	ENTREPRENEURSHIP DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Objectives

- To develop necessary knowledge and skills for entrepreneurship
- Develop and strengthen entrepreneurial quality
- Understand the process and procedure involved in setting up enterprises

Entrepreneurship concept, Characteristics of Successful Entrepreneur, Knowledge and Skills of Entrepreneur, Central and State Government Industrial Policies and Regulations.

Prefeasibility Study, Criteria for Selection of Product, Capital Budgeting, Feasibility Report Preparation and Evaluation Criteria

Finance and Human Resource Mobilization, Operations Planning, Market and Channel Selection, Growth Strategies, Product Launching, Incubation, Venture capital

References

1. S.S.Khanka, "Entrepreneurial Development"; S. Chand & Co. Ltd., 2011.
2. Hisrich R D and Peters M P, "Entrepreneurship"; Tata McGraw-Hill, 5th Edition, 2012.
3. Mathew Manimala, "Entrepreneurship Theory at the Crossroads", Paradigms & Praxis, Biztrantra , 2nd Edition , 2009
4. Prasanna Chandra, "Projects – Planning, Analysis, Selection, Implementation and Reviews", Tata McGraw-Hill, 2015.
5. Rabindra N. Kanungo; "Entrepreneurship and Innovation"; Sage Publications, 2014.

UMGG002	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

Course Objectives

- To acquire knowledge about the intellectual property rights.
- To learn the procedure for registering Patents, Copy Rights, Trademarks and Geographical Indication
- To protect one's intellectual property rights

Introduction to IPR, International cooperation on IPR, Major Treaties, International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

Nature &Importance of Patents, Copy Rights, Trade Marks, Geographical Indication. Procedure to file Application for grant of Patents, Copy rights, Trade Marks and Geographic Indication.

Emerging trends in IPR, IPR litigation, Case Studies on Patents, Copyright and related rights, Trade Marks, geographic indications

References

1. Bare Acts (Up-to-date)
2. Subbaram N. R., and Viswanathan S., "Handbook of Indian Patent Law and Practice", Printers and Publishers Pvt. Ltd., 2008.
3. Susan K. Sell, "Private Power, Public Law: The globalization of Intellectual Property Rights", Cambridge studies in International relations, Cambridge University Press, 2013.
4. Wadehra, B.L., "Law relating to Intellectual Property", University law publishing company Pvt Ltd, 4th Edition, 2010.
5. Bhandari, M.K., "Law Relating to Intellectual Property Rights", Central Law Publications, 4th Edition, 2015.

UMGG003	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives

- To determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization.
- To apply and evaluate best practices for the attainment of total quality.
- To expose the students to the quality management systems and standards.

Quality, TQM framework, Customer Focus, Customer retention, Product and service quality, Quality Cost,, Taguchi techniques, Quality circle, Japanese 5S principles and 8D methodology.

Statistical process control, Control charts, Process capability, Six sigma, Reliability, and Business process re-engineering (BPR). Tools and Techniques for Quality Management - Quality Functions Deployment (QFD), Failure Mode Effect Analysis (FMEA), Total Productivity Maintenance (TPM).

Quality management systems, IS/ISO 9000, Performance improvements, Quality Audits, TQM culture, Leadership, Quality council, Employee involvement, Motivation, Empowerment, Recognition and Reward.

References

1. Dale H. Besterfield, et. al., “Total Quality Management”, Pearson Education, Revised 3rd Edition, 2011.
2. Lal, H., “Total Quality Management: A Practical Approach”, New Age International publication, 2015.
3. Douglas C. Montgomory, “Introduction to Statistical Quality Control”, Wiley Student Edition, Wiley India Pvt Limited, 7th Edition, 2012.
4. James R. Evans and William M. Lindsay, “The Management and Control of Quality”, Thomson, 8th Edition, 2010.
5. Indian standard – “Quality Management Systems – Guidelines for performance improvement”, Bureau of Indian standards, New Delhi.

UMGG004	HUMAN RIGHTS AND HUMAN VALUES	L	T	P	C
		3	0	0	3

Course Objectives

- To understand values and its importance
- To know human rights and duties.
- To understand the duty towards women and society.

Values and Self-Development - Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgments. Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

Human Rights and Duties: United Nations declaration, Role of various agencies in protection and promotion of human rights. Computer Ethics: Social Impact of Computer, Gender-Issues and Privacy, Cyber Crime, Ethical use of Software. Protection of women at work place.

The Constitution of India - Philosophy of Constitution, Fundamental Rights and Fundamental Duties, Organs of the State - Legislature, Executive, and Judiciary – their composition scope and activities, Judiciary as the guardian of fundamental rights – Writs as constitutional remedies –types of Writs.

References

1. Basu D. D, “Introduction to the Constitution of India”, Lexis Nexis, New Delhi, 2014.
2. “Value Education and Human Rights”, Isha books, New Delhi, 2012
3. Kapoor S.K, “International Law and Human Rights”, Central Law Agency, New Delhi, 2016.
4. Chakraborty S.K, “Values and Ethics for organizations: Theory and Practice”, Oxford University Press, New Delhi, 2001.

UMGG005	SUPPLY CHAIN MANAGEMENT AND LOGISTICS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the Logistics and SCM Role in the Organization
- To apply theory on logistics in Customer Service, Procurement and Outsourcing
- To enhance the knowledge about supply chain processes and its management.

Introduction

Definition –Scope and Importance of logistics – Logistics-"A system concept"- Logistics functions – Customer value chain – The importance of supply chain flows – Logistics and Competitive advantage –Drivers of supply chain and performance – Integrating logistics within organization.

Supply Chain Management

Introduction- Objectives – Role of logistics in supply chain –Functions and contribution of supply chain management –Warehouse function –Purpose of warehouses – Modes of transport –Freight Management

Logistics Outsourcing and Logistics Information System

Role of sourcing in a supply chain – Supplier selection and contracts –The procurement process –Supplier selection –The role of IT in the supply chain – Supplier relationship management – Logistics information needs –The role of e-business in supply chain.

References

1. Vinod V. Sople, "Logistics Management-The Supply Chain Imperative", Pearson, 2012.
2. Sunil Chopra, Peter Meindl and Kalra, "Supply Chain Management Strategy, Planning and Operations", Pearsons Education, 2016.
3. Martin Christopher, "Logistics and Supply Chain Management", Pearsons Education, 2016.
4. Richard B.Chase, Ravi Shankar, Robert Jacobs," Operations and Supply Chain Management", SIE, 2014.
5. Leenders, Johnson, Flyn, Fearon, "Purchasing and Supply Management", Tata McGraw Hill, 2010.