B.E. – ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER I										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UICH001	Technical English	HS	2	0	1	3	40	60	100
2	UICH008	Electronics 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	UICE004	Computing Fundamentals and C Programming	ES	2	0	2	4	40	60	100
7	UICE001	Basic Civil and Mechanical Engineering	ES	4	0	0	4	40	60	100
8	UICE015	Engineering Workshop	ES	0	0	2	2	60	40	100
			Total	**19**	**1**	**7**	**27**			

SEMESTER II										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UICH002	Business English	HS	2	0	1	3	40	60	100
2	UICM002	Engineering Mathematics – II	BS	3	1	0	4	40	60	100
3	UICC002	Ecology and Environmental Sciences	BS	3	0	0	3	40	60	100
4	UICE013	Engineering Materials	ES	3	0	0	3	40	60	100
5	UICE007	Electric Circuits	ES	3	0	1	4	40	60	100
6	UICE017	Object Oriented Programming with C++ and Java	ES	2	0	2	4	40	60	100
7	UICE010	Engineering Graphics	ES	2	0	2	4	40	60	100
			Total	**18**	**1**	**6**	**25**			

SEMESTER III										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UICH003	Economics for Engineers	HS	3	0	0	3	40	60	100
2	UICM003	Transforms and Partial Differential Equations	BS	3	1	0	4	40	60	100
3	UICE008	Electrical Engineering	ES	3	0	1	4	40	60	100
4	UECC001	Electron Devices	PCC	3	0	0	3	40	60	100
5	UECC002	Signals and Systems	PCC	3	0	0	3	40	60	100
6	UECC003	Digital Logic with HDL	PCC	3	0	1	4	40	60	100
7	UECC004	Electromagnetic Fields and Waves	PCC	3	0	0	3	40	60	100
			Total	**21**	**1**	**2**	**24**			

SEMESTER IV										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UICM006	Probability and Random Processes	BS	3	1	0	4	40	60	100
2	UECC005	Analog Electronics	PCC	3	0	1	4	40	60	100
3	UECC006	Communication Theory	PCC	3	0	0	3	40	60	100
4	UECC007	Linear Integrated Circuits	PCC	3	0	1	4	40	60	100
5	UECC008	Microprocessor and Microcontroller	PCC	3	0	1	4	40	60	100
6	UECC009	Transmission Lines and Wave Guides	PCC	3	0	0	3	40	60	100
7		Generic Elective -I	GE	3	0	0	3	40	60	100
			Total	**21**	**1**	**3**	**25**			

SEMESTER V										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UECC010	Digital Communication	PCC	3	0	1	4	40	60	100
2	UECC011	Digital Signal Processing	PCC	3	0	1	4	40	60	100
3	UECC012	VLSI Design	PCC	3	0	1	4	40	60	100
4	UECC013	Control Engineering	PCC	3	0	0	3	40	60	100
5	UECC101	Telecommunication Switching and Networks	PCC	3	0	0	3	40	60	100
6	xxxxxxx	Professional Elective-I	PE	3	0	0	3	40	60	100
7	xxxxxxx	Generic Elective -II	GE	3	0	0	3	40	60	100
			Total	**21**	**0**	**3**	**24**			

SEMESTER VI										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UECC014	Antennas and Wave Propagation	PCC	3	0	0	3	40	60	100
2	UECC102	Optical Communication	PCC	2	0	1	3	40	60	100
3	UECC103	Cellular and Mobile Communication	PCC	3	0	0	3	40	60	100
4	UECC104	Principles of Satellite Communication	PCC	3	0	0	3	40	60	100
5	xxxxxxx	Professional Elective-II	PE	3	0	0	3	40	60	100
6	xxxxxxx	Generic Elective-III	GE	3	0	0	3	40	60	100
7	UECC016	Industrial Design Project (Course Work)	IDP	4	0	0	4	40	60	100
8	UECC017	Industrial Design Project (Practical)	IDP	0	0	2	2	60	40	100
			Total	**22**	**0**	**3**	**24**			

SEMESTER VII										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UECC015	RF and Microwave Communication	PCC	3	0	1	4	40	60	100
2	xxxxxxx	Professional Elective-III	PE	3	0	0	3	40	60	100
3	xxxxxxx	Professional Elective-IV	PE	3	0	0	3	40	60	100
4	xxxxxxx	Generic Elective-IV	GE	3	0	0	3	40	60	100
5	UECC018	Industrial Design Project – Phase II	IDP	0	0	6	6	60	40	100
6	UECC019	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**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	xxxxxxx	Professional Elective-V	PE	3	0	0	3	40	60	100
2	xxxxxxx	Professional Elective-VI	PE	3	0	0	3	40	60	100
3	UECC020	Final Year Project – Phase II	FYP	0	0	6	6	60	40	100
			Total	**6**	**0**	**6**	**12**			

PROFESSIONAL ELECTIVE – I & II										
Sl.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UECE101	Computer Architecture	PE	3	0	0	3	40	60	100
2	UECE102	Measurements and Instrumentation	PE	3	0	0	3	40	60	100
3	UECE103	Advanced Microcontrollers	PE	3	0	0	3	40	60	100
4	UECE104	Biomedical Instrumentation	PE	3	0	0	3	40	60	100
5	UECE105	Embedded Systems	PE	3	0	0	3	40	60	100
6	UECE106	Electronic Packaging	PE	3	0	0	3	40	60	100
7	UECE107	Advanced Digital System Design	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – III & IV										
Sl.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UECE108	Information Theory & Coding	PE	3	0	0	3	40	60	100
2	UECE109	Cryptography and Network Security	PE	3	0	0	3	40	60	100
3	UECE110	Multimedia Compression	PE	3	0	0	3	40	60	100
4	UECE111	Principles of Digital Image Processing	PE	3	0	0	3	40	60	100
5	UECE112	Numerical Analysis	PE	3	0	0	3	40	60	100
6	UECE113	Introduction to Web Technology	PE	3	0	0	3	40	60	100
8	UECE114	Introduction to MEMS System Design	PE	3	0	0	3	40	60	100

PROFESSIONAL ELECTIVE – V & VI										
Sl.No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UECE115	Wireless Networks	PE	3	0	0	3	40	60	100
2	UECE116	RF MEMS	PE	3	0	0	3	40	60	100
3	UECE117	Cognitive Radio	PE	3	0	0	3	40	60	100
4	UECE118	Wireless Sensor Networks	PE	3	0	0	3	40	60	100
5	UECE119	High Performance Communication Networks	PE	3	0	0	3	40	60	100
6	UECE120	Advanced Wireless Communication	PE	3	0	0	3	40	60	100
8	UECE121	Mobile Adhoc Networks	PE	3	0	0	3	40	60	100

LIST OF GENERIC ELECTIVES

OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UCEG001	Environmental Impact Assessment	GE	3	0	0	3	40	60	100
2	UCEG002	Disaster Mitigation and Management	GE	3	0	0	3	40	60	100
3	UCEG003	Global Warming and Climate Changes	GE	3	0	0	3	40	60	100
4	UCEG004	GIS for Natural Resources Management	GE	3	0	0	3	40	60	100
5	UCEG005	Principles of Remote Sensing	GE	3	0	0	3	40	60	100

OFFERED BY THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UCSG001	Fundamentals of Information Security	GE	3	0	0	3	40	60	100
2	UCSG002	Introduction to Computer Networks	GE	3	0	0	3	40	60	100
3	UCSG003	Introduction to Software Engineering	GE	3	0	0	3	40	60	100
4	UCSG004	Python Programming for Engineers	GE	3	0	0	3	40	60	100
5	UCSG005	Soft computing and its applications	GE	3	0	0	3	40	60	100

OFFERED BY THE DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UEEG001	Energy Management Systems	GE	3	0	0	3	40	60	100
2	UEEG002	Medical Instrumentation	GE	3	0	0	3	40	60	100
3	UEEG003	PLC Programming	GE	3	0	0	3	40	60	100
4	UEEG004	Renewable Energy Systems	GE	3	0	0	3	40	60	100
5	UEEG005	Virtual Instrumentation & Data Acquisition	GE	3	0	0	3	40	60	100

OFFERED BY THE DEPARTMENT OF MECHANICAL ENGINEERING										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UMEG001	Automotive Fundamentals	GE	3	0	0	3	40	60	100
2	UMEG002	Computer Aided Design	GE	3	0	0	3	40	60	100
3	UMEG003	Introduction to Power Plant Engineering	GE	3	0	0	3	40	60	100
4	UMEG004	Introduction to Robotics	GE	3	0	0	3	40	60	100
5	UMEG005	3D Printing	GE	3	0	0	3	40	60	100

OFFERED BY THE DEPARTMENT OF INFORMATION TECHNOLOGY										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UITG001	Big Data Analytics and its Applications	GE	3	0	0	3	40	60	100
2	UITG002	Cloud Computing Fundamentals	GE	3	0	0	3	40	60	100
3	UITG003	Fundamentals of Internet of Things	GE	3	0	0	3	40	60	100
4	UITG004	Introduction to Database Management Systems	GE	3	0	0	3	40	60	100
5	UITG005	Web Interface Design and Development	GE	3	0	0	3	40	60	100

OFFERED BY THE DEPARTMENT OF SCIENCE AND HUMANITIES										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UHSG001	Indian Constitution, Democracy and World Affairs	GE	3	0	0	3	40	60	100
2	UPHG001	Fundamentals of Astrophysics	GE	3	0	0	3	40	60	100
3	UCHG001	Fundamentals of Biochemistry	GE	3	0	0	3	40	60	100
4	UMHG001	Statistical Inferences and Applications	GE	3	0	0	3	40	60	100

OFFERED BY THE DEPARTMENT OF MASTER OF BUSINESS ADMINISTRATION										
Sl. No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**C**	**CA**	**FE**	**Total**
1	UMGG001	Entrepreneurship Development	GE	3	0	0	3	40	60	100
2	UMGG002	Intellectual Property Rights	GE	3	0	0	3	40	60	100
3	UMGG003	Total Quality Management	GE	3	0	0	3	40	60	100
4	UMGG004	Human Rights and Human Values	GE	3	0	0	3	40	60	100
5	UMGG005	Supply Chain Management and Logistics	GE	3	0	0	3	40	60	100

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.

Course Content

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", 1st Edition Cambridge University Press, 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.

UICH008	ELECTRONICS ENGINEERS AND SOCIETY	L	T	P	C
		2	0	0	2

Course Objectives

- To create awareness on ethical principles and apply in professional practice.
- To create awareness about the responsibilities of an engineer for safety and risk.
- To understand the scope of Electronics and Communication Engineering and its impact to the society.

Course Content

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 Electronics and Communication Engineering(ECE) – Branches in ECE – Trends and Scope of ECE – Impact of developments in Electronics and Communication Engineering – Role of Electronics and Communication Engineers in Society.

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, Second 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. Louis E.Freznel, “Communication Electronics, Principles and Applications”, Tata McGraw Hill., 3rd Edition, Reprint 2012.

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.

Course Content

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.

Course Content

Properties of Matter

Hooke's lawstress – 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 – CO2 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 Nanoscience

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.

Course Content

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.

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.

Course Content

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.
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", 3rd Edition, Pearson Education, 2014.
5. Henry S. Warren Jr., "Hacker's Delight", 2nd Edition, Pearson Education, 2013.

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.

Course Content

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 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.

UICE015	ENGINEERING WORKSHOP	L	T	P	C
		0	0	2	2

Course Objective

- 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.

Course Content

I. Civil Engineering Practice Lab

Buildings:

a) Study of plumbing and carpentry components of residential and industrial buildings.

Plumbing Works:

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

Hands–on–exercise:

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

Carpentry using Power Tools only:

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

Hands–on–exercise:

a) Wood work, joints by sawing, planning and cutting.

II. 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

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

Study

4. Study of centrifugal pump
5. Study of air conditioner

Demonstration

6. Demonstration on foundry operations.

III. 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.

IV. Electronics Engineering Practice Lab

1. Study of Electronic Components and instruments– Resistors, Capacitors, Inductors, Diodes and multimeter.
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.

Course Content

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.

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.

Course Content

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 – Modeling with Differential Equations.

Vector

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

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.

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.

Course Content

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 – bio magnifications – 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.

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.

Course Content

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 nanomaterials – synthesis of nanomaterials by ball milling – plasma arcing-pulsed laser deposition and sol-gel methods – carbon nanotubes – properties and applications – applications of nanomaterials 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.

UICE007	ELECTRIC CIRCUITS	L	T	P	C
		3	0	1	4

Course Objectives

- To understand the concepts of circuit elements, circuit laws and network reduction.
- To solve complex circuits using network theorems.
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits and the operation of three phase circuits.
- To impart practical knowledge by conducting experiments incorporating the concepts learnt.

Course Content

Basic Circuit Concepts & Laws

Electrical elements and their classification– Charge, Current, Voltage, Power and Energy – Ohm's law – KCL and KVL – Independent and dependent sources – Series and Parallel circuits – Voltage and Current division in Series and Parallel Circuits – Source Transformation – Star to Delta conversion and Delta to Star conversion.

Analysis of Electrical Circuits

A.C. Single Phase Circuits– Sinusoidal Voltage and Current – RMS Value – Form Factor – Phasor representation of Sinusoidal Voltage – Network Reduction – Mesh and nodal analysis with Voltage and Current source for D.C. Circuits and AC Circuits.

Network Theorems and Resonance

Circuit Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity and Maximum Power Transfer theorem for Sources in DC and AC circuits, Resonance: Series Resonance– Parallel resonance–Basic definition of Q factor & Band-width–applications.

Coupled Circuits and Transients

Introduction to coupled circuits – Dot rule – Self and Mutual inductance – Coefficient of coupling – Ideal transformer – Single and double tuned circuits – Transient response – Response of RL, RC and RLC circuit to sinusoidal excitation.

Polyphase Circuits

Three phase system – Phasor diagram of voltages and currents – Interconnection of three phase sources and loads – balanced and unbalanced circuits – Power measurement by one, two and three wattmeter methods.

List of Experiments

1. Verification of KVL & KCL.
2. Verification of Network theorems (Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity and Maximum Power Transfer theorem).
3. Determination of Resonance Frequency of Series RLC Circuits.
4. Determination of Resonance Frequency of Parallel RLC Circuits.
5. Transient analysis of RL and RC circuits.

References

1. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum’s Series, Tata McGraw-Hill, New Delhi, 11th Edition 2013.
2. W.H.Hayt, Jr J. E. Kemmerly and S. M.Durbin, “Engineering Circuit Analysis”, TMH, 17th Edition, 2010.
3. Robert L. Boylestad, “Introductory Circuit Analysis”, Pearson Prentice Hall, 13th Edition - Global Edition, 2016.
4. Charles K. Alexander and Matthew N.O. Sadiku, “Fundamentals of Electric Circuits”, McGraw-Hill Education Pvt. Ltd., 15th Edition, 2013.
5. S.N.Sivanandam, “Electric Circuit Analysis”, Vikas Publishing House Pvt. Limited, 2nd Edition, Reprint 2015.

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.

Course Content

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", Ninth Edition, Prentice Hall India Learning Private Limited, 2014.
4. Stanley B. Lippman, Josee Lajoie, Barbara E. Moo, "C++ Primer", 5th Edition, Addison Wesley, 2012.
5. Stephen Prata, "C++ Primer Plus", 6th Edition, Developer's Library, Addison Wesley, 2011.

UICE010	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	4

Course Objective

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

Course Content

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.

SEMESTER III

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.

Course Content

Introduction

Economics – Policy and scope-Micro and macroeconomics–Relationship between Science, Engineering, Technology and Economic Development.

Production and Demand

Production: Factors of production - Production Possibility Curve – Demand analysis: Law of Demand, exceptions – Elasticity of Demand.

Cost and Break even Analysis

Concepts of cost of production – different types of costs; accounting cost, sunk cost, marginal cost, opportunity cost–Break even analysis.

Capital Budgeting

Capital budgeting techniques: Payback period method, IRR and NPV – Replacement and maintenance analysis – types of maintenance – replacement of an asset.

Inflation and Globalisation

Inflation – types – measures to control inflation – fiscal policy – monetary policy – Globalisation and international business.

References

1. Gupta, G.S. "Managerial Economics", 2nd Edition, Tata McGraw Hill, 2013.
2. Joel Dean, "Managerial Economics", Prentice Hall India, 2014.
3. John A. White, Kellie S. Grasman, Kenneth E. Case, Kim LaScola Needy, and David B. Pratt, "Fundamentals of Engineering Economic Analysis", 1st Edition, Wiley, August 2013.
4. R.M.Joshi, "International Business", Oxford higher Education 2012.
5. P K Jain and M. Y Khan, "Financial Management: Text, Problems and Cases", 7th Edition, McGraw Hill Education, 2014.

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

(Common to Civil Engineering, Mechanical Engineering, Information Technology, Electronics and Communication Engineering and Electrical and Electronics Engineering)

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.

Course Content

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., and Goyal M., “Transforms and Partial Differential Equations”, University Science Press, New Delhi, 2010.
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th Edition, Wiley India, 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”, 6th Edition, Jones and Bartlett Learning, LLC, an Ascend Learning Company, 2016.
6. Peter V. O’Neil, “Advanced Engineering Mathematics”, 8th Edition, Cengage Learning, Boston, USA, 2016.
7. Donald. A. McQuarrie, “Mathematical Methods for Scientists and Engineers”, Viva Books Pvt. Ltd, New Delhi, 1st Edition, Reprint 2015.

UICE008	ELECTRICAL ENGINEERING	L	T	P	C
		3	0	1	4

Course Objectives

- To impart knowledge on principles of operation, testing and performance analysis of various electrical machines.
- To introduce the concepts of measurement and instrumentation

Course Content

DC Machine

DC Generator – Construction, Principle of operation, types, characteristics, performance and applications. DC Motors- Principle and operation, types, characteristics, starting, speed control, applications.

Transformer

Single Phase Transformer- Construction, Principle of operation, Transformer on no-load and load, equivalent circuit, losses, efficiency and voltage regulation.

Induction Machines

Three Phase Induction Motor- Construction, Types, Principle of operation, Equivalent circuit, Induction motor starters. Single phase induction motor- Construction, Types, Double Revolving Field Theory, Starting methods of single-phase induction motors.

Basics of Measurement and Instrumentation

Introduction, Characteristics of measurement, Standards and calibration, Functional Elements of an instrument, Selection of instruments, PMMC, Moving Iron, Electro-dynamometer, Errors in measurement.

Analog and Digital Instruments

Introduction, DVM, DMM, Storage Oscilloscope. Transducers - Classification, Resistive, Inductive, Capacitive, Piezo-electric. Measurement of R, L and C using Bridges- Wheatstone, Kelvin, Maxwell, Anderson, Schering and Wien bridges, Q-Meter.

List of Experiments

1. Load test on DC Shunt Machine.
2. Load test on Single Phase Transformer.
3. Load test on Three Phase Squirrel cage Induction Motor.
4. Measurement of passive elements using Bridge Networks.
5. Study of characteristics of transducers.

References

1. Deshpande M. V., “Electrical Machines” PHI Learning Pvt. Ltd., New Delhi, 2011.
2. Nagrath I. J and Kothari D. P. ‘Electric Machines’, 4th Edition, Tata McGraw Hill Publishing Company Ltd., 2010.
3. A.K. Sawhney, “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai and Co., 2015.
4. J. B. Gupta, “A Course in Electronic and Electrical Measurements”, S.K.Kataria & amp; Sons, Delhi, 2013.
5. Fitzgerald. A.E., Charles Kingsley Jr, Stephen D.Umans, ‘Electric Machinery’, 6th Edition, Tata McGraw Hill Books Company, 2003.

UECC001	ELECTRON DEVICES	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the working of diodes and transistors.
- To understand the working of special semiconductor devices.
- To understand the application of different circuits in electronic devices.
- To learn about biasing methods of BJTs.

Course Content

Semiconductor Diode

PN junction diode – VI characteristics – Current equations – Switching Characteristics – Diffusion and drift current densities – Rectifiers – Zener diode – VI characteristics – Zener diode as voltage Regulator.

Bipolar Junction Transistor

Structure and working of bipolar junction transistor – CB, CC and CE configurations – Hybrid-π model – h parameter model – Transistor as a switch – DC load line – operating point – Transistor switching times – Maximum voltage rating – various biasing methods for BJT – Bias Stability – Bias compensation – Thermal stability.

Field-Effect Transistor

Operation and Characteristics of JFET – FET as a Voltage Variable resistor – Enhancement and Depletion mode of MOSFET – Characteristics of nMOS and pMOS – CMOS Characteristics.

Special Semiconductor Devices

Metal Semiconductor Junction – Schottky barrier diode – Varactor diode – Tunnel diode – Gallium Arsenide diode – LASER diode – LDR.

Power Devices and Display Devices

UJT – SCR – Diac – Triac – Power BJT – Power MOSFET – DMOS – VMOS. LED – LCD – Photo transistor – Opto Coupler – Solar cell – CCD.

References

1. Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Prentice Hall, 11th Edition, 2017.
2. Thomas L Floyd, "Electronic Devices ", Pearson New International Edition, 9th Edition, 2015.
3. Jacob. Millman, Christos C. Halkias, "Electronic Devices and Circuits", Tata McGraw Hill Publishing Limited, New Delhi, 4th Edition, 2015.
4. Donald .A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 3rd Edition, 2015.
5. David A. Bell, "Electronic Devices and Circuits", Prentice Hall of India Private Limited, New Delhi, 5th Edition, 2012.

UECC002	SIGNALS AND SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the basic properties of signal & systems and the various methods of classification.
- To learn Fourier series, Laplace Transform & Fourier transform and their properties.
- To learn Z transform & DTFT and their properties.
- To characterize LTI systems in Time domain and Transform domains.

Course Content

Classification of Signals and Systems

Basic Continuous Time Signals, Basic Discrete Time Signals – Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Unit Impulse and Unit Step Functions, Signal Classification – Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals, CT systems and DT systems – Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable, Linear Time invariant Systems – properties of LTI Systems.

Analysis of Continuous Time Signals

Fourier series Representation of CT and DT periodic signals – properties, Representation of a periodic Signals by Continuous Time FT and Laplace Transform(LT) – properties, FT and LT of periodic signals, Region of Convergence (ROC) in LT, Relationship of LT with Fourier Transform & mapping, Spectrum of CT signals(Amplitude & phase spectra). Solving complex problems applying the knowledge of mathematics.

Linear Time Invariant (LTI) Continuous Time (CT) Systems

Differential Equations – System Transfer function & Impulse response, Frequency response of systems characterized by Differential Equations, Magnitude and phase response of LTI systems, Block diagram representation, Convolution integral, Fourier and Laplace transforms in analysis of CT systems, State variable equations and matrix representation of systems.

Analysis of Discrete Time Signals

Sampling theorems for continuous to discrete – time conversion – Impulse sampling – Reconstruction – Effect of under sampling – Aliasing error – DTFT and Z-transform – properties, Region of convergence of ZT, Inverse Z and DTF transforms, Relationship between Z transform and Fourier transform.

Linear Time Invariant (LTI) Discrete Time (DT) Systems

Difference equations, Block diagram representation, System Transfer function & Impulse response, Convolution sum, LTI systems analysis using DTFT and Z-transforms, State variable equations and matrix representation of systems, Analysis of Recursive & Non-Recursive systems. Case study: physiological signals.

References

1. Alan V. Oppenheim, Alan S. Wilsky, S. Hamid Nawab, “Signals and Systems”, Prentice Hall India, 2nd Edition, 2009.
2. John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing, Principles, Algorithms, and Applications”, 4th Edition, PHI, 2007.
3. B.P. Lathi, “Signal Processing and Linear Systems”, Oxford University Press, Incorporated, 2009.
4. Hwei Hsu, “Signals and systems”, Schaum's outlines, Tata McGraw-Hill Co Ltd., 2nd Edition, 2010.
5. M.J.Roberts, “Signals and Systems, Analysis Using Transform Methods and MATLAB”, Tata McGraw Hill (India), 2nd Edition, 2011.

UECC003	DIGITAL LOGIC WITH HDL	L	T	P	C
		3	0	1	4

Course Objectives

- To understand the basic postulates of Boolean algebra, Boolean expressions and methods for simplifying Boolean expressions.
- To study the analysis and design of combinational and sequential logic circuits.
- To understand the concept of memories and programmable logic devices.
- To simulate combinational and sequential logic circuits using VHDL.

Course Content

Boolean Algebra and Logic Gates

Boolean postulates and laws – De-Morgan's Theorem – Principle of Duality – Boolean expression – Canonical and Standard Forms – Minimization of Boolean expressions – Karnaugh map minimization – Don't care conditions – Tabulation Method – Implementation of logic functions using gates – NAND and NOR implementation.

Combinational Logic

Binary Adder – Binary Subtractor – BCD adder – Binary Multiplier – Magnitude comparator – Multiplexers/Demultiplexers – Decoders/Encoders – Code converters – Implementation of combinational logic using MUX.

Sequential Logic

Latches – Flip flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design of Asynchronous counters & Synchronous counters – Modulo-n counter – Shift registers – Universal Shift Register – Ring counter – Johnson counter. Synchronous: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits. Asynchronous: Design of fundamental mode and pulse mode circuits – Problems in Asynchronous Circuits – Cycles-Races – Hazards, Reversible Logic Gates.

Memory and Programmable Logic

RAM and ROM – Memory Decoding – Error Detection and Correction – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices – Application Specific Integrated Circuits.

Hardware Description Language

Introduction to VHDL – VHDL models of Combinational circuits – full adder, mux/demux and code converters. VHDL models for Sequential Logic Circuits – Flip Flops, Registers and Counters.

List of Experiments

1. Verification of logic gates.
2. Design of full adder and half adder.
3. Design of 4:1 multiplexers.
4. Design and implementation of parity generator / checker using logic gates.
5. Construction and Verification of D & T flip-flops.
6. Construction and Verification of 4 Bit Ripple Counter.
7. Design and Implementation of Shift Register.

References

1. Morris Mano M. and Michael D. Ciletti, "Digital Design", 4th Edition, Pearson Education, 2011.
2. John F. Wakerly, "Digital Design Principles and Practices", 4th Edition, Pearson Education, 2008.
3. Charles H. Roth, Larry L Kinney, "Fundamentals of Logic Design", 7th Edition – CL Engineering, 2015.
4. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, 2002.
5. Blaine C. Readler, "VHDL by Examples", Full Arc Press, 2014.

UECC004	ELECTROMAGNETIC FIELDS AND WAVES	L	T	P	C
		3	0	0	3

Course Objectives

- To impart knowledge on the basics of static electric and magnetic field.
- To impart knowledge on the basics of electric and magnetic materials.
- To give insight into the propagation of EM waves and wave reflection.

Course Content

Static Electric Field

Coordinate Systems, vector algebra, gradient, divergence, curl, Coulombs law, Electric field intensity for point, line, surface and volume charge distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute electric potential and potential difference, electric dipole, electrostatic energy and energy density.

Steady Magnetic Field

Biot-Savart Law, Magnetic field intensity for straight and circular conductors, Ampere's circuital law, point form of Ampere's circuital law, Stokes theorem, magnetic flux and magnetic flux density, scalar and vector Magnetic potentials, Force and torque on a closed circuit.

Electric and Magnetic Materials

Current and current density, continuity equation, resistance of a conductor, Capacitance, Polarization, Parallel plate, Coaxial and Spherical capacitances, Method of images, nature of magnetic materials, magnetization and permeability, self and mutual inductances, inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, energy stored in magnetic fields, boundary conditions.

Electromagnetic Waves

Maxwell's equations in point and integral forms, Propagation of plane EM wave in free space, lossy dielectric, perfect dielectric and good conductor, impedance of conducting medium, skin depth, Poynting vector and Poynting Theorem.

Wave Reflection

Plane wave in arbitrary direction, plane wave at dielectric interface, reflection and refraction from dielectric interface, total internal reflection, wave polarization at media interface, Brewster angle, Electromagnetic waves at conducting boundaries.

References

1. William H Hayt and John A Buck, "Engineering Electromagnetics", Tata McGraw-Hill, 8th Edition, 2014
2. Mathew N.O. Sadiku, "Principles of Electromagnetics", Oxford University Press, 4th Edition, 2010.
3. Jordan E.C, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2nd Edition, 2012.
4. David K Cheng, "Field and Wave Electromagnetics", Pearson Education, 2014
5. Nannapaneni Narayana Rao, "Elements of Engineering Electromagnetics", Pearson Education, 6th Edition, 2005.

SEMESTER IV

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

(Common to Electronics and Communication Engineering & Computer Science and Engineering)

Course Objectives

- To understand the fundamental knowledge of basic probability concepts and apply them in Engineering Problems.
- To acquaint with two dimensional random variables and its transformations.
- To know about the behaviour of Random Processes in various applications.
- To understand the concepts of Correlation functions and Spectral densities.
- To analyze the response of random inputs to linear time invariant.

Course Content

Probability and Random Variables

Axioms of probability – Conditional probability – Total probability (Revision only) – Baye's theorem – Random variable – Probability mass function – Probability density functions – Properties – Moments – Moment generating functions – properties – Binomial– Poisson – Uniform – Exponential – Normal distributions – Properties – Functions of a random variable – Applications of 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) – Problems – Application: Mutual Information.

Random Processes

Random Processes – First order – Second order – Strictly stationary – Wide sense stationary – Ergodic processes – Markov process – Poisson process – Normal process – 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 – Applications to 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. Oliver C. Ibe"Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Edition, 2014.
2. Peyton Z. Peebles, "Probability, Random Variables and Random Signal Principles", Tata McGraw- Hill, 4th Edition, 2017.
3. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", John Wiley & Sons, 3rd Edition, 2014.

4. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press 2nd Edition, 2012.
5. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
6. Kandasamy P, Thilagavathy K and Gunavathy K., "Probability, Statistics and Random Processes" S.Chand& Co, Ramnagar, New Delhi, Reprint 2013.
7. Veerarajan. T, "Probability, Statistics and Random Processes", 3rd Edition, Tata McGraw-Hill Education, 2013.

UECC005	ANALOG ELECTRONICS	L	T	P	C
		3	0	1	4

Course Objectives

- To learn the concepts of small and large signal amplifiers.
- To learn frequency response of amplifiers.
- To understand the advantages and method of analysis of feedback amplifiers.
- To infer the analysis and design of LC and RC Oscillators, Amplifiers, Multivibrators.

Course Content

BJT Amplifiers

Small signal analysis of common emitter, common collector and common base amplifiers – Differential amplifiers – CMRR – Darlington Amplifier – Bootstrap technique – Cascaded amplifier – Cascode amplifier – Introduction to large signal Amplifiers – Class A , Class B and Class C Power Amplifiers.

Frequency response of BJT and FET Amplifiers

General shape of frequency response of CE amplifier – Low frequency response of transistor amplifier – Effect of coupling capacitor on low frequency response – High frequency π model for a transistor – f_α and f_β unity gain – frequency response of multistage amplifiers – FET Model at high frequency – frequency response of FET amplifier.

Feedback Amplifiers

Properties of negative feedback – Basic Feedback Topologies – Feedback amplifiers – Series-Shunt, Series-Series, Shunt-Shunt and Shunt-Series Feedback – Determining the Loop Gain – Stability Problem – Nyquist Plot – Effect of feedback on amplifier poles – Frequency Compensation.

Oscillators

Classification, Barkhausen Criterion – Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator, Analysis of LC oscillators – Hartley, Colpitts, Clapp, Franklin, Armstrong, Tuned collector oscillators, RC oscillators – phase shift – Wienbridge – Twin-T Oscillators, Quartz Crystal oscillator frequency stability of oscillators.

Wave Shaping and Multivibrator Circuits

RC & RL Integrator and Differentiator circuits – Storage, Delay and Calculation of Transistor Switching Times – Speed-up Capacitor – Diode clippers and Clampers. Collector coupled and Emitter coupled Astable multivibrator – Monostable multivibrator – Bistable multivibrator – Triggering methods for Bistable multivibrator – Schmitt trigger circuit.

List of Experiments

1. Input Output characteristics of CE configuration.
2. Design of Differential Amplifier using BJT.
3. Design of Darlington Amplifier using BJT.
4. Frequency Response of CE Amplifier.
5. Design of Class B Complementary Symmetry Power Amplifier.
6. Design of RC and LC Oscillator.
7. Square wave generator using BJT multivibrators.

References

1. Sedra and Smith, “Micro Electronic Circuits”; 6th Edition, Oxford University Press, 2011.
2. Jacob. Millman, Christos C.Halkias, “Electronic Devices and Circuits”, Tata McGraw Hill Publishing Limited, New Delhi, 4th Edition, 2015.
3. Robert Boylestad and Louis Nashelsky, “Electron Devices and Circuit Theory” Pearson Prentice Hall, 11th Edition, 2017.
4. David A.Bell, “Electronic Devices and Circuits”, Prentice Hall of India Private Limited, New Delhi, 5th Edition 2012.
5. Donald. A. Neamen, “Electronic Circuit Analysis and Design”, Tata McGraw Hill, 3rd Edition, 2015.

UECC006	COMMUNICATION THEORY	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce the concepts of various analog modulation techniques and their spectral characteristics.
- To study the performance of analog communication systems in the presence of noise.
- To introduce the concepts of information theory and source coding.

Course Content

Amplitude Modulation

Basic blocks of Communication System – Need for Modulation – Amplitude Modulation – Time and Frequency domain description, power relations in AM waves– Methods of generation and detection of AM, DSB-SC, SSB-SC and VSB-SC signals – FDM – AM Broadcast transmitter – Super Heterodyne Receiver – Receiver Characteristics.

Angle Modulation

Frequency and Phase modulation – Single tone, narrow band and wideband FM – Transmission Bandwidth – Generation and detection of FM signal – FM Radio Receiver.

Noise Theory

Noise sources and types – Noise figure and noise temperature – Noise equivalent bandwidth – Friis formula – Narrow Band Noise –Noise in cascaded systems.

Noise in CW modulation systems

Introduction – Receiver model – Noise in AM receivers, Noise in DSB-SC receivers, Noise in SSB receivers – Threshold effect – Noise in FM receivers – FM threshold effect – Capture effect – Pre-emphasis and De-emphasis in FM.

Information Theory and Source coding

Entropy – Discrete Memory less channels – Channel Capacity – Hartley-Shannon law – Source coding theorem – Huffman & Shannon – Fano codes.

References

1. S. Haykin and K. Moher, Communication Systems, 5th Edition, John Wiley, 2011.
2. George Kennedy and Bernard Davis, “Electronic Communication Systems”, Tata McGraw Hill, 5th Edition, 2012.
3. Herbert Taub, Donald L. Schilling and Goutam Saha, “Principles of Communication Systems”, McGraw Hill, 4th Edition 2013.
4. Wayne Tomasi, “Electronic Communications Systems: Fundamentals through Advanced Telecommunications Series”, 5th Edition, Pearson/Prentice Hall, Reprint 2012.
5. J.G.Proakis, M.Salehi, “Fundamentals of Communication Systems”, 2nd Edition, Pearson Education, Reprint 2014.

UECC007	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	1	4

Course Objectives

- To introduce the basic building blocks of Operational Amplifier Circuits.
- To illustrate the concept of linear and non-linear applications of operational amplifiers.
- To study the analysis of analog multipliers, PLL and its applications.
- To illustrate the concept of ADC and DAC.
- To inculcate the concepts of waveform generation and special function ICs.

Course Content

Basics of Operational Amplifiers

Current mirror and Current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier – General operational amplifier stages, internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, open and closed loop configurations.

Applications of Operational Amplifiers

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, Adder, Subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band–pass Butterworth filters.

Analog Multiplier and PLL

Analog Multiplier using Emitter Coupled Transistor Pair – Gilbert Multiplier cell – Variable transconductance technique, Analog multiplier ICs and their applications, Operation of the basic PLL, Voltage Controlled Oscillator(VCO), Monolithic PLL IC 565 – basic block diagram and operation, capture range and lock range, applications of PLL IC 565 – AM, FM, FSK demodulation, Compander ICs.

Analog to Digital and Digital to Analog Converters

Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current Mode types – switches for DAC, high speed sample and hold circuits and sample and hold ICs, A/D Converters – specifications – Flash, Successive Approximation, Single Slope, Dual Slope, Delta Sigma Modulation, Voltage to Time converters.

Waveform Generators and Special Function ICs

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, Timer IC 555 – functional diagram, Monostable and Astable operation, applications, function generator IC, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators – IC 723 general purpose regulator – Monolithic switching regulator, Frequency to Voltage and Voltage to Frequency converters, Isolation Amplifier, opto-couplers and fiber optic IC.

List of Experiments

(Using Op-Amps μA741, LM 301, LM 324)

1. Design, simulation and testing of inverting, non-inverting and differential amplifiers, integrator, differentiator and Schmitt trigger using op-amp.
2. Determination of frequency response of op-amp.
3. Design, simulation and testing of active filters using op-amp.
4. Design, simulation and testing of Astable and Monostable multivibrators using NE555 Timer.
5. DC power supply using LM317 and LM723.
6. PLL characteristics and its use as Frequency Multiplier.
7. Simulation of D/A and A/D converters (successive approximation) using PSPICE and TINA simulator tool.

References

1. Roy Choudary D. and Shail B. Jain, "Linear Integrated circuits", 4th Edition, New Age International Publishers, 2011.
2. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, PHI, 2010.
3. Sergio Franco, "Design with Operational Amplifier and Analog Integrated Circuits", 4th Edition, TMH, 2011.
4. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 2004.
5. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 5th Edition, 2009.

UECC008	MICROPROCESSOR AND MICROCONTROLLER	L	T	P	C
		3	0	1	4

Course Objectives

- To learn the basics of Microprocessors and its interfacing to various peripherals.
- To gain knowledge on the architecture of 8051 Microcontroller.
- To impart programming skills using Assembly Language Programming.

Course Content

8086 Processor Architecture

Introduction to microprocessors – 8086 Architecture – Programmable registers, address and data busses, memory interfacing, Pin diagram descriptions – signals, Minimum mode and Maximum mode CPU module.

8086 Programming

Instruction formats, addressing modes, Data transfer instructions, string instructions, logical instructions, arithmetic instructions, control transfer instructions, process control instructions – Assembler directives – Assembly Language programs for logical, arithmetic, delay and interrupt programming.

I/O Interfacing

Peripheral Interface using 8255 in I/O and BSR mode – 8279 Keyboard/Display controller – 8251 USART – Timer/Counter (8253) – ADCs and DACs –Programmable DMA Controller (8257) - Power and energy consumption of processor

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 using 8051 Microcontroller

Programming 8051Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – Stepper Motor Interfacing – Application of 8051 in power optimization – Case study of MSP430 – Power and real – world constraints.

List of Experiments

1. Basic Arithmetic and Logical operations using 8086.
2. Sorting and searching a character using 8086.
3. ADC and DAC interface using 8086.
4. Interfacing a stepper motor with 8086.
5. Interface with Keyboard and Display using 8086.
6. Basic Arithmetic and Logical operations using 8051.
7. Square and 2's complement of a number using 8051.

References

1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.
2. A. K. Ray, K. M. Bhurchandi, "Advanced Microprocessor and Peripherals", 2nd Edition, Tata McGraw-Hill, 2012.
3. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education, 2013.
4. Subrata Ghoshal, "8051 Microcontrollers: Internals, Instructions, Programming &Interfacing", 2nd Edition, Pearson education, 2014.
5. John Paul Shen, Mikko H. Lipasti "Modern Processor Design: Fundamentals of Superscalar Processor", Waveland Press, Inc., 2013.

UECC009	TRANSMISSION LINES AND WAVEGUIDES	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the concepts of high frequency lines.
- To introduce the various types of transmission lines.
- To use Smith chart for solving problems.
- To gain knowledge about waveguides.

Course Content

Transmission Lines Parameters

A line of cascaded T sections, General solution of transmission lines, Physical significance of the equations, infinite line, wavelength, velocity of propagation, distortion line, reflection on a line not terminated in Zo, reflection coefficient, open and short circuited lines, insertion loss, input impedance, transfer impedance.

The Line at Radio Frequency

Parameter of the open wire line and coaxial line at RF, Line constants for dissipation less line, voltages and currents on the dissipation less line, standing waves, input impedance of open and short circuited lines, power and impedance measurement on lines.

Line Impedance Matching Techniques and Smith Chart

$\lambda/2$, $\lambda/4$, $\lambda/8$ line, Quarter Wave line impedance matching, single and double stub matching, Smith chart and its applications, problem solving using Smith chart, numerical tools.

Parallel Plates and Rectangular Waveguide

General solutions for TE and TM waves, Waves between parallel plates of perfect conductors, Velocities of wave propagation, Attenuation in parallel plate waveguide, Wave impedance of TE and TM waves in a parallel plate waveguide, Mode theory of a Rectangular waveguide, Characteristics of TE and TM waves – Impossibility of TEM waves in rectangular waveguides, Dominant mode, Wave impedances of TE and TM waves, Characteristic impedance of a waveguide – Attenuation factor, Excitation of various modes.

Circular Waveguides and Cavity Resonators

Bessel functions, TE and TM modes in circular waveguides, wave impedances, dominant mode, comparison of circular and rectangular waveguides, excitation of mode, Microwave cavity resonators, rectangular and Circular cavity resonators, Q factor of a rectangular cavity resonator for the TE101 mode.

References

1. Ryder J.D, "Networks, Lines and Fields", Prentice Hall of India, New Delhi, 2nd Edition, 2015.
2. Jordan E.C, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2012.
3. B. Somanathan Nair, "Transmission Lines and Wave guides", Sanguine Technical Publishers, 2006.
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines", Pearson Education, 1st Edition, 2005.
5. Nannapaneni Narayana Rao, "Fundamentals of Electromagnetics for Engineering" Pearson Education India; 1st Edition, 2013.

SEMESTER V

UECC010	DIGITAL COMMUNICATION	L	T	P	C
		3	0	1	4

Course Objectives

- To learn the principles of sampling, quantization and waveform coding.
- To study the various baseband and bandpass transmission schemes.
- To know the fundamentals of error control coding techniques

Course Content

Sampling & Quantization

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM – TDM.

Waveform Coding

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding.

Baseband Transmission

Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester- ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding – M-ary schemes – Eye pattern – Equalization

Digital Modulation Scheme

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier synchronization - Structure of non-coherent receivers - Principle of DPSK.

Error Control Coding

Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes-Viterbi Decoder-Turbo codes.

List of Experiments

1. FSK, PSK and ASK schemes.
2. Line coding schemes.
3. Signal constellations of BPSK.
4. Error control coding schemes.
5. Equalization.

References

1. S. Haykin, “Digital Communications”, John Wiley, 2014 reprint.
2. B. Sklar, “Digital Communication Fundamentals and Applications”, 2nd Edition, Pearson Education, 2013.
3. B.P.Lathi, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press 2011.
4. J.G Proakis, “Digital Communication”, 5th Edition, Tata McGraw Hill Company, 2014.
5. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition, Pearson Education, 2013.

UECC011	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	1	4

Course Objectives

- To learn Discrete Fourier Transform and its properties
- To learn the design of infinite and finite duration impulse response filters
- To understand Finite word length effects
- To study the concepts of DSP Processors and Multirate Signal Processing

Course Content

Discrete Fourier Transform

DFT– Properties of DFT- Circular Convolution - Efficient computation of DFT– FFT Algorithms-Radix 2 DIT–FFT and DIF–FFT, use of DFT in linear filtering.

Design of Infinite Duration Impulse Response Filters

Analog filters–Butterworth and Chebyshev Type I–Transformation of analog filters into digital filters using approximation of derivatives, Impulse invariant method and Bilinear transformation method–preparing–Realization structures for IIR filters–direct, cascade and parallel forms.

Design of Finite Duration Impulse Response Filters

Linear phase FIR filter – Windowing techniques for design of linear phase FIR filters: Rectangular, Hamming, Hanning – FIR filter design using Frequency sampling method– Realization of FIR filters, Comparison of FIR and IIR filters.

Finite Word Length Effects

Quantization noise – quantization noise power – Fixed point and floating point number representations – Comparison – truncation and rounding errors – quantization error – coefficient quantization error–product quantisation error – limit cycle oscillations – dead band – overflow error – signal scaling.

Digital Signal Processors and DSP Applications

Introduction – Architecture – Features – Addressing Formats - Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor.

List of Experiments

1. Discrete Time signal generation and signal manipulation.
2. Convolution (Linear and Circular), Correlation, Spectral analysis using DFT and FFT.
3. FIR Filter Design.
4. IIR Filter Design.
5. Signal generation and Convolution using DSP Processor.

References

1. John G Proakis and Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education, 4th Edition, 2014.
2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, Prentice Hall India, 3rd Edition, 2014.
3. Mitra S.K. “Digital Signal Processing - A Computer based approach”, Tata McGraw Hill, 4th Edition, 2013.
4. P.Ramesh Babu, “Digital Signal Processing”, Scitech Publications, 6th Edition, 2014.
5. B. Venkataramani and M. Bhaskar, “Digital Signal Processors”, Tata McGraw Hill, 2017.

UECC012	VLSI DESIGN	L	T	P	C
		3	0	1	4

Course Objectives

- To understand the MOS circuit realization of the various building blocks used in digital VLSI design.
- To learn transistor circuit level design and realization of arithmetic building blocks.
- To learn the implementation of digital VLSI circuits using Xilinx and ACTEL FPGA.

Course Content

MOS Transistor Principle

NMOS and PMOS transistor operations, MOS DC Equations, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles CMOS inverter, Second Order Effects, propagation delays, Stick diagram, Layout diagrams.

Combinational Logic Circuits

MOSFETs as switches, Basic Logic Gates in CMOS, Examples of Combinational Logic Design, RC Delay Model, Linear Delay Model, Logical Effort of Paths, Timing Analysis, Delay Models, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation, Low power design principles.

Sequential Logic Circuits

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits.

Arithmetic Building Blocks

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, Multipliers, dividers, Barrel shifters, 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 and ACTEL FPGA.

List of Experiments

1. Design and simulation of combinational logic circuits using HDL.
2. Design and simulation of synchronous and asynchronous sequential logic circuits using HDL.
3. FPGA Implementation of Traffic light controller.
4. FPGA Implementation of 4 bit multiplier.
5. DC and Transient Analysis of CMOS Logic Gates and D Latch.

References

1. Weste and Harris: CMOS VLSI Design: A Circuits and Systems Perspective Pearson Education India, 4th Edition 2015.
2. A.Pucknell, Kamran Eshraghian, "Basic VLSI Design", 3rd Edition, Prentice Hall of India, 2016.
3. Jan M Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", 2nd Edition, Pearson Education India, 2016.
4. M.J. Smith, "Application Specific Integrated Circuits", Pearson Education, 2011.
5. R.Jacob Baker, Harry W. LI., David E. Boyee, "CMOS Circuit Design, Layout and Simulation", IEEE Press series on Microelectronic Systems Book 19, 2011.

UECC013	CONTROL ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives

- To provide adequate knowledge about use of transfer function models for analysing physical systems and time response of systems.
- To impart knowledge on open loop and closed–loop frequency responses of systems.
- To introduce stability analysis and design of compensators.

Course Content

Control System Modeling

Open loop and closed loop systems – Mathematical modeling of Mechanical, electrical and electromechanical systems– Block diagram reduction and Signal flow graph techniques.

Time Response Analysis

Time response of type 0 and type 1 first and second order systems – Impulse and step response. Steady state and dynamic error – P-PD-PI-PID controllers

Frequency Response Analysis

Frequency domain specifications – correlation between time and frequency domain specifications for type 1 second order system – Polar plot – Bode plot – Assessment of relative stability – Closed loop frequency response from open loop response, Performance criteria – Lag/Lead compensator design using bode plots.

Stability Analysis

Necessary and sufficient conditions for stability – Absolute, Marginal and Relative stability – Routh stability criterion, Nyquist Stability Criterion, Root locus construction – Effect of pole-zero addition.

State Variable Analysis

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems.

References

1. M. Gopal, "Control Systems, Principles and Design", 4th Edition, Tata McGraw Hill, New Delhi, 2012.
2. Norman S. Nise, "Control System Engineering", 6th Edition, Wiley India, 2011.
3. K. Ogata, "Modern Control Engineering", 5th edition, PHI, 2012
4. Richard C. Dorf, Robert H. Bishop, "Modern Control Systems", Pearson Prentice Hall Publications, 12th Edition, 2010.
5. Gene F. Franklin, J. David Powell, Abbas Emami-Naeini, "Feedback Control of Dynamic Systems", Pearson Education India Publications, 6th Edition, 2008.

UECC101	TELECOMMUNICATION SWITCHING AND NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the various multiplexing techniques and digital switching techniques.
- To know the concepts of network synchronization, control and management.
- To study the principles of ISDN and networks.

Course Content

Multiplexing

Transmission Systems – FDM – TDM – Line Coding – SONET/SDH: SONET Multiplexing Overview – SONET Frame Formats – SONET Operations – Administration and Maintenance – Payload Framing and Frequency Justification – Virtual Tributaries – DS3 Payload Mapping – E4 Payload Mapping – SONET Optical Standards – SONET Networks – SONET Rings: Unidirectional Path-Switched Ring –Bidirectional Line – Switched Ring.

Digital Switching

Switching Functions – Space Division Switching – Time Division Switching – Two – Dimensional Switching: STS Switching – TST Switching – No-4 ESS Toll Switch – Digital Cross – Connect Systems - Digital Switching in an Analog Environment – Elements of SSN07 signaling. Signal Exchanges-State Transition Diagrams – Stored Program Control.

Network Synchronization Control and Management

Timing: Timing Recovery: Phase – Locked Loop – Clock Instability – Jitter Measurements – Systematic Jitter – Timing Inaccuracies: Slips – Asynchronous Multiplexing – Network Synchronization – Network Control – Network Management.

Digital Subscriber Access

ISDN: ISDN Basic Rate Access Architecture – ISDN U Interface – ISDN D Channel Protocol – High – Data – Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line – VDSL – Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems – Integrated Digital Loop Carrier Systems – Next Generation Digital Loop Carrier – Fiber in the Loop – Hybrid Fiber Coax Systems – Voice band Modems: PCM Modems – Local Microwave Distribution Service – Digital Satellite Services.

Networks

Introduction – Analog Networks-Integrated Digital Networks – Integrated Services Digital Networks – Cellular Radio Networks – Intelligent Networks – Private Networks – Charging – Routing General – Automatic Alternative Routing.

References

1. Viswanathan T., “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 2015.
2. Flood J.E., “Telecommunications switching traffic and networks”, Pearson Education Ltd., 2011.
3. John.C. Bellamy, “Digital Telephony”, John Wiley & Sons, 3rd Edition, 2009.
4. Behrouz A. Forouzan, “Data Communications and Networking”, TMH, 5th Edition, 2012.
5. William Stallings, “Data and Computer Communications”, 10th Edition 2014.

SEMESTER VI

UECC014	ANTENNAS AND WAVE PROPAGATION	L	T	P	C
		3	0	0	3

Course Objectives

- To understand EMI/EMC concepts of different antennas.
- To understand EMI/EMC concepts of different antenna arrays.
- To study the principles of antenna measurements.
- To study different modes of wave propagation.

Course Content

Radiation Principles and Radiating Wire Structures

Concept of scalar and vector potentials – Retarded vector potentials, Radiation from a elementary dipole, Half wave dipole and Quarter Wave monopole antenna. Antenna parameters: Radiation pattern, Beam width, Gain, Directivity, Effective height, Effective aperture, Bandwidth, Polarization and Antenna Temperature – Helical antenna, Log periodic antenna

Antenna Arrays

Two element array – uniform linear array – Broadside and End fire array – Direction of maxima, minima, Beamwidth, HPBW, Visible Region, Directivity, method of pattern multiplication, binomial array, Phased arrays, Adaptive arrays and Smart antennas.

Aperture and Lens Antennas

Radiation from Huygen's source, Radiation from rectangular aperture - Directivity, Beam width and effective area, E plane horn, H Plane Horn-Pyramidal Horn - Reflector antennas-Paraboloid Reflector Antenna – Aperture Blockage, Cassegrain feeding system, Rectangular Microstrip Antenna.

Modern Antennas and Antenna Measurements

Modern antennas - Reconfigurable antenna, Active antenna, Dielectric antenna for terrestrial mobile communication systems, Embedded antennas, UWB antenna, Plasma antenna. Antenna Measurements: Test Ranges, Measurement of Gain, Radiation pattern, VSWR, Impedance, Efficiency, Polarization.

Propagation of Radio Waves

Ground wave propagation, Space wave propagation, , Ionosphere - critical frequency, Maximum Usable Frequency, Skip distance, Virtual height, Radio noise of terrestrial and extra-terrestrial origin, Tropospheric wave propagation, Principle of Wave Propagation between Buried Antennas.

References

1. John D Kraus, Ronalatory Marhefka and Ahmad S Khan, "Antennas and Wave Propagation", Tata McGraw Hill Book Company, 3rd Edition, 2010.
2. Jordan E.C and Balmain, "Electro Magnetic Waves and Radiating Systems", Prentice Hall of India, 2nd Edition, 2003.
3. Constantine. A. Balanis, "Antenna Theory Analysis and Design", Wiley student Edition, 2006.
4. Ganesh Rao D, Somanathannair B, Deepa Reghunath, "Antennas and Radio Wave Propagation", Sanguine Technical Publishers, Bangalore, 2007.
5. Amit S. Kesar and Eyal Weiss, "Wave Propagation between Buried Antennas", IEEE Transactions on Antennas and Propagation, Vol. 61, No. 12, December 2013.

UECC102	OPTICAL COMMUNICATION	L	T	P	C
		2	0	1	3

Course Objectives

- To impart the concepts of optical fiber modes and losses.
- To impart the knowledge about optical fiber sources, receivers and transmission techniques.
- To learn the concepts of optical networks and system transmission.

Course Content

Introduction to Optical Fibers

Need for optical communication – Advantages and applications – EM spectrum– system model description – selection of system components – choice of operating wave length – Mode theory of Circular Wave guides – Overview of Modes – Key Modal concepts – Linearly Polarized Modes – Single Mode Fibers – Graded Index fiber structure.

Signal Degradation Optical Fibers

Attenuation, Scattering Losses, Absorption Losses, Leaky modes, mode coupling losses, Bending Losses, Combined Losses in the fiber – Polarization mode dispersion – Intermodal dispersion, Material dispersion, Wave guide dispersion, Total dispersion, Transmission rate, Pulse Broadening in GI fibers – Mode Coupling – Design Optimization of SM fibers – RI profile and cut-off wavelength.

Fiber Optical Sources

Characteristics and requirements – Spontaneous and stimulated emission– Source classifications: Ruby, He-Ne lasers, Homo & Hetero structures – Laser Diodes and LED's characteristics, Comparison and applications. Splices and connectors – Power Launching and Coupling: Source to fiber power launching – Lensing Schemes for coupling improvement.

Fiber Optical Receivers

Physical principles of Photodiodes, PIN Photo detector – Avalanche Photodiodes-Photo detector Noise, Detector response time -Avalanche multiplication Noise – Comparisons of photo detectors– Fundamental Receiver operation – Receiver configurations – Pre-amplifier for detectors.

Optical Networks and System Transmission

Basic Networks – SONET/SDH – Broadcast and select WDM Networks – Wavelength Routed Networks – Nonlinear effects on Network performance – Link Power budget – Rise time budget – Noise Effects on System Performance – Operational Principles of WDM Performance of WDM + EDFA system – Solutions – Optical CDMA – Ultra High Capacity Networks.

List of Experiments

1. Analog communication through optical link.
2. Numerical Aperture determination for Fibers.
3. Measurement of Attenuation, coupling and Bending Losses.
4. Characteristics of light sources.
5. Characteristics of light detectors

References

1. G.Keiser, "Optical fiber communication", 5th Edition, McGraw-Hill, New York, 2013.
2. G.P. Agarwal, "Fiber optic communication systems", 4th Edition, John Wiley & Sons, New York, 2017.
3. John Senior, "Optical Fiber Communications: Principles and Practices", Prentice Hall Publications, 3rd Edition, New Delhi, 2010.
4. Ramaswami, Sivarajan and Sasaki, "Optical Networks", Morgan Kaufmann, 3rd Edition, 2010.
5. Fedor Mitschke, "Fiber Optics", Springer Nature, 2nd Edition, 2016.

UECC103	CELLULAR AND MOBILE COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the characteristic of wireless channels.
- To learn the basic concepts of cellular architectures.
- To understand the concepts behind various digital signaling schemes for fading channels.
- To learn the various multipath mitigation techniques and multiple antenna systems

Course Content

Wireless Channels

Large scale path loss – Path loss models: Free Space and Two – Ray models – Link Budget design – Small scale fading – Parameters of mobile multipath channels – Time dispersion parameters Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

Cellular Architecture

Multiple Access techniques – FDMA, TDMA, CDMA – Capacity calculations – Cellular concept Frequency reuse – channel assignment– hand off– interference & system capacity – trunking & grade of service – Coverage and capacity improvement.

Modulation Techniques

Minimum Shift Keying, Gaussian MSK, M-ary QAM, M-ary FSK, Orthogonal Frequency Division Multiplexing, Performance of Digital Modulation in Slow-Flat Fading Channels and Frequency Selective Mobile Channels.

Multipath Mitigation Techniques

Equalization: Survey of Equalization Techniques, Linear Equalization, Non-linear Equalization, Algorithms for Adaptive Equalization, Diversity Techniques, Rake receiver.

Multiple Antenna Techniques

MIMO systems – spatial multiplexing – System model – Pre-coding – Beam forming – transmitter diversity, receiver diversity – Channel state information-capacity in fading and non-fading channels.

References

1. C. Y. Lee and William, “Mobile Cellular Telecommunications”, 2nd Edition, McGraw Hill, 2011.
2. Theodore S Rappaport, “Wireless Communication Principles and Practice”, 2nd Edition, Pearson Education, 2010.
3. Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University, Press, 2nd Edition, 2010.
4. Andrea Goldsmith, “Wireless Communication”, 2nd Edition, Cambridge University Press, 2012.
5. Kaveh Pahlavan and Prashant Krishnamurthy, “Principles of Wireless Networks”, Pearson, 2011.

UECC104	PRINCIPLES OF SATELLITE COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives

- To study the various satellite orbits and space segments.
- To know the basics of satellite subsystem in relation to other terrestrial systems.
- To impart knowledge on the basic access system used in Satellite Applications.

Course Content

Satellite Orbits

Overview of Satellite Communications–GEO, MEO and LEO satellite systems, frequency bands Kepler's law, Newton's law, orbital parameters, orbital perturbations, station keeping, geostationary and non-geostationary orbits – Look Angle Determination – Limits of visibility–eclipse –Sub satellite point –Sun transit outage.

Space Segment and Satellite Link Design

Spacecraft Technology– Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command, Satellite uplink and downlink Analysis and Design, link budget, E/N calculation–performance impairments–system noise, inter modulation and interference.

Satellite Subsystems

Attitude and Orbit Control System (AOCS), Telemetry, Tracking and Command System (TT&C), Power System, Satellite antennas, Communications subsystem, transponders, Satellite Link Design: Basic transmission theory, System noise temperature and G/T ratio, CNR, CIR, ACI, IMI, Down link design, Up link design.

Satellite Access

Relativity Principle – Lorentz Transformation – Transformation of velocities – Tensor and Pseudo Tensors – Electromagnetic Field Tensor – Dual Electromagnetic Field Tensor – Gauge Invariance – Retarded Potentials – Transformation of Fields-Potential and field due to moving charge – Relativistic Particle Dynamics – Larmor Formula.

Satellite Applications

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System, Direct Broadcast satellites (DBS) – Direct to home Broadcast (DTH),Digital audio broadcast (DAB) – World space services, Business TV(BTV), GRAMSAT, Specialized services – E–mail, Video conferencing & and Internet.

References

1. Dennis Roddy, "Satellite Communication", 4th Edition, McGraw Hill International, 2016.
2. Timothy Pratt, Charles Bostian Jermey Allnutt, "Satellite Communications", John Wiley, 2nd Edition, 2013.
3. Anil K. Maini, Varsha Agrawal, "Satellite Communication", Wiley, 2nd Edition, 2010.
4. Gerard Maral, Michel Bousquet, "Satellite Communications Systems: Systems", Techniques and Technology, 5th Edition, Wiley, 2014.
5. K.N.Raja Rao, "Satellite Communication: Concepts and Applications", 2nd Edition, Pearson, 2012.

SEMESTER VII

UECC015	RF AND MICROWAVE COMMUNICATION	L	T	P	C
		3	0	1	4

Course Objectives

- To inculcate the basics required for circuit representation of RF networks.
- To deal with the issues in the design of RF matching networks.
- To instill knowledge on the properties of various microwave devices.
- To deal with the microwave generation and microwave measurement techniques

Course Content

Two Port Network Theory

Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters – Different types of interconnection of Two port networks – High Frequency parameters – Properties of S-parameters – Reciprocal and lossless Network – RF behaviour of Resistors, Capacitors and Inductors.

RF Amplifiers and Matching Networks

Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Impedance matching using discrete components – Two component matching networks – Frequency response and quality factor – T and Pi Matching Networks – Microstrip Line Matching Networks.

Passive and Active Microwave Devices

Terminations – Attenuators – Phase shifters – Directional couplers – Hybrid Junctions – Power dividers – Circulator –Isolator – Gunn diode oscillator – IMPATT, TRAPATT, BARITT diode oscillator and amplifier – Varactor diode Manley–Rowe relations.

Microwave Generation

Introduction to M and O Type tubes, Two cavity Klystron Amplifier: Velocity and Current modulation – Reflex Klystron oscillator – Traveling wave tube amplifier – Cylindrical Magnetron oscillator – Backward wave Crossed field amplifier and oscillator.

Microwave Measurements

Measuring Instruments: Principle of operation and application of VSWR meter, Power meter, Spectrum Analyzer, Network Analyzer – Measurement of Impedance, Frequency, Power – Calorimeter method, VSWR, Q-factor, Dielectric constant, Scattering coefficients, Attenuation, S-parameters – Microwave Hazards.

List of Experiments

1. Mode Characteristics of Reflex Klystron
2. VI Characteristics of Gunn Diode
3. Measurement of S- Parameters of passive microwave devices.
4. Measurement of S-Parameters of non-reciprocal devices.
5. Measurement of VSWR of the given microwave device.
6. Measurement of relation between frequency and wavelength in free space and waveguide.
7. Measurement of Radiation Pattern of Horn Antenna.

References

1. David M. Pozar, “Microwave Engineering”, Wiley India (P) Ltd., New Delhi, 2008.
2. Reinhold Ludwig and Gene Bogdanov, “RF Circuit Design: Theory and Applications”, Pearson Education Inc., 2011.
3. Robert E Colin, “Foundations for Microwave Engineering”, John Wiley & Sons Inc., 2005.
4. Samuel Y. Liao, “Microwave Devices and Circuits 3rd Edition, Prentice-Hall,
5. Mathew M Radmanesh, “RF and Microwave Electronics”, Prentice Hall, 2000.

UECC016	INDUSTRIAL DESIGN PROJECT (COURSE WORK)	L	T	P	C
		4	0	0	4

Course Objectives

Industrial design project offers a distinctive opportunity to play a key role as part of a team working on a realistic design project in an industry or organization. It's about creating and testing ideas to solve real-world problems. It will improve technical knowledge, communication, practical skills and employability at a stroke.

The students should undergo Industrial design project from third year (Sixth Semester) of study. Industrial design project is designed into three courses **UECC016 - Industrial Design Project (Course Work), UECC017 - Industrial Design Project (Practical) and UECC018 - Industrial Design Project (Phase – II)** it will be a platform for the students to gain full experience in the breadth and depth of Electronics and Communication Engineering.

Course Content

A project based course in which students are required to undertake a course work on Information and Communication Technology / advanced design which involves different areas of the Electronics and Communication Engineering discipline such as Integrated Circuits, Software & Hardware, Communications, Control, Electromagnetics and Remote Sensing, Microelectronics and design the related systems for various societal applications.

UECC017	INDUSTRIAL DESIGN PROJECT (PRACTICAL)	L	T	P	C
		0	0	2	2

A project based practical course in which students are required to complete Information and Communication Technology software / advanced design software through an organization / institution. At the end of the course, students have to submit a certificate of completion and appear for final practical examination.

UECC018	INDUSTRIAL DESIGN PROJECT (PHASE – II)	L	T	P	C
		0	0	6	6

The objective of this course is to impart and improve the design capability of the student using advanced software related to Electronics and Communication Engineering. This course conceives purely a design problem in any one of the disciplines of Electronics and Communication Engineering; e.g., Design of analog/digital system, Design of an embedded/automation system, Design of a communication system etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than three. The students will be guided by internal and external supervisors. The external supervisor will be appointed by the Head of the Department after consultation with Industry-Institute Interaction Cell. At the end of the course, the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of procedures which follow the design.

UECC019	FINAL YEAR PROJECT (PHASE – I)	L	T	P	C
		0	0	2	2

Course Objectives

- To allow students to complete a research and / or development project via an individual work or team work.
- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To enhance students skills pertaining to scientific and technical report writing and presentation.

Course Content

The student individually or in a group of 2 to 3 works on a specific topic approved by the project review committee constituted by the head of the department under the guidance of a faculty member who is familiar in this area of interest. The students can select any topic which is relevant to the area of Electronics and Communication Engineering. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

UECC020	FINAL YEAR PROJECT (PHASE – II)	L	T	P	C
		0	0	6	6

Course Objectives

- To solve the identified problem based on the formulated methodology.
- To further develop students' skills to analyze and discuss the test results, and make conclusions.
- To enhance students skills pertaining to scientific and technical report writing and presentation.

Course Content

The student should continue the Final Year Project Phase I work on the selected topic as per the formulated methodology under the same supervisor. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

PROFESSIONAL ELECTIVES

UECE101	COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the basic structure and operation of digital computer and hardware-software interface.
- To familiarize with arithmetic logic unit and implementation of fixed point and floating-point arithmetic operations.
- To familiarize with the operation of processor and control units.
- To learn the concepts of Memory and I/O Systems.

Course Content

Overview & Instructions

Eight Ideas – Components of a Computer System – Technology – Performance – Power Wall – Uni-processors to Multiprocessors; Instructions – Operations and Operands – Representing Instructions – Logical Operations – Control Operations –Addressing Modes.

Arithmetic Operations

ALU – Addition and Subtraction – Multiplication – Division – Floating Point Operations – Subword Parallelism.

Processor and Control Unit

Basic MIPS Implementation – Building Datapath – Control Implementation Scheme – Pipelining – Pipelined Datapath and Control – Handling Data Hazards & Control Hazards – Exceptions – Instruction Level Parallelism – Parallel Processing Challenges – Flynn's Classification – Hardware Multithreading – Multicore Processors

Memory and I/O Systems

Memory Hierarchy – Memory Technologies – Cache Basics – Measuring and Improving Cache Performance – Virtual Memory, TLBs – Input / Output System, Programmed I/O, DMA and Interrupts, I/O Processors.

References

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design", 5th Edition, Morgan Kauffman / Elsevier, 2014.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", 6th Edition, McGraw-Hill Inc., 2012.
3. William Stallings "Computer Organization and Architecture", 7th Edition, Pearson Education, 2006.
4. Vincent P. Heuring and Harry F. Jordan, "Computer System Architecture", 2nd Edition, Pearson Education, 2005.
5. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", 1st Edition, Tata McGraw Hill, New Delhi, 2005.

UECE102	MEASUREMENTS AND INSTRUMENTATION	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.
- To learn the different methods of measuring physical quantities.

Course Content

Introduction

Units and Dimensions – Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

Electrical and Electronics Instruments

Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeter's and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss – Power Quality Meters – Instruments for measurement of frequency and phase.

Measurements, Storage and Display Device

DC and AC potentiometers – Self-balancing potentiometer – DC & AC bridges, transformer ratio bridges, Electrostatic and electromagnetic interference – Grounding techniques - Digital plotters and printers, digital CRO

Transducers and Data Acquisition Systems

Classification of transducers: Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers – Data acquisition systems

Measurement of Physical Quantities

Measurement of Temperature: Thermocouples – Radiation and Optical pyrometer – Low and high pressure measurements – Differential pressure measurement – Flow measurement: Pitot tube, hot wire and hot film anemometer, venturi and orifice meter, ultrasonic and electromagnetic flow meter – Level, viscosity and pH measurement.

References

1. A.K. Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", 18th Edition, Dhanpat Rai and Co., 2010.
2. J. B. Gupta, "A Course in Electronic and Electrical Measurements and Instrumentation", 13th Edition, S. K. Kataria & Sons, 2013.
3. H. S. Kalsi, "Electronic Instrumentation", 3rd Edition Tata McGraw Hill Company, 2010.
4. Reissland, U. Martin, "Electrical Measurements: Fundamentals, Concepts, Applications", 2nd Edition, New Age, International (P) Ltd., 2012.
5. E. W. Golding and F. C. Widdis, "Electrical Measurements & Measuring Instruments", 15th Edition, Reem Publications (P) Ltd., 2011.

UECE103	ADVANCED MICROCONTROLLERS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the architecture and programming of Pentium processors.
- To learn the architecture and application development tools of ARM processor.
- To impart knowledge on the PIC architecture and programming using MPLAB.

Course Content

High Performance CISC Architecture – Pentium

CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

High Performance RISC Architecture – ARM

Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set - Instruction cycle timings - The ARM Programmer's model – ARM Development tools – ARM Assembly Language Programming - C programming – Optimizing ARM Assembly Code – Optimized Primitives.

ARM Application Development

Introduction to DSP on ARM –FIR filter – IIR filter – Discrete Fourier transform – Exception handling – Interrupts – Interrupt handling schemes- Firmware and boot loader – Embedded Operating systems – Integrated Development Environment- STDIO Libraries – Peripheral Interface – Application of ARM Processor - Caches – Memory protection Units – Memory Management units – Future ARM Technologies.

PIC Microcontroller

CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART- A/D Converter –PWM and introduction to C-Compilers – programming with MPLAB

References

1. Andrew N. Sloss, Dominic Symes and Chris Wright, "ARM System Developer's Guide: Designing and Optimizing System Software", Morgan Kaufmann Publishers, 1st Edition, 2012.
2. Steve Furber, "ARM System –On –Chip architecture", Addision Wesley, 2nd Edition 2012.
3. Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, "AVR Microcontroller and Embedded Systems using Assembly and C", Pearson Education, 3rd Edition, 2014.
4. John .B. Peatman, "Design with PIC Microcontroller", Prentice Hall, 2nd Edition 2011.
5. John Iovine, "PIC Microcontroller Project Book ", McGraw Hill, 2012.

UECE104	BIOMEDICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the origin of bioelectric potential and their measurements using appropriate electrodes and transducers.
- To learn the measurement techniques of biochemical and nonelectrical parameters of human system.
- To familiarize the student with the bioelectric signals and various assist devices used in hospitals.

Course Content

Electro-Physiology and Bio-Potential Recording

The origin of Bio-potentials, Bio-potential electrodes, Biological amplifiers, ECG, EEG, EMG, PCG, Lead systems and Recording methods, Typical waveforms and Signal characteristics.

Bio-Chemical and Non Electrical Parameter Measurement

pH, pO_2, pCO_2, Colorimeter, Auto analyzer, Blood flow meter, Cardiac output, Respiratory measurement, Blood pressure, Temperature, Pulse, Blood cell counters.

Assist Devices

Cardiac pacemakers, DC Defibrillator, Dialyzer, Heart lung machine.

Physical Medicine and Biotelemetry

Diathermies- Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy, Telemetry principles, Frequency selection, Biotelemetry.

Recent Trends in Medical Instrumentation

Thermograph, Endoscopy unit, Laser in medicine, Cryogenic application, Electrical safety, Introduction to Telemedicine.

References

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2012.
2. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, New Delhi, 2013.
3. John G. Webster, “Medical Instrumentation Application and Design”, 4th Edition, Wiley India Edition, 2011.
4. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2013.
5. L. Nokes, D. Jennings, T. Flint, B. Turton, “Introduction to Medical Electronics Applications”, Little, Brown and Company, USA, 2015.

UECE105	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the concepts of embedded systems and embedded hardware modules.
- To learn the basic programming concepts for embedded systems.
- To study the design techniques of embedded hardware applications and the basic concepts of real time operating system.

Course Content

Introduction to Embedded Systems

Introduction to Embedded Systems - Definition of Embedded System - Embedded Systems vs. General Computing Systems - History of Embedded Systems - Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Hardware for Embedded Systems

Buses – DMA – interrupts – Built-ins on the microprocessor – Microprocessor Architectures – Serial Communication Interface: SCI, SPI, I2C, CAN, Analog to Digital Converter, Pulse Width Modulator – Timer – Memory: ROM, RAM – Memory Shadowing, Memory selection for Embedded Systems.

Programming Embedded Systems

Embedded Program – Role of Infinite loop – Compiling, Linking and locating – downloading and debugging – Emulators and simulators for the processor – External peripherals – Memory testing – Flash Memory-Simple Programs using IDE.

Integration of Hardware and Software Modules

Host and Target Machines, Getting Embedded Software into Target System, In-Circuit Emulators, Debugging, Kernels: BDM and JTAG – Application of Embedded systems in Traffic light control – automatic chocolate vending machine – Smart card and ATM.

Real Time Operating Systems

Tasks and Task states – Semaphores – Shared data – Message queues – Mail boxes and pipes – Memory management – Interrupt routines – Encapsulating semaphore and queues – Hard Real-time scheduling – Power saving.

References

1. David E Simon, “An Embedded Software Primer”, Pearson Education Asia, New Delhi, 2014.
2. Jonathan W. Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, 3rd Edition, Cengage Learning, 2012.
3. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, 3rd Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
4. Raj Kamal, “Embedded Systems Architecture Programming and Design”, Pearson, 2011.
5. C.M. Krishna, Kang G. Shin, “Real Time systems”, McGraw Hill, 2017.

UECE106	ELECTRONIC PACKAGING	L	T	P	C
		3	0	0	3

Course Objectives

- To provide rigorous foundations in electronic system packaging.
- To introduce the concepts of various packaging techniques
- To make the students to design the various electronic chip packaging and circuit board design.
- To enhance the understanding and design of embedded system design

Course Content

Introduction to Electronic Systems Packaging

Introduction – role of packaging – IC packaging – consumer electronics packaging -Products and levels of packaging-medical electronics packaging-Packaging aspects of handheld products-Definition of PWB-Basics of Semiconductor and Process flowchart-Wafer fabrication,-inspection and testing- Wafer packaging-Packaging evolution; Chip connection choices-Wire bonding-TAB and flip chip

Semiconductor Packages

Single chip packages or modules (SCM)-Commonly used packages and advanced packages-Materials in packages; Thermal mismatch in packages-Multichip modules (MCM)-types-System-in package (SIP)-Packaging roadmaps-Hybrid circuits-Electrical Design considerations in systems packaging, Resistive-Capacitive and Inductive Parasitics-Layout guidelines and the Reflection problem- Interconnection.

CAD For Printed Wiring Boards

Benefits from CAD-Introduction to DFM-DFR & DFT-Components of a CAD package and its highlights-Beginning a circuit design with schematic work and component layout-DFM check list and design rules-Design for Reliability-Printed Wiring Board Technologies-Board-level packaging aspects- Review of CAD output files for PCB fabrication- Photo plotting and mask generation- Process flow-chart- PWB substrates-Surface preparation-Photoresist and application methods- UV exposure and developing-Printing technologies for PWBs-PWB etching-PWB etching-Resist stripping-Screen-printing technology- through-hole manufacture process steps-Panel and pattern plating methods-Solder mask for PWBs-Multilayer PWBs.

Surface Mount Technology and Thermal Considerations

SMD benefits-Design issues- Introduction to soldering -Reflow and Wave Soldering methods to attach SMDs-Solders- Wetting of solders -Flux and its properties- Defects in wave soldering-Vapour phase soldering-BGA soldering and Desoldering /Repair-SMT failures-SMT failure library and Tin Whisker, Tin-lead and lead-free solders-Phase diagrams-Thermal profiles for reflow soldering- Lead free Alloys, Lead-free solder considerations; Green electronics-RoHS compliance and e-waste recycling- Issues-Thermal Design considerations in systems packaging

Embedded Passives Technology

Introduction to embedded passives- Need for embedded passives- Design Library- Embedded resistor processes-Embedded capacitors-Processes for embedding capacitors-Case study examples.

References

1. Andrea Chen, Randy Hsiao-Yu Lo "Semiconductor Packaging: Materials Interaction and Reliability" CRC Press, 2017.
2. Rao R. Tummala, "Fundamentals of Microsystems Packaging", McGraw Hill, NY, Reprint 2014.
3. William D. Brown, "Advanced Electronic Packaging", IEEE Press, Reprint 2014.
4. Bosshart, Printed Circuit Boards Design and Technology, Tata Mc Graw Hill, 2012.

UECE107	ADVANCED DIGITAL SYSTEM DESIGN	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce the concept of advanced Boolean algebra.
- To realize and design hazard free circuits.
- To gain knowledge about different fault diagnosis and testing methods.
- To familiarize with the architectures of FPGA.
- To learn the design methodology of data path units.

Course Content

Advanced Topics in Boolean Algebra

Shannon's expansion theorem – Conseusus theorem – Octal Designation – Run measure – INHIBIT / INCLUSION / AOI / Driver / Buffer Gates – Gate Expander – Reed Muller Expansion, – Synthesis of multiple output combinational logic circuits by product map method – Design of static hazard free and dynamic hazard free logic circuits.

Sequential Circuit Design

Design of synchronous sequential circuit's – design of iterative circuits – ASM chart – ASM Realization – Design of Arithmetic circuits for Fast adder – Array Multiplier – design of asynchronous sequential circuit – Static, dynamic and essential hazards – data synchronizers – mixed operating mode asynchronous circuits – designing vending machine controller.

Fault Diagnosis and Testability Algorithms

Fault diagnosis: Fault Table Method – Path Sensitization Method – Boolean Difference Method – Kohavi Algorithm – Tolerance Techniques – The Compact Algorithm – Design for testability: Test Generation – Masking Cycle – DFT Schemes – Circuit testing fault model – specific and random faults – testing of sequential circuits – Built in Self Test – Built in Logic Block observer (BILBO) – signature analysis, Reliability driven optimisation and synthesis techniques for combinational circuits.

Design with FPGA

Digital IC design flow - The role of FPGAs in digital design – FPGA architectures – Configurable logic blocks – configurable I/O blocks – Programmable interconnect – clock circuitry – Xilinx FPGA architecture – Xilinx 4000 –Programming Technologies: Antifuse, SRAM, EPROM,EEPROM.

Digital System Design

Data path, control path -The ASM chart, Arithmetic and logic unit, Shifter, Multiplier – Memory unit Building a Data path, ALU control, pipelined data path and design of main control unit

References

1. Charles H.Roth Jr "Fundamentals of Logic Design" Thomson Learning 2014.
2. William I. Fletcher, "An Engineering Approach to Digital Design", Pearson education, 2015.
3. Parag K.Lala "Fault Tolerant and Fault Testable Hardware Design" B S Publications, 2012.
4. Satish Grandhi, David McCarthy, Christian Spagnol, Emanuel Popovici and Sorin Cotofana, "Reliability driven optimisation and synthesis techniques for combinational circuits", 33rd IEEE International Conference on Computer Design (ICCD), 2015.
5. Wayne Wolf, "FPGA-Based System Design", Prentice Hall, New Delhi, 2012.

UECE108	INFORMATION THEORY & CODING	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the basic concepts of information theory.
- To impart knowledge about the capacity of continuous channels.
- To gain knowledge on source coding and error control coding schemes.

Course Content

Memoryless Finite Schemes

Self-information measure – Entropy function – Conditional Entropies – Characteristics of Entropy function – Derivation of the noise characteristics of a channel – Mutual information – Redundancy – Efficiency and channel capacity – capacities of channels with symmetric noise structure

Continuous Channels

Definitions of different entropies – Mutual information – Maximization of the entropy of a continuous random variable – Entropy maximization problems – Channel capacity under the influence of additive white Gaussian Noise – Parallel Gaussian Channel.

Element of Encoding

Separable binary codes – Shannon – Fano encoding – Necessary and sufficient conditions for noiseless coding – Shannon‘s binary coding – fundamental theorem of discrete noise-less coding – Huffman's code – Gilbert Moore coding – Fundamental theorem of discrete coding in the presence of noise.

Error Control Coding

Need for error control coding – Linear block codes – Optimum soft decision decoding of linear block codes – Hard decision decoding – Polynomial representation of codes – Cyclic codes – Convolutional codes – Viterbi decoding algorithm – Other decoding methods of convolutional codes, Galois fields, BCH codes, Reed Solomon codes, Turbo codes, Low-Density Parity-Check codes.

References

1. Reza F M, "An Introduction to Information Theory", 3rd Edition, McGraw Hill, 2010.
2. Joya Thomas and Cover M, “Elements of Information Theory”, 3rd Edition, John Wiley, 2009.
3. Peter Sweeney, “Error Control Coding from Theory to Practice”, 1st Edition, John Wiley and Sons, 2002.
4. Salvatore Gravano, “Introduction to Error Control Codes”, 1st Edition, Oxford University Press, 2007.
5. Richard B Wells, “Applied Coding and Information Theory for Engineers”, 1st Edition, Prentice Hall, 1998.

UECE109	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the methods of conventional encryption.
- To learn the concepts of public key encryption algorithms.
- To familiarise with integrity, authentication and Hash functions.
- To learn the system level security, security tools and applications.

Course Content

Introduction on Security

Security Goals – Types of attacks: Passive attack, Active attack, Attacks on confidentiality, Attacks on integrity and availability – Security services and mechanisms – Cryptography – Steganography – Revision on mathematics for cryptography.

Symmetric & Asymmetric Key Algorithms

Substitution ciphers – Transposition ciphers – Stream and block ciphers – Data Encryption Standards (DES) – Advanced Encryption Standard (AES) – RC4 – Principle of asymmetric key algorithms – RSA cryptosystem.

Integrity, Authentication and Key Management

Message integrity – Hash functions – SHA – Digital signatures – Digital signature standards – Authentication – Entity authentication – Biometrics – Key management techniques.

Network Security, Firewalls and Web Security

Introduction on firewalls – Types of firewalls – Firewall configuration and limitation of firewall – IP security overview – IP security architecture – Authentication header – Security payload – Security associations – Web security requirement – Secure sockets layer – Transport layer security – Secure electronic transaction – Dual signature.

Wireless Network Security

Security attack issues specific to wireless systems – Wormhole – Tunneling – DoS – WEP for Wi-Fi network – Security for 4G networks – Secure ad hoc Network – Secure sensor network.

References

1. W. Stallings, "Cryptography and Network Security: Principles and Practice", 5th Edition, Prentice Hall, 2013.
2. William Stallings, "Network Security Essentials: Applications and Standards", Pearson Education, 4th Edition 2010.
3. Behrouz A. Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", 2nd Edition, Tata McGraw Hill, 2011.
4. AtulKahate, "Cryptography and Network security", 3rd Edition, Tata McGraw- Hill, 2013.
5. Madhumita Panda, "Data security in wireless sensor networks via AES Algorithm", Intelligent Systems and Control (ISCO), IEEE, 2015.

UECE110	MULTIMEDIA COMPRESSION	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the fundamental concepts of data compression techniques.
- To introduce the techniques of text and audio compression.
- To study the features of image and video compression standards.

Course Content

Introduction

Special features of Multimedia – Graphics and Image Data Representations – Fundamental Concepts in Video and Digital Audio – Storage requirements for multimedia applications– Need for Compression – Taxonomy of compression techniques.

Text Compression

Static Huffman coding – Dynamic Huffman coding – Arithmetic coding – Shannon-Fano coding – Dictionary techniques – Lempel-Ziv coding – Lempel-Ziv Welch coding.

Audio compression

Audio compression techniques–- Frequency domain and filtering – Basic sub-band coding– Application to speech coding– G.722 - Application of audio coding: MPEG audio – Speech compression techniques– Linear predictive coder.

Image compression

Approaches to image compression– Graphics interchange format, Tagged image file format, Digitized documents– Digitized pictures – JPEG– Lossy predictive image compression.

Video compression

Video signal representation– Video compression techniques– MPEG1, 2, 4– Motion estimation– H.261, H.263– Overview of wavelet based compression.

References

1. Fred Halsall, James F. Kurose, "Multimedia communication-Applications, Networks, Protocols and standards", Pearson Education Limited, 2002.
2. Khalid Sayood, "Introduction to Data Compression", Morgan Kauffman, 4th Edition, 2012.
3. Tay Vaughan, "Multimedia: making it work", 9th Edition, TMH 2014.
4. Jerry D. Gibson, "Multimedia Communications: Directions and Innovations", Morgan Kaufmann, 1st Edition, 2009.
5. David Solomon, "Data Compression the complete reference", Springer, 4th Edition, 2007.

UECE111	PRINCIPLES OF DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

Course Objectives

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To learn the image processing operations in both the spatial and frequency domains.
- To learn the image representation and recognition techniques.

Course Content

Digital Image Fundamentals

Introduction – Origin – Steps in Digital Image Processing – Elements of Visual Perception – A Simple image model - Sampling and Quantization – Relationships between pixels – Arithmetic and Logical operations on images – Image Transformations – DFT, DCT and Hadamard transform – Introduction to colour image processing.

Image Enhancement

Spatial and Frequency Domain methods – Point processing, Intensity Transformations, Histogram Processing – Spatial filtering, Smoothing Filters, Sharpening Filters – Enhancement in the Frequency Domain, Low Pass Filtering, High Pass Filtering – Homomorphic filtering.

Image Restoration and Segmentation

A model of Image degradation / Restoration process – Noise models – Mean Filters – Order Statistics filters- Adaptive filters - Band Reject Filters – Band pass Filters – Notch filters – Inverse filtering.

Segmentation: Detection of Discontinuities – Region based Segmentation – Morphological processing – Erosion and Dilation.

Image Compression

Fundamentals of Compression – Image Compression Models – Error free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

Image Representation and Recognition

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor – Regional Descriptors – Topological feature, Texture – Recognition based on matching – Set Registration – Typical computer vision system.

References

1. Rafael C. Gonzales and Richard E. Woods, “Digital Image Processing”, 3rd Edition, Pearson Education, 2010.
2. Anil K Jain. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, 3rd Edition Tata McGraw Hill Pvt. Ltd., 2011.
4. William K Pratt, “Digital Image Processing”, John Willey, 2010.
5. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, 1st Edition, PHI Learning Pvt. Ltd., 2011.

UECE112	NUMERICAL ANALYSIS	L	T	P	C
		3	0	0	3

Course Objectives

- To provide the mathematical foundations of numerical techniques for finding the solutions of algebraic and transcendental equations, interpolation, numerical differentiation and integration.
- To learn the numerical techniques for solving ordinary and partial differential equations.

Course Content

Solution of algebraic and transcendental equations

Solution of algebraic and transcendental equations – Newton – Raphson Method – Method of false position – Solutions of Linear system by Gauss Jordan method, Iterative method – Gauss Seidel Method

Interpolation and Approximation

Interpolation – Lagrangian Polynomials – Newton‘s divided difference formula –Newton Forward and Backward difference formula.

Numerical Differentiation and Integration

Newton’s forward and backward difference formula for derivatives – Trapezoidal and Simpson’s 1/3 rule – Double integrals using Trapezoidal and Simpson’s rules.

Initial and Boundary value problem

Initial value problem: Taylor’s series method – Euler method – Fourth order Runge – Kutta method for solving first order equation, Milne’s and Adam’s predictor and corrector methods.

Boundary value problems: Finite difference solution for one dimensional heat equation by explicit and implicit methods – one dimensional wave equation- Two dimensional Laplace equation – Applications of initial and boundary value problems to electronics engineering problems.

References

1. Joe D. Hoffman, “Numerical methods for Engineers and scientists”, Wiley, 2015.
2. Gerald C.F. and Wheatley, P.O. “Applied Numerical Analysis”, Pearson Education Asia, New Delhi, 7th Edition, 2011.
3. Steven C. Chapra, Raymond P. Canale, “Numerical Methods for Engineers”, Tata McGraw Hill New Delhi, 4th edition 2010.
4. Kandasamy P., Thilagavathy K. and Gunavathy K., “Numerical Methods”, S. Chand Co., Ltd., New Delhi, 2007.
5. T. Veerarajan, “Numerical Methods”, Tata McGraw Hill Pub. Co. Ltd, New Delhi, 2016.

UECE113	INTRODUCTION TO WEB TECHNOLOGY	L	T	P	C
		3	0	0	3

Course Objectives

- To understand HTML5 and CSS3 to control the layout and appearance of web pages.
- To understand JavaScript to add dynamic behaviour and interactive elements to web pages and use appropriate tools to develop, test and debug web sites.
- To understand the issues of web accessibility and develop sites that comply with current legislation relating to accessibility.

Course Content

Web Design

Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation

HTML

Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

Style sheets

Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colours and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3

JavaScript

Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML: Combining HTML, CSS and Javascript, Events and buttons

References

1. Jeffrey C.Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2006.
2. Robert. W. Sebesta, "Programming the World Wide Web", 4th Edition, Pearson Education, 2007.
3. Deitel, and Deitel, Goldberg, "Internet & World Wide Web How To Program", 3rd Edition, Pearson Education, 2006.
4. Marty Hall and Larry Brown, "Core Web Programming" 2nd Edition, Volume I and II, Pearson Education, 2001.
5. Bates, "Developing Web Applications", Wiley, 2006.

UECE114	INTRODUCTION TO MEMS SYSTEM DESIGN	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the characteristics of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication and Micromachining techniques.
- To introduce the various sensors and actuators.
- To learn the various types of polymer and optical MEMS.

Course Content

Introduction

Intrinsic Characteristics of MEMS – Energy Domains and Transducers – Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending – Torsional deflection.

Sensors and Actuators-I

Electrostatic sensors – Parallel plate capacitors – Applications – Inter-digitated Finger capacitor –Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys.

Sensors and Actuators-II

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators –piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

Micromachining

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process.

Polymer and Optical MEMS

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS –Lenses and Mirrors – Actuators for Active Optical MEMS.

References

1. Chang Liu, “Foundations of MEMS”, Pearson Education Inc., 2012.
2. Stephen D Senturia, “Microsystem Design”, Springer Publication, 2000.
3. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture”, Tata McGraw Hill, New Delhi, 2002.
4. Thomas M. Adams and Richard A. Layton, “Introduction MEMS, Fabrication and Application”, Springer, 2010.
5. Nadim Maluf,“ An Introduction to Micro Electro Mechanical System Design”, Artech House, 2000.

UECE115	WIRELESS NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- To learn about the architecture and various protocols of wireless LAN.
- To understand the various layers of mobile network.
- To impart knowledge on wireless WAN and 4G network.

Course Content

Wireless LAN

Introduction-WLAN technologies: infrared, UHF narrowband, spread spectrum – IEEE802.11: system architecture, protocol architecture, physical layer, MAC Layer, 802.11b, 802.11a – HiperLAN: WATM, BRAN, HiperLAN2 – Bluetooth: architecture, radio layer, baseband layer, link manager protocol, security – IEEE802.16-WIMAX: physical layer, mac, spectrum allocation for WIMAX

Mobile Network Layer

Introduction – Mobile IP: IP packet delivery, agent discovery, tunneling and encapsulation, IPV6-Network Layer in the Internet- Mobile IP session initiation protocol – Mobile Ad-Hoc network: routing, destination sequence distance vector, dynamic source routing

Mobile Transport Layer

TCP enhancements for wireless protocols – traditional TCP: congestion control, fast retransmit/fast recovery, implications of mobility – classical TCP improvements: indirect TCP, snooping TCP, mobile TCP, time out freezing, selective retransmission, transaction oriented TCP – TCP over 3G wireless networks.

Wireless Wide Area Network

Overview of UTMS Terrestrial Radio Access Network-UMTS Core Network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, firewall, DNS/DHCP - High Speed Downlink Packet Access (HSDPA)- LTE Network Architecture and Protocol.

4G Network

Introduction – 4G vision – 4G features and challenges – applications of 4G – 4G technologies: multicarrier modulation, smart antenna techniques, OFDM-MIMO systems, adaptive modulation and coding with time slot scheduler, cognitive radio.

References

1. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2012.
2. Vijay Garg, "Wireless Communications and Networking", 1st Edition, Elsevier, 2007.
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", 2nd Edition, Academic Press, 2008.
4. Anurag Kumar, D. Manjunath, Joy Kuri, "Wireless Networking", 1st Edition, Elsevier 2011.
5. Simon Haykin, Michael Moher, David Koilpillai, "Modern Wireless Communications", 1st Edition, Pearson Education, 2013.

UECE116	RF MEMS	L	T	P	C
		3	0	0	3

Course Objectives

- To impart knowledge on basics of MEMS.
- To educate on the process of designing, analysing, fabricating and testing the RF MEMS.
- To gain knowledge about micro-machined RF filters and MEMS phase shifters.
- To impart knowledge on micromachined antennas

Course Content

Introduction to MEMS

MEMS and Microsystems – Miniaturization – Typical products – Micro sensors – Micro actuation-MEMS with micro actuators – Microaccelorometers and Micro fluidics – MEMS materials, Micro fabrication.

RF MEMS Elements and Fabrication Techniques

Switches, Mechanical and Electronic switches, Switches for RF and microwave applications, Micro relays and micro actuators-MEMS inductors and capacitors – Modeling and design issues – Thin films for MEMS and their deposition techniques – Materials for polymer MEMS – Bulk micromachining for silicon-based MEMS –

Silicon surface micromachining – Microstereolithography for polymer MEMS.

Micro-machined RF Filters

Introduction – Modeling of Mechanical Filters-Micro-machined filters-Electrostatic comb drive – Micromechanical filters using comb drives, electrostatic coupled beam structures – SAW filters Basics – Design of Inter Digital Transducers – Capabilities, Limitations and applications – Micro-machined filters for mm wave frequencies.

MEMS Phase Shifters

Introduction – Types of Phase shifters-Limitations-MEMS phase shifters-Switched delay line, Distributed and polymer based-Ferro electric phase shifters – Distributed and bilateral Interdigitated-Micro-machined transmission lines: Losses in Transmission Lines-Coplanar lines-Micro shield and membranes supported transmission lines – Micro-machined directional coupler and mixer design, fabrication and evaluation.

Micromachined Antennas

Introduction – Overview of Microstrip antenna – Design parameters – Micromachining to improve antenna performance – Micromachining as a Fabrication process – Reconfigurable antennas – Packaging for Plastic multilayer – Embedded overlay, self-packaging, Flip chip assembly, Multichip module packaging – Reliability issues – Thermal issues – Vacuum Packaging for MEMS.

References

1. Chang Liu, “Foundations of MEMS”, 2nd edition, Pearson Education Limited Publications, 2011.
2. V.K. Varadan, K.J. Vinoy and K.A. Jose, “RF MEMS and their Applications”, John Wiley & Sons Inc., Reprint 2003.
3. G.M. Rebeiz, “RF MEMS: Theory, Design and Technology”, John Wiley & Sons Inc., 2003.
4. Stepan Lucyszyn, “Advanced RF MEMS”, The Cambridge RF and Microwave Engineering Series, Cambridge University Press, 2010.
5. Singh Tejinder Pal, “RF MEMS: A Technological Aspect”, LAP Lambert Academic Publishing, ISBN: 9783659378768, 3659378763, 2013.

UECE117	COGNITIVE RADIO	L	T	P	C
		3	0	0	3

Course Objectives

- To learn the basics and architecture of software defined radios.
- To study the techniques and architecture of Cognitive Radio.
- To learn the design of next generation wireless networks based on cognitive radios.

Course Content

Introduction to Software Defined Radio

Definitions and potential benefits – software radio architecture evolution – technology trade-offs and architecture implications.

SDR Architecture

Essential functions of the software radio – basic SDR – hardware architecture – Computational processing resources – software architecture – top level component interfaces – interface topologies among plug and play modules.

Introduction to Cognitive Radios

Making radio self–aware, cognitive techniques – position awareness – environment awareness in cognitive radios – optimization of radio resources – Artificial Intelligence Techniques.

Cognitive Radio Architecture

Cognitive Radio – functions – components and design rules – Cognition cycle – orient – plan – decide and act phases – Inference Hierarchy – Architecture maps – Building the Cognitive Radio Architecture on Software defined Radio Architecture.

Next Generation Wireless Networks

The XG Network architecture – spectrum sensing – spectrum management – spectrum mobility – spectrum sharing – upper layer issues – cross – layer design.

References

1. J. Mitola, “Cognitive Radio: An Integrated Agent Architecture for software defined radio”, Doctor of Technology thesis, Royal Inst. Technology, Sweden 2014.
2. Alexander M. Wyglinski, MaziarNekovee, and Y. Thomas Hou, “Cognitive Radio Communications and Networks - Principles and Practice”, Elsevier Inc., 2010.
3. E. Biglieri, A. J. Goldsmith., L. J. Greenstein, N. B. Mandayam and H. V. Poor, “Principles of Cognitive Radio”, Cambridge University Press, 2013.
4. Kwang-Cheng Chen and Ramjee Prasad, “Cognitive Radio Networks”, John Wiley & Sons, Ltd, 2010.
5. Khattab, Ahmed, Perkins, Dmitri, Bayoumi and Magdy, “Cognitive Radio Networks – From Theory to Practice”, Springer Series: Analog Circuits and Signal Processing, 2012.

UECE118	WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- To introduce the technologies and applications for the emerging domain of wireless sensor networks.
- To impart knowledge on the design and development of the various layers in the WSN protocol stack.
- To elaborate the various issues related to WSN implementations.
- To familiarize the students with the hardware and software platforms used in the design of WSN.

Course Content

Overview of Wireless Sensor Network

Challenges for Wireless Sensor Networks – Characteristics requirements – Applications of sensor networks – Sensor Node Architecture – Hardware Components – Energy Consumption of Sensor Nodes – Network Architecture – Sensor Network Scenarios, Optimization Goals and Figures of Merit – Gateway Concepts.

Infrastructure Establishment

Topology Control – Clustering Types – High level overview Time Synchronization – Sensor Tasking and Control.

Networking Sensors

Physical Layer and Transceiver Design Considerations – MAC Protocols for Wireless Sensor Networks – Low Duty Cycle Protocols and Wakeup Concepts –Mediation Device Protocol – Wakeup Radio Concepts – Address and Name Management – Assignment of MAC Addresses – Routing Protocols – Energy Efficient Routing – Geographic Routing.

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 – Dissemination Protocol for Large Sensor Network.

WSN Routing, Localization & QOS

Issues in WSN routing – OLSR – Localization – Indoor and Sensor Network Localization – Absolute and relative localization – Triangulation – Localization and Positioning – QOS in WSN – Energy Efficient Design – Synchronization – Transport Layer issues.

References

1. Ian F. Akyildiz, Mehmet Can Vuran, " Wireless Sensor Networks" John Wiley, 2010.
2. Fei Hu and Xiaojun Cao, "Wireless Sensor Networks Principles and Practice", CRC Press, 2010.
3. Kazem, Sohraby, Daniel Minoli, Taieb Zanti, "Wireless Sensor Network: Technology, Protocols and Application", John Wiley and Sons, 2010.
4. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge Press, 2010.
5. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2013.

UECE119	HIGH PERFORMANCE COMMUNICATION NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- To study the concept of Layered Architectures.
- To understand the principles of ATM, Broadband, IP and Mobile Ad-hoc Networks.
- To learn about High Performance networking with WiMax and UWB.

Course Content

Introduction

Networking principles – Digitalization Service and layered architecture – traffic characterization and QoS – network services – Network elements – Network Monitoring – Network Control – network mechanisms – Network Element Management.

Broadband Networks

Introduction – Multihop Wireless Broadband Networks – Mesh Networks – Importance of Routing Protocols – Routing Metrics – Packet Scheduling – Admission Control – Classification of Routing Protocols – MANET Routing Protocols.

IP Networks

Technology Trends in IP Networks – internet protocol – IP Packet Communications in Mobile Communication Networks – TCP and UDP – Performance of TCP/IP networks – Circuits Switched Networks – SONET – DWDM – Fiber to home – DSL – Intelligent Network (IN) Scheme – CATV and layered network.

ATM Networks

ATM Reference Model – The ATM Layer – The ATM Adaptation Layer (AAL) – Traffic Classes –Traffic Management and Quality of Service – Traffic Descriptor – Traffic Shaping – ABR and Traffic Congestion – Network Management – Layer Management – ATM Signaling – ATM Addressing Format – Connection Establishment – IP/ATM Internetworking – IP Multicast over ATM.

High Performance Networking With WiMAX and Ultra Wideband (WPAN)

Introduction – WiMAX Overview – Competing Technologies – Overview of the Physical Layer – PMP Mode – Mesh Mode – Multihop Relay Mode–Time-Hopping Ultra-wideband – Direct Sequence Ultra-wideband – Multiband – Other Types of UWB – LTE.

References

1. Jean Warland and Pravin Varaiya, “High Performance Communication Networks”, Harcourt and Morgan Kauffman Publishers, London, 2nd Edition, 2011.
2. Leon Garcia and Widjaja, “Communication networks”, Tata McGraw Hill, 2nd Edition, 2014.
3. Lumit Kasera and Pankaj Sethi, “ATM Networks”, Tata McGraw Hill, 2010.
4. Keiji Tachikawa, “W-CDMA Mobile Communication System”, John Wiley & Sons, 2012.
5. David Tung Chong Wong, Peng-Yong Kong, Ying-Chang Liang, Kee Chaing Chua and Jon W. Mark, “Wireless Broadband Networks”, John Wiley & Sons, 2009.

UECE120	ADVANCED WIRELESS COMMUNICATION	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the evolving paradigm of cooperative and green wireless communication concepts and the challenges and trade-offs involved in such networks.
- To understand the different power saving strategies and energy efficient signal, system and network design.
- To learn about the energy saving techniques adopted in existing wireless components, protocols and networks and the evolution of green wireless communication technologies.

Course Content

Cooperative Communications and Green Concepts

Network architectures and research issues in cooperative cellular wireless networks – Cooperative communications in OFDM and MIMO cellular relay networks – issues and approaches – Fundamental trade-offs on the design of green radio networks – Green modulation and coding schemes.

Cooperative Techniques

Cooperative techniques for energy efficiency – Cooperative base station techniques for cellular wireless networks; Turbo base stations – Antenna architectures for cooperation – Cooperative communications in 3GPP LTE – Partial information relaying and coordinated multi-point transmission in LTE.

Relay-Based Cooperative Cellular Networks

Distributed space-time block codes – Collaborative relaying in downlink cellular systems; Radio resource optimization – Adaptive resource allocation – Cross-layer scheduling design for cooperative wireless two-way relay networks – Network coding in relay-based networks.

Green Radio Networks

Base Station Power-Management Techniques – Opportunistic spectrum and load management, Energy-saving techniques in cellular wireless base stations – Power-management for base stations in smart grid environment – Cooperative multi-cell processing techniques for energy-efficient cellular wireless communications.

Access Techniques for Green Radio Networks

Cross-layer design of adaptive packet scheduling for green radio networks – Energy-efficient relaying for cooperative cellular wireless networks – Energy performance of TDD-CDMA multihop cellular networks; Resource allocation for green communication in relay-based cellular networks – Green Radio Test-Beds and Standardization Activities.

References

1. Ekram Hossain, Vijay K. Bhargava(Editor), Gerhard P. Fettweis (Editor), “Green Radio Communication Networks”, Cambridge University Press, 2012.
2. F. Richard Yu, Yu, Zhang and Victor C. M. Leung “Green Communications and Networking”, CRC press, 2012.
3. Mohammad S. Obaidat, Alagan Anpalagan and Isaac Woungang, “Handbook of Green Information and Communication Systems”, Academic Press, 2012.
4. Jinsong Wu, Sundeep Rangan and Honggang Zhang, “Green Communications: Theoretical Fundamentals, Algorithms and Applications”, CRC Press, 2012.
5. Ekram Hossain, Dong In Kim, Vijay K. Bhargava, “Cooperative Cellular Wireless Networks”, Cambridge University Press, 2011.

UECE121	MOBILE ADHOC NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the design issues in mobile Adhoc networks.
- To familiarize the students with different types of MAC and Adhoc routing protocols.
- To impart knowledge on QoS related performance measurements.

Course Content

Introduction

Introduction – Cellular and Adhoc Networks – Mobile Adhoc networking with 4G - Application of Mobile Adhoc Networks – Issues in Mobile Adhoc Networks – Adhoc wireless Internet – Mobile Quality of Service – QoS Parameters-Issues and Challenges in providing Mobile QoS – Mobility models – types.

MAC protocols for Adhoc wireless networks

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

Routing protocols and transport layer in Adhoc wireless networks

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

Wireless Sensor Networks (WSNs) and MAC Protocols

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

QOS in Adhoc wireless networks

Issues in designing a transport layer protocol for Mobile Adhoc Networks – Introduction to Mobile QoS – Classification of QoS solutions – MAC layer solutions – Network layer solutions – Mobile QoS framework for Mobile Adhoc Networks.

References

1. C.Sivaram Murthy and B.S Manoj, “Ad Hoc Wireless Networks”, Pearson Education, 2nd Edition India, 2008.
2. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, “Mobile Adhoc Networking”, John Wiley, 2007.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005.
4. Amitabh Mishra “Security and Quality of Service in Adhoc Wireless Networks”, Cambridge University Press, 2008.
5. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, “Adhoc Mobile Wireless Networks”, Auerbach Publications, 2008.

GENERIC ELECTIVES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING

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

Course Objectives

- To provides 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.

Course Content

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; 3rd 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, 2nd Edition, 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.

Course Content

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 CHANGES	L	T	P	C
		3	0	0	3

Course Objectives

- To understanding of 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.

Course Content

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. Henderson-Sellers, A. & K. 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.

Course Content

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", 2nd 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", 2nd 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.

Course Content

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" 2nd Edition, 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 THE DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

UCSG001	FUNDAMENTALS OF INFORMATION SECURITY	L	T	P	C
		3	0	0	3

Course Objectives

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To analyse the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

Course Content

Introduction

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

Security Investigation

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues

Security Analysis

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk

Logical Design

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture

Physical Design

Security Technology, IDS, Scanning and Analysis Tools, Cryptography – Protocols for secure communications, Physical Security, Security and Personnel

References

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003.
2. Micki Krause, Harold F. Tipton, “ Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
3. Stuart Mc Clure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2003.
4. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.
5. Mark Stamp, “Information Security: Principles and Practice”, Wiley-Blackwell, 2nd edition, 2011.

UCSG002	INTRODUCTION TO COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

Course Objectives

- Understand the division of network functionalities into layers
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

Course Content

Fundamentals & Link Layer

Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

Media Access & Internetworking

Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)

Routing

Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

Transport Layer

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

Application Layer

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

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”, Mc Graw Hill Publisher, 2011.
5. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw – Hill, 2011.

UCSG003	INTRODUCTION TO SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives

- To be successful professionals in the field with solid fundamental knowledge of software engineering
- To utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams
- To apply the foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

Course Content

Requirements Analysis and Specification

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets.

Software Design

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components

Testing and Maintenance

Software testing fundamentals-Internal and external views of Testing–Types of testing - System testing and debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model

References

1. Roger S Pressman, “Software Engineering – A Practitioner’s approach”, Seventh edition, McGraw-Hill International edition,2010
2. Ian Somerville, ”Software Engineering”, 9th edition, Pearson Education Asia, 2011.
3. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited, 2009.
4. Pankaj Jalote, ”Software Engineering”, A Precise Approach, Wiley India, 2010.
5. James F Peters, Witold Pedrycz, “Software Engineering An Engineering Approach”, John Wiley, Dec 1999.

UCSG004	PYTHON PROGRMMING FOR ENGINEERS	L	T	P	C
		3	0	0	3

Course Objectives

- To know the basics of algorithmic problem solving, read and write simple Python programs.
- To develop Python programs with Python data structures –- lists, tuples, dictionaries.

Course Content

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion).

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments.

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays.

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension.

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages.

References

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.

UCSG005	SOFT COMPUTING AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

Course Objectives

- Introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
- Insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems Techniques.

Course Content

Introduction to Soft Computing, Introduction to Fuzzy logic, Fuzzy membership functions, Operations on Fuzzy sets Fuzzy relations, Fuzzy propositions, Fuzzy implications Fuzzy inferences

Defuzzyfication Techniques-I, Defuzzyfication Techniques-II, Fuzzy logic controller-I, Fuzzy logic controller-II Solving optimization problems, Concept of GA, GA Operators: Encoding, GA Operators: Selection-I

GA Operators: Selection-II, GA Operators: Crossover-I, GA Operators: Crossover-II, GA Operators: Mutation Introduction to EC-I, Introduction to EC-II

MOEA Approaches: Non - Pareto, MOEA Approaches: Pareto – I MOEA Approaches: Pareto - II, Introduction to ANN, ANN Architecture and ANN Training-I, ANN Training-II, ANN Training-III, Applications of ANN

References

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications”, Prentice-Hall of India Pvt. Ltd., 2006.
2. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
3. David E. Goldberg, “Genetic Algorithm in Search Optimization and Machine Learning” Pearson Education India, 2013.
4. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
5. Simon Haykin, “Neural Networks Comprehensive Foundation” Second Edition, Pearson Education, 2005.

GENERIC ELECTIVES OFFERED BY THE DEPARTMENT OF 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.

Course Content

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 Objectives

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

Course Content

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.

Course Content

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.
4. Garry Duning, "Introduction to Programmable Logic Controller", Cengage Learning, 3rd Edition, 2006.
5. W. Bolten, "Programmable Logic Controller", Elsevier Newnes Publication, 5th 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.

Course Content

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.

Course Content

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 andInput/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. 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 THE DEPARTMENT OF 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.

Course Content

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. Thirteenth Edition. New Delhi, 2014.
2. R. K. Rajput, “A Text book of Automobile Engineering”, Lakshmi publication, Second Edition. 2014
3. Heniz Heisler, “Vehicle and Engine Technology, SAE, Second 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 Objective

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

Course Content

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 “ Second 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 Objective

- 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.

Course Content

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, 3rd Edition, 2012.
3. Nag P.K, "Power Plant Engineering", Tata McGraw-Hill, 2014.
4. G. D. Rai, "Introduction to Power Plant Technology", Khanna Publishers, 3rd Edition, 2014.
5. T. Morse Frederick, "Power Plant Engineering", Prentice Hall of India, 3rd Edition, 2014.
6. Culp A. W., "Principles of Energy Conversion", McGraw Hill, 2nd 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.

Course Content

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.

Course Content

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, 2nd Edition, 2010.
5. Ian Gibson, “Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping”, Wiley, 2006.

GENERIC ELECTIVES OFFERED BY THE DEPARTMENT OF INFORMATION TECHNOLOGY

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

Course Objectives

The students should be made to:

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

Course Content

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 Hadoop", 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:

The students should be made to:

- 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.

Course Content

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

The students should be made to:

- 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.

Course Content

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 SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives

The students should be made to:

- 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.

Course Content

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”, 6th 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, 3rd 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

The students should be made to:

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

Course Content

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", 2nd 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", 3rd Edition, Tata McGraw-Hill, 2013.
5. Thomas A. Powell, "Web Design: The Complete Reference", 2nd Edition, Tata McGraw-Hill, 2003.

GENERIC ELECTIVES OFFERED BY THE DEPARTMENT OF SCIENCE AND HUMANITIES

UHSG001	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.

Course Content

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.

UPHG001	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.

Course Content

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.

UCHG001	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.

Course Content

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– enaturation 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.

UMHG001	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.

Course Content

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 THE DEPARTMENT OF MANAGEMENT

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

Course Content

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

Course Content

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.

Course Content

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.

Course Content

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.

Course Content

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", Pearson's Education, 2016.
3. Martin Christopher, "Logistics and Supply Chain Management", Pearsons Education, 2016.
4. Richard B.Chase, Ravi Shankar, F. Robert Jacobs, "Operations and Supply Chain Management", SIE, 2014.
5. Leenders, Johnson, Flyn, Fearon, "Purchasing and Supply Management", Tata McGraw Hill, 2010.