K.S. Rangasamy College of Technology

(Autonomous Institution)

Curriculum & Syllabus

of

B.E. Electronics and Communication Engineering

(For the batch admitted in 2014 – 18)

R 2014

Courses Accredited by NBA, Accredited by NAAC with 'A' Grade, Approved by AICTE, Affiliated to Anna University, Chennai.

KSR Kalvi Nagar, Tiruchengode – 637 215.

Namakkal District, Tamil Nadu, India.

Vision

To become recognized as a leader in Electronics and Communication Engineering education and research

Mission

To craft professionals and technology leaders adherent to the professional ethical code in the areas of Electronics and communication Engineering

To address the needs of the society while advancing boundaries of disciplinary and multidisciplinary research and cultivate universal moral values

Programme Educational Objective(s)(PEOs)

I. Graduates of the programme will be motivated to successful technical and professional career growth

II. Graduates of the programme will be able to apply the scientific, mathematical and engineering fundamentals to provide solutions to the problems in Electronics and Communication Engineering and related fields

III. Graduates of the programme will exhibit and demonstrate professional and ethical behaviour and engage in lifelong learning

Programme Outcomes (POs)

a) Apply the knowledge of mathematics, science, engineering fundamentals to the solution of complex problems in Electronics and Communication Engineering

b) Identify, formulate, research literature, and analyse complex Electronics and Communication engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

c) Design solutions for complex Electronics and Communication engineering problems and design system components or processes that meet t h e specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

d) Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Electronics and Communication Engineering

e) Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Electronics and Communication engineering activities with an understanding of the limitations

f) Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

g) Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

h) Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

i) Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

j) Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

k) Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

l) Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

K.S.Rangasamy College of Technology, Tiruchengode – 637 215	
Curriculum for the Programmes under Autonomous Scheme	
Regulation	**R 2014**
Department	**Electronics and Communication Engineering**
Programme Code & Name	EC : B.E. Electronics and Communication Engineering

Semester I

Course Code	Course Name	Hours/ Week			Credit
		L	T	P	C
	THEORY				
40 EN 001	English	3	0	0	3
40 MA 001	Ordinary and Partial Differential Equations	3	1	0	4
40 PH 001	Solid State Physics	3	0	0	3
41 CH 007	Environmental Science and Engineering	3	0	0	3
40 CS 001	Fundamentals of Programming	3	0	0	3
40 EC 002	Electronic Devices	3	0	0	3
	PRACTICAL				
40 PH 0P1	Physics Laboratory	0	0	3	2
40 CS 0P1	Fundamentals of Programming Laboratory	0	0	3	2
40 ME0P1	Engineering Graphics Laboratory	0	0	3	2
Total		18	1	9	25

Semester II

Course Code	Course Name	Hours / Week			Credit
		L	T	P	C
	THEORY				
40 EN 002	Communication Skills	3	0	0	3
40 MA 003	Fourier Series and Transform Methods	3	1	0	4
40 CH 001	Engineering Chemistry	3	0	0	3
40 ME 001	Basics of Mechanical Engineering	3	0	0	3
40 CE 002	Fundamentals of Civil Engineering and Mechanics	3	1	0	4
40 EE 004	Electric Circuit Theory	3	1	0	4
	PRACTICAL				
40 CH 0P1	Chemistry Laboratory	0	0	3	2
40 ME 0P2	Engineering Practices Laboratory	0	0	3	2
Total		18	3	6	25

Semester III

Course Code	Course Name	Hours / Week			Credit
		L	T	P	C
	THEORY				
40 MA 005	Linear Algebra and Numerical Methods	3	1	0	4
40 CS 003	Data Structures	3	0	0	3
40 EE 006	Electrical Technology	3	0	0	3
40 EC 003	Digital Principles and System Design	3	1	0	4
40 EC 301	Electronic Circuits I	3	0	0	3
40 EC 302	Electromagnetic Fields	3	1	0	4
	PRACTICAL				
40 CS 0P3	Data Structures Laboratory	0	0	3	2
40 EE 0P2	Electrical Technology Laboratory	0	0	3	2
40 EC 3P1	Analog and Digital Electronics Laboratory	0	0	3	2
40 TP 0P1	Career Competency Development I	0	0	2	0
Total		18	3	11	27

Semester IV

		Hours / Week			Credit
		L	T	P	C
	THEORY				
40 MA 009	Statistics and Random Processes	3	1	0	4
40 EC 401	Electronic Circuits II	3	0	0	3
40 EC 402	Transmission Lines and Wave Guides	3	1	0	4
40 EC 403	Signals and Systems	3	1	0	4
40 EC 404	Linear Integrated Circuits	3	0	0	3
40 CS 004	Object Oriented Programming	3	0	0	3
	PRACTICAL				
40 EC 4P1	Electronic Circuits laboratory	0	0	3	2
40 EC 4P2	Linear Integrated Circuits Laboratory	0	0	3	2
40 CS 0P4	Object Oriented Programming Laboratory	0	0	3	2
40 TP 0P2	Career Competency Development II	0	0	2	0
Total		18	3	11	27

K.S.Rangasamy College of Technology, Tiruchengode – 637 215	
Curriculum for the Programmes under Autonomous Scheme	
Regulation	**R 2014**
Department	**Department of Electronics and Communication Engineering**
Programme Code & Name	EC : B.E. Electronics and Communication Engineering

Semester V

Course Code	Course Name	Hours/ Week			Credit
		L	T	P	C
	THEORY				
40 EE 007	Control Systems Engineering	3	1	0	4
40 EC 501	VLSI Design	3	0	0	3
40 EC 502	Analog Communication	3	1	0	4
40 EC 503	Digital Signal Processing	3	1	0	4
40 EC 504	Microprocessors and Microcontrollers	3	0	0	3
40 HS 003	Total Quality Management	2	0	0	2
	PRACTICAL				
40 EC 5P1	VLSI Laboratory	0	0	3	2
40 EC 5P2	Digital Signal Processing Laboratory	0	0	3	2
40 EC 5P3	Microprocessors and Microcontrollers Laboratory	0	0	3	2
40 TP 0P3	Career Competency Development III	0	0	2	0
Total		17	3	11	26

Semester VI

Course Code	Course Name	Hours / Week			Credit
		L	T	P	C
	THEORY				
40 EC 601	Digital Communication	3	1	0	4
40 PH 008	Applied Physics	3	0	0	3
40 EC 602	Embedded Systems	3	0	0	3
40 EC 603	Antennas and Wave Propagation	3	1	0	4
40 EC 604	Computer Networks	3	0	0	3
40 EC 6E*	Elective I	3	0	0	3
	PRACTICAL				
40 EC 6P1	Analog and Digital Communication Laboratory	0	0	3	2
40 EC 6P2	Computer Networks Laboratory	0	0	3	2
40 EC 6P3	Embedded Systems Laboratory	0	0	3	2
40 TP 0P4	Career Competency Development IV	0	0	2	0
Total		18	2	11	26

Semester VII

Course Code	Course Name	Hours/ Week			Credit
	THEORY	**L**	**T**	**P**	**C**
40 HS 002	Engineering Economics and Financial Accounting	2	0	0	2
40 EC 701	Optical Communication and Networks	3	0	0	3
40 EC 702	Microwave Engineering	3	0	0	3
40 EC 703	Wireless Communication	3	0	0	3
40 EC 7E*	Elective II	3	0	0	3
40 EC 7E*	Elective III	3	0	0	3
	PRACTICAL				
40 EC 7P1	Optical and Microwave Laboratory	0	0	3	2
40 EC 7P2	System Design Laboratory	0	0	3	2
40 EC 7P3	Project Work – Phase I	0	0	3	2
40 TP 0P5	Career Competency Development V	0	0	2	0
Total		17	0	11	23

Semester VIII

Course Code	Course Name	Hours/ Week			Credit
	THEORY	**L**	**T**	**P**	**C**
40 EC 801	Ad Hoc and Sensor Networks	3	0	0	3
40 EC 8E*	Elective IV	3	0	0	3
40 EC 8E*	Elective V	3	0	0	3
	PRACTICAL				
40 EC 8P1	Project Work - Phase II	0	0	16	8
Total		09	0	16	17

K.S.Rangasamy College of Technology , Tiruchengode– 637215									
Curriculum for the Programmes under Autonomous Scheme									
Regulation	R 2014								
Department	Department of Electronics and Communication Engineering								
Programme Code & Name	EC : B.E. Electronics and Communication Engineering								
Elective I									
Course Code	Course Name	Hours/ Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
	THEORY								
40 EC E11	Medical Electronics	3	0	0	3	50	50	100	
40 EC E12	VLSI Signal Processing	3	0	0	3	50	50	100	
40 EC E13	Consumer Electronics	3	0	0	3	50	50	100	
40 EC E14	High Performance RISC Processor	3	0	0	3	50	50	100	
40 EC E15	Digital Image Processing	3	0	0	3	50	50	100	
40 EC E16	Foundations for Nano electronics	3	0	0	3	50	50	100	
40 EC E17	Micro Electromechanical Systems	3	0	0	3	50	50	100	
40 IT E17	Programming in JAVA	3	0	0	3	50	50	100	
Elective II									
40 HS 001	Professional Ethics	2	0	0	2	50	50	100	
40 EC E21	Advanced Digital Signal Processing	3	0	0	3	50	50	100	
40 EC E22	Robotics	3	0	0	3	50	50	100	
40 EC E23	Radar and Navigational Aids	3	0	0	3	50	50	100	
40 EC E24	Advanced Digital Communication	3	0	0	3	50	50	100	
40 EC E25	Cryptography and Network Security	3	0	0	3	50	50	100	
40 EC E26	Electromagnetic Interference and Compatibility	3	0	0	3	50	50	100	
Elective III									
40 EC E31	Testing and Fault Diagnosis of VLSI circuits	3	0	0	3	50	50	100	
40 EC E32	High Speed Networks	3	0	0	3	50	50	100	
40 EC E33	Measurements and Instrumentation	3	0	0	3	50	50	100	
40 EC E34	Satellite Communication	3	0	0	3	50	50	100	
40 EC E35	Advanced Microcontrollers	3	0	0	3	50	50	100	
40 EC E36	RFID and Biometrics	3	0	0	3	50	50	100	
40 EC E37	CMOS RF System Design	3	0	0	3	50	50	100	
Elective IV									
40 EC E41	Software for Embedded Systems	3	0	0	3	50	50	100	
40 EC E42	Electronic Product Design	3	0	0	3	50	50	100	
40 EC E43	Virtual Instrumentation	3	0	0	3	50	50	100	
40 EC E44	Optoelectronic Devices	3	0	0	3	50	50	100	
40 EC E45	Avionics	3	0	0	3	50	50	100	
40 EC E46	Autotronics and Vehicle Intelligence	3	0	0	3	50	50	100	
40 EC E47	Principles of Medical Imaging	3	0	0	3	50	50	100	
Elective V									
40 EC E51	Real Time Digital Signal Processing Design	3	0	0	3	50	50	100	
40 EC E52	Wavelets and Its applications	3	0	0	3	50	50	100	
40 EC E53	Multimedia Compression and Communication	3	0	0	3	50	50	100	
40 EC E54	Speech Processing	3	0	0	3	50	50	100	
40 EC E55	Telecommunication Switching Techniques	3	0	0	3	50	50	100	
40 EC E56	Green Communication	3	0	0	3	50	50	100	
40 EC E57	Neural and Fuzzy Systems	3	0	0	3	50	50	100	

K.S.Rangasamy College of Technology – Autonomous								
40 EN 001 English								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objective(s)	• To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts. • To help learners develop strategies that could be adopted while reading texts. • To help learners acquire the ability to speak effectively in English in real life and career related situations. • To train learners in organized academic and professional writing.
Course Outcomes	**At the end of the course, the students will be able to** 1. Comprehend the basic grammatical structures and generate new sentences in a given paradigm. 2. Explain and apply the enriched vocabulary in academic and professional contexts. 3. Identify the main idea and integrate it with supporting data to facilitate effective comprehension. 4. Infer, compare and summarize lexical & contextual meaning of various technical / general passages. 5. Recognize the basic phonetic units of language and execute it for better oral competency. 6. Recognize and interpret standard English Pronunciation & use it in diverse situations. 7. Find and classify different reading strategies and demonstrate better articulation / expression 8. Categorize words into different parts of speech and use them in different contexts. 9. Retrieve information from various sources and construct a well designed descriptive writing.

Grammar and Vocabulary

Word formation with Prefixes and Suffixes Level -1 (50 words), Level -2 (100 words) – Synonyms and Antonyms (100 each)– Verbal Analogy- Finding the Odd man out- Alphabet Test- One word substitute- Sentence Patterns- Subject-Verb Agreement – Tenses – Active and Passive voice – Use of conditionals – Comparative Adjectives– Expanding Nominal Compounds (100) – Articles – Use of Prepositions (basic level – 25) Identifying Phrasal Verbs - Error Detection – Abbreviations and Acronyms (100 each).

Suggested Activities

Prefixes and suffixes– identifying the lexical and contextual meanings of words – correction of errors in the given sentences -providing a context for the use of tenses, sentence structures – using comparative forms of adjectives - Identifying phrasal verbs - 'if' clauses – the three main types, probable condition, improbable condition and impossible conditions.

Note: All examples should preferably be related to science and technology.

Listening skill

Extensive listening – Listening for General Content – Listening to fill up Gapped Texts – Intensive Listening – Listening for Specific Information: Retrieval of Factual Information – Listening to Identify Topic, Context, Function, Speaker's Opinion, Attitude, etc. – Global Understanding Skills and Ability to infer, extract gist and understand main ideas – Note-Taking: Guided and Unguided

Suggested Activities

Taking a quick glance at the text to predict the content – reading to identify main content and giving feedback in response to the teacher's questions – making a thesis statement about the text – scanning for specific information – sequencing of jumbled sentences using linguistic clues (e.g. reference words and repetition) and semantic clues following propositional development –fast reading drills – comprehending a passage and answering questions of varied kinds relating to information, inference and prediction.

Speaking skill

Verbal and Non-Verbal communication – Speech Sounds – Syllables – Word Stress (structural and content

words) – Sentence Stress – Intonation – Pronunciation Drills, Tongue Twisters – Formal and Informal English – Oral Practice – Developing Confidence – Introducing Oneself – Asking for or Eliciting Information – Describing Objects – Expressing Opinions (agreement / disagreement) – Giving Instructions – (Road Maps)

Suggested Activities

Role play activities based on real life situations – discussing travel plan / industrial visits- giving oral instructions for performing tasks at home and at work (use of imperatives) -using appropriate expressions-defining / describing an object /device / instrument / machine – participating in a short discussion on a controversial topic – oral presentation

Reading skill

Exposure to different reading techniques – Reading for gist and global meaning – Predicting the content – Skimming the text – Identifying the topic sentence and its role in each paragraph – Scanning – Inferring / Identifying lexical and contextual meanings – Reading for structure and detail – Transfer of information / Guided Note-Making – Understanding Discourse Coherence.

Suggested Activities

Gap filling activity while listening to a text – listening intently to identify the missing words in a given text – listening to a brief conversation and answering questions – listening to a discourse and filling up gaps in a worksheet – taking notes during lecture – inferential comprehension and literal comprehension tasks based on listening to quizzes.

Note: The listening activities can be done using a worksheet in the Language Laboratory or in the class room using a tape recorder.

Writing skill

Introduction to the characteristics of technical style – Writing Definitions and Descriptions – Paragraph Writing (topic sentence and its role, unity, coherence and use of cohesive expressions) – Process Description (use of sequencing connectives) – Comparison and Contrast – Classifying the Data – Analyzing / Interpreting the data – Formal letter Writing (letter to the editor, letter for seeking practical training, and letter for undertaking project works in industries) – Editing (punctuation, spelling and grammar)

Suggested Activities

Writing a paragraph based on information provided in a tree diagram / flow chart / bar chart / pie chart / tables – formal letters – writing to officials (leave letter, seeking permission for practical training , asking for certificates, testimonials) – letter to the editor – informal letters (persuading / dissuading, thanking and congratulating friends / relatives) – sending e- mail – editing a passage (correcting the mistakes in punctuation, spelling and grammar)

Text book(S) :

1	Ashraf M Rizvi, 'Effective Technical Communication', Tata McGraw-Hill Publishing Company Ltd., 1st Edition, New Delhi, 2005.

Reference(s) :

1.	M.Balasubramanian and G.Anbalagan, 'Performance in English', Anuradha Publications, Kumbakonam, 2007.
2.	Sharon J. Gerson, Steven M. Gerson, 'Technical Writing – Process & Product' , Pearson Education (Singapore) (p) Ltd., 3rd Edition, New Delhi, 2004.
3.	Mitra K. Barun, 'Effective Technical Communication – A Guide for Scientists and Engineers', Oxford University Press, New Delhi, 2006.
4.	R.S. Aggarwal, 'A Modern Approach to Verbal & Non – Verbal Reasoning', S.Chand& Company Ltd., New Delhi, Revised Edition, 2012.
5.	NPTEL Video Courses on Spoken English.

K.S.Rangasamy College of Technology – Autonomous								
40 MA 001 Ordinary and Partial Differential Equations								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	50	50	100

Objective(s)	• To present methods of solving system of linear equations. • To develop the mathematical skills for solving ordinary and partial differential equations. • To acquire knowledge about the concept of vectors in two-dimensional and three dimensional spaces.
Course Outcomes	**At the end of the course, the students will be able to** 1. (i) Understand the types of matrix and find eigen values, eigen vectors and inverse of the matrix. (ii) Solve the system of linear equations. 2. Apply transformation techniques to reduce quadratic form into canonical form. 3. Solve linear differential equations with constant and variable coefficients. 4. (i) Find the solution of differential equations by the method of variation of parameters. (ii) Solve simultaneous differential equations. 5. Understand the concepts of curvature and evolutes. 6. (i) Analyze the maxima and minima of a function (ii) Expand the function of two variables as Taylor's series and find the Jacobians. 7. Construct partial differential equations and find the solutions of non-linear partial differential equations of first order. 8. Apply the appropriate method to solve Lagrange's linear equations and solve linear partial differential equations with constant coefficients. 9. Know about gradient, directional derivative, solenoidal and irrotational of a vector function. 10. Apply the notions of vector calculus to verify Green's, Gauss divergence and Stoke's theorems.

Matrices

Basic concepts – Addition and multiplication of matrices – Orthogonal matrices – Conjugate of a matrix – Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem (without proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation – System of linear equations.

Ordinary Differential Equations

Introduction – Differential equations of first-order and first degree – Exact differential equations – Linear differential equations of second and higher order with constant co-efficient when the R.H.S is $e^{\alpha x}$, $\sin \alpha x$ or $\cos \alpha x$, x^n n>0, $e^{\alpha x} x^n$, $e^{\alpha x} \sin\beta x$, and $e^{\alpha x} \cos\beta x$ – Differential equations with variable co-efficients reducible to differential equations with constant co-efficients (Cauchy's form and Legendre's linear equation) – Method of variation of parameters – Simultaneous first-order linear equations with constant co-efficients.

Differential Calculus and Functions of Several Variables

Curvature – Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Involutes and evolutes – Taylor's series for a function of two variables – Maxima and minima of function of two variables – Constrained maxima and minima (Lagrange's method of undetermined multipliers) – Jacobians(Problems only).

Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Non-linear partial differential equations of first order (Type I – IV) – Solution of partial differential equations of first order – Lagrange's linear equations – Linear partial differential equations with constant coefficients.

Vector Calculus

Introduction – Gradient of a scalar point function – Directional derivative – Angle of intersection of two surfaces – Divergence and curl(excluding identities) – Solenoidal and irrotational vectors – Green's theorem in the plane –Gauss divergence theorem – Stoke's theorem(without proof) – Verification of the above theorems and evaluation of integrals using them.

Text book(s):

1. Kreyszig E, 'Advanced Engineering Mathematics', John Wiley and Sons (Asia) Limited, 9th Edition ,New Delhi, Reprint 2012.

Reference(s):

1. Grewal B.S, 'Higher Engineering Mathematics', Khanna Publishers, 43rd Edition, Delhi, 2013.
2. Bali N.P and Manish Goyal, 'A Text book of Engineering Mathematics', Lakshmi Publications Pvt Ltd, 9th Edition, New Delhi, 2014.

K.S. Rangasamy College of Technology – Autonomous								
40 PH 001 Solid State Physics								
Common to EC, EE & EI								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objective(s)	• To impart fundamental knowledge about conducting, superconducting, semiconducting, magnetic, dielectric and advanced materials. • To correlate the theoretical principles with application oriented studies.
Course outcomes	**At the end of the course, the students will be able to** 1. Recognize the electrical and thermal conductivity to analyze the properties of electrons in metals. 2. Recall superconductivity to understand the properties, the classification and the applications of superconducting devices. 3. Recall the fundamental concept of semiconductors and classify them based on structural arrangements, deduce the semiconductor parameters 4. Recognize Hall effect and employ Hall experiment to discriminate the semiconductor types. 5. Classify magnetic materials based on their properties 6. Employ magnetic materials to act as memory storage devices 7. Comprehend different types of polarization in dielectric and analyze dielectric material based on frequency, temperature and breakdown voltage. 8. Apply ferro and piezo electric material for research and industrial application. 9. Understand and apply the properties of metallic glasses, SMA, MEMS for research and industrial applications. 10. Understand the properties and preparation of nonmaterial's and its impact in research and industrial applications.

Conducting, Superconducting Materials and Devices

Introduction-Classical Free electron theory-verification of Ohm's law –Electrical Conductivity- Expression for electrical Conductivity-Thermal Conductivity-Expression for thermal Conductivity-Widemann Franz Law-Lorentz number –Advantages and drawbacks of classical free electron theory- superconductivity-Properties of Superconductors-Factors affecting superconducting phenomena – DC and AC Josephson effect –BCS theory-Type-I and Type-II superconductors-High TC Superconductors-Applications: SQUID, Cryotron, Magnetic Levitation.

Semiconducting Materials and Devices

Introduction-properties-Elemental and Compound Semiconductors-Intrinsic and Extrinsic Semiconductors-Properties-Carrier Concentration in intrinsic and Extrinsic semiconductors- electrical conductivity of a semiconductor- determination of band gap-Relation between electrical conductivity and mobility- Variation of Fermi level with Temperature and impurities-Hall effect-Hall Coefficient-Experimental Determination of Hall Coefficient- Applications-Semiconductor devices :LDR, Solar Cells

Magnetic Materials and Devices

Introduction-Classification of Magnetic materials-properties-Domain theory of ferromagnetism-Hystersis-Hard and Soft magnetic materials-Ferrites: Structure, preparation and applications-Applications: Charge coupled devices (CCD)-. Optical and magnetic data storage.

Dielectric Materials and Devices

Introduction-Polarization: Electronic, ionic, orientation and space charge-Frequency and Temperature dependence of polarization- Ferroelectric materials – classification- Piezoelectric materials- Applications of ferroelectric and piezoelectric materials-Breakdown mechanisms-Classification of insulating materials

Advanced Materials

Metallic glasses: preparation, properties and applications – Shape memory alloys (SMA):Characteristics, properties of NiTi alloy, application: MEMS – Nanomaterials: Properties- Top-down process: Ball Milling method – Bottom-up process: Vapour Phase Deposition method- Carbon Nano Tube(CNT): Properties, preparation by Electric arc method, Applications.

Text Book(s):

1	Rajendran V, 'Engineering Physics', TataMcGraw Hill, New Delhi, 2011
2	William D.Callister, 'Material Science and Engineering,' Wiley India, 2006

Reference (s) :

1	Charles Kittel, 'Introduction to solid state physics', Wiley Publications, 2006
2	Neil W.Ashcroft, N.David Mermin, 'Solid State Physics', Cengage Publications, 2011
3	S.O.Pillai, 'Solid State Physics', New Age International, New Delhi, 2005

K.S. Rangasamy College of Technology - Autonomous								
41 CH 007 Environmental Science and Engineering								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100
Objective(s)	• To help the learners to analyze the importance of ecosystem and biodiversity. • To familiarize the learners with the impacts of pollution, control and legislation. • To enlighten the learners about waste and disaster management. • To endow with an overview of food resources and human health. • To enlighten awareness and recognize the social responsibility in environmental issues.							
Course Outcomes	**At the end of the course, the students will be able to** 1. Recognize the concepts and issues related to environment and ecosystem. 2. Assess the importance of biodiversity 3. Analyze the source, effects, and control measures of pollution. 4. Imbibe the applications of Laws of environmental protection. 5. Appraise the methods of solid waste management. 6. Increase the awareness of disaster management and preparedness. 7. Instill the awareness on the impacts of food resources and its related problems. 8. Evaluate the problems related to population explosion and its related health issues. 9. Analyze the value of sustainable development. 10. Identify the issues related to environmental issues and civic responsibilities.							

Environmental Studies, Ecosystem and Biodiversity

Environment- Segment - Environmental studies - Scope and multidisciplinary nature - Need for public awareness - Environmental ethics- Ecosystem - Structure and function - Ecological succession. Biodiversity - Values of biodiversity - Endangered and endemic species - Hot spots - India a mega biodiversity nation - Threats - Impact of biodiversity loss - Conservation - In-situ and ex-situ - Case studies.

Environmental Pollution and Legislation

Pollution - Sources, effects and control measures - Air, water, soil, noise, thermal, nuclear and marine - Major polluting industries of India - Land degradation - Impacts of mining. Environmental legislation in India- Environment protection act - Air pollution, water pollution, wildlife protection and forest conservation - Case studies.

Waste and Disaster Management

Waste - Solid waste - Sources, effects and control measures - Management techniques - e-waste - Effluent water treatment - Radioactive waste and disposal methods. Disaster management - Earth quakes - Landslides - Floods - Cyclones - Tsunami - Disaster preparedness - Response and recovery from a disaster - Disaster management in India - Case studies.

Food Resources, Human Population and Health

World food problems - Over grazing and desertification - Effects of modern agriculture - Fertilizer – Pesticide - Problems, water logging and salinity. Population - Population growth and explosion - Population variation among nations. Human rights - Value education - Women and child welfare - HIV/AIDS - Role of IT in environment and human health - Case studies.

Social Issues and the Environment

Unsustainable to sustainable development - Use of alternate energy sources - Energy Conversion processes - Biogas - Anaerobic digestion - Production and uses - Water conservation - Rain water harvesting - Water shed management - Resettlement and rehabilitation of people - Deforestation - Green house effect - Global warming - Climate change - Acid rain - Ozone layer depletion - Waste land reclamation. Consumerism and waste products - Role of an individual in conservation of natural resources - Case studies.

Text book(s):

1	Tyler miller. G, 'Environmental Science', Cengage Publications, 13th Edition, Delhi, 2013.

Reference(s):

1.	Gilbert M.Masters and Wendell P. Ela,'Environmental Engineering and Science', Phi learning private limited, New Delhi, 3rd Edition, 2013. Learning private limited, New Delhi, 3rd Edition, 2013.
2.	Rajagopalan. R, 'Environmental Studies' Oxford University Press, New Delhi, 2nd Edition, 2012.
3.	Deeksha Dave and Katewa. S.S, 'Environmental Studies', Cengage Publications, 2nd Edition, Delhi, 2013.

K.S.Rangasamy College of Technology - Autonomous								
40 CS 001 Fundamentals of Programming								
Common to BT, CE, EC, EE, EI, TT, ME, MC &NST								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objective(s)	• To enable the students to provide comprehensive knowledge about the fundamental principles, concepts and constructs of modern computer programming • To enhance the competencies for the design, coding and debugging of computer programs. • To provide ample way to identify, formulate, and solve engineering problems.
Course Outcomes	**At the end of the course, the students will be able to** 1. Recognize the generation and application of computers 2. Analyze various problem solving techniques with categories of software 3. Recognize the concepts of tokens branching and looping statements 4. Affirm the concepts of arrays and strings 5. Identity the purpose of pointers with its associated features 6. Recognize the concepts of functions, recursion with its features 7. Comprehend basic concepts of structures and unions 8. Relate the concept of user defined data types and preprocessor 9. Annotate the concepts of console input and output features 10. Interpret the concept of file input and output features

Computer Fundamentals

Evolution of computers - Generations of computers - Applications of computers - Computer Memory and Storage – Algorithm – Flowchart - Pseudo code – Program control structures -Programming languages - Computer Software – Definition - Categories of Software.

Introduction to C

An Overview of C – Data types – Identifiers - Variables- – Type Qualifiers - Constants – Operators - Expressions – Selection statements – iteration statements – jump statements, Arrays: Introduction - Types – Initialization, Strings: Strings: Introduction - Arrays of Strings – String and Character functions.

Pointers and Functions

Pointers: Introduction - Pointer Variables - The Pointer Operators - Pointer Expressions - Pointers and Arrays - Generating a Pointer to an Array - Indexing Pointers Functions: Scope of a Function – Library Functions and User defined functions - Function Prototypes – Function Categorization - Function Arguments - Arguments to main function - The return Statement - Recursion - Passing Arrays to Functions – Dynamic memory allocation – Storage class Specifiers.

Structures, Unions, Enumerations, Typedef and Preprocessors

Structures - Arrays of Structures - Passing Structures to Functions - Structure Pointers - Arrays and Structures within Structures - Unions – BitFields - Enumerations - typedef – The preprocessor and comments.

Console I/O and File I/O

Console I/O: Reading and Writing Characters - Reading and Writing Strings - Formatted Console I/O, File I/O: Streams and Files - File System Basics - fread( ) and fwrite( ) - Random Access I/O - fprintf( ) and fscanf( ) - The standard streams.

Text book(s) :

1	Herbert Schildt, 'The Complete Reference C', 4th Edition, TMH.

Reference(s) :

1	Brian W. Kernighan and Dennis M. Ritchie, 'C Programming Language', Prentice-Hall.
2	E.Balagurusamy, 'Programming in ANSI C', TMH, New Delhi, 2002.

K.S.Rangasamy College of Technology - Autonomous								
40 EC 002 Electronic Devices								
Common to EC & EI								
Semester	**Hours/Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objective(s)	• This course provides a comprehensive introduction to the basic concepts and characteristics of the electronic devices like diodes and transistors. • This course is a prerequisite for the courses Electronic circuits, Digital electronics, Linear Integrated Circuits and Communication theory to be learnt in higher semesters.
Course Outcomes	**At the end of the course, the students will be able to** 1. Discuss the operational basics of semiconductor devices. 2. Explain the characteristics of PN junction diodes. 3. Describe the construction and working of bipolar junction transistor. 4. Discuss the characteristics of BJT in various configurations. 5. Explain the construction, operating principle and various configurations of FET. 6. Describe the construction and operating principle of MOSFET and know the applications of FET. 7. Paraphrase the construction, working and characteristics of special semiconductor devices and their applications. 8. Illustrate the characteristics of thyristors and know their applications. 9. Discuss the functioning of internal circuits of power supply. 10. Describe the working principle of SMPS

Semiconductor Diodes

Review of semiconductor Physics: Insulators, Conductors and Semiconductors–Semiconductor types – Law of Mass Action – Drift and Diffusion carriers- Semiconductor diode: VIcharacteristics - Switching characteristics – Temperature effects– Diode current equation – Ideal Versus Practical diode-Resistance levels– Diode equivalent circuits – Transition and diffusion capacitances– Diode specifications – Zener diodes .

Bipolar Junction Transistor

Transistor Construction–Operation– Common-Base configuration – Transistor amplifying action –Common-Emitter configuration – Common-Collector configuration – Limits of Operation-Specifications- Transistor as a switch.

Field Effect Transistors

Construction and characteristics of JFET– Transfer characteristics – FET Parameters and specifications– Depletion type MOSFET – Enhancement type MOSFET – MOSFET handling FET in CS, CD and CG Configurations –FET applications

Special Semiconductor Devices

Varactor Diode –Tunnel Diode–PIN Diode – Photodiodes–Photoconductive cell–photovoltaic cell–Solar cell–Photo transistors –Opto-isolators – Unijunction Transistor – SCR: Basic SCR operation-characteristics and ratings– SCR Applications–LASCR– TRIAC and DIAC– LED,LCD and CCD

Power Supplies

Half wave Rectification – Full wave Rectification – Filters – Zener diode voltage regulator – Discrete Transistor Voltage Regulation - IC Voltage Regulator - SMPS.

Text book (s) :

1	Anil K. Maini, Varsha Agrawal, 'Electronics Devices and Circuits', Wiley India Pvt.Ltd, 2012.
2	Robert L. Boylestad, Louis Nashelsky, 'Electronic Devices and circuit theory', Pearson Education, 11th Edition, 2013.

Reference(s) :

1	Jacob Millman, Christos C.Halkias, 'Electronic Devices and Circuits', Tata McGraw Hill Publishing Limited, 2012.
2	Sedra Smith, 'Micro Electronic Circuits', Oxford University Press, 6th Edition, 2011.
3	Ben G. Streetman and Sanjay Banerjee, 'Solid State Electronic Devices', Pearson Education, 6th Edition, 2011.

K.S.Rangasamy College of Technology – Autonomous								
40 PH 0P1 Physics Laboratory								
Common to CS,IT,EE, EC &EI								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	2	50	50	100
Objective(s)	• To give exposure for understanding the various physical phenomena in mechanics, optics, materials science and properties of matter • To correlate the theoretical principles with application oriented studies.							
Course Outcomes	**At the end of the course, the students will be able to** 1. Know the concept of parameters, such as stress, strain and elastic limit needed to achieve a given amount of deformation in the given material 2. Understand the concept of a wave encountering an obstacle (particle) that is comparable in size to its wavelength, undergoing scattering (diffraction) by particles and to apply it find the wavelength of light and the particle size 3. Understand the light gathering efficiency of optical fiber communication by finding the light launching parameters, acceptance angle and numerical aperture 4. Understand the role of valence band, conduction band and difference in their band gap energy in determining the conductivity of a semiconductor for semiconducting and opto-electronic device applications. 5. Understand the lagging of magnetisation behind the applied magnetic field (hysteresis behaviour) of a ferromagnetic material, the application being the ON/OFF switch in memory devices 6. Understand the phenomenon of interference of light between the two reflected lights from a flat (glass plate) and spherical surfaces (Plano-convex lens) that produces puddles of Newton's rings, the application of which is an accurate measure of the size of any hollows and heights on a surface by counting the rings and knowing the wavelength of the illumination 7. Understand the concept of refractive index that varies with the wavelength of the light and to know the dispersion of light due to refraction by a glass prism in optical device applications. 8. Know the concept of interference of light between two reflected lights from a thin air wedge. 9. Comprehend the diffraction property of light through a spectrometer grating element which yields the wavelength of mercury spectral lines 10. Apply the knowledge of semiconductor thin films in conversion of optical energy into electrical energy, the application being the photovoltaic solar cells employed as one of the potential and perennial renewable energy source							
S.No.	**List of Experiments**							
1.	Determination of Young's modulus of a cantilever (Pin & Microscope method).							
2.	Determination of wavelength of laser and particle size							
3.	Determination of acceptance angle and numerical aperture of an optical fiber.							
4.	Determination of band gap energy of semiconductor.							
5.	Study of characteristics of hysteresis curve (B-H curve) of a ferromagnetic material.							
6.	Determination of radius of curvature of a plano convex lens using Newton's rings.							
7.	Determination of dispersive power of a prism using spectrometer.							
8.	Determination of thickness of a thin wire by air wedge.							
9.	Determination of wavelength of mercury spectral lines using spectrometer grating element.							
10.	V-I characteristics of Solar cell.							
Lab Manual :								
1.'Physics Lab Manual', Department of Physics, KSRCT.								

K.S.Rangasamy College of Technology - Autonomous Regulation								
40 CS 0P1 Fundamentals of Programming Laboratory								
Common to BT, CE, EC, EE, EI, TT, ME, MC,&NST								
Semester	**Hours/Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	2	50	50	100

Objective(s)	• To enable the students to apply the concepts of C to solve basic problems • To apply the knowledge of library functions in C programming • To implement the concepts of functions, structures and enumerator in C • To implement the file handling operations through C
Course Outcomes	**At the end of the course, the students will be able to** 1. Perform basic calculations using MS-EXCEL. 2. Write a simple C program to read and display basic information. 3. Develop a C program using selection and iterative statements. 4. Demonstrate a C program to manage collection related data. 5. Interpret a C program to perform string manipulation functions. 6. Perform dynamic memory allocation using C. 7. Design and Implement different ways of passing arguments to functions. 8. Implement a C program to manage collection of different data using Structure or Enum. 9. Apply a C program to manage data using preprocessor directives. 10. Demonstrate a C program to store and retrieve data using file concepts.

LIST OF EXPERIMENTS

1. Implement basic calculations using MS EXCEL.
2. Implement a simple C program to read and display basic information.
3. Implement a C program using selection and iterative statements.
4. Implement a C program to manage collection related data.
5. Implement a C program to perform string manipulation functions.
6. Implement a C program to perform dynamic memory allocation.
7. Implement different ways of passing arguments to functions.
8. Implement a C program to manage collection of different data using Structure or Enum.
9. Implement a C program to manage data using preprocessor directives.
10. Implement a C program to store and retrieve data using file concepts.

Note: Programs specific to branches are to be taught and examined.

K.S.Rangasamy College of Technology – Autonomous

40 ME 0P1 Engineering Graphics Laboratory

Common to CS, EE,EC,IT,NST &EIE

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	2	50	50	100

Objective(s)	• To enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient • To impart the graphic skills for communicating concepts, ideas and designs of engineering products
Course outcomes	**At the end of the course the students will be able to** 1. Use the drawing instruments, drafting software and construct the conics 2. Draw the projection of points, straight lines and plane surfaces 3. Draw the projection of simple solids 4. Draw the true of section of solids 5. Develop the lateral surfaces of prism, pyramid, cylinder and cone 6. Convert the pictorial views in to orthographic views 7. Sketch the three dimensional view of solids given orthographic views.

Introduction to Engineering Drawing

Introduction to Drafting Software, Drawing Sheet Layouts - Title Block - Lines - Dimensioning, Construction of Pentagon, Hexagon, Conic Sections. Construction of Ellipse and Parabola (Eccentricity method only) with tangent and normal. Introduction to cycloid Involutes of square and circle.

Projection of Points, Lines and Planes

Projection of points, straight lines and plane surfaces in first quadrant (parallel to one plane and inclined to other), true length, true inclinations.

Projection of Solids

Projection of solids of Prisms, Pyramids, Cylinder and Cone using change of position method (axis is parallel to one plane).

Section of Solids

Section of solids of Prisms, Pyramids, Cylinder and Cone by cutting plane inclined to one reference plane (base is on HP and axis perpendicular to HP), true shape of section.

Development of Surfaces

Development of lateral surfaces of simple and truncated solids: Prisms, Pyramids and Cones with square hole perpendicular to the axis.

Orthographic Projection

Theory of projection - Terminology, Method of projection – Introduction of First angle and Third angle projection. Conversion of pictorial views into orthographic views.

Isometric Projection

Principles of isometric projection, Isometric scale - isometric projections of simple solids - Prisms, Pyramids and Cones.

Text book (s) :

1	Bhatt N.D., 'Engineering Drawing', Charotar Publishing House Pvt. Ltd., 49th Edition, Anand, Gujarat, 2006.
2	Venugopal K., 'Engineering Graphics', New Age International (P) Limited, 2002.

Reference(s) :

1	Kulkani D.M, Rastogi A.P, Sarkar A.K, 'Engineering Graphics with AutoCAD', PHI Learning Private Limited, New Delhi, 2009.
2	Natarajan K.V., 'A textbook of Engineering Graphics', Dhanalakshmi Publishers, Chennai, 2006
3	Shah M.B. and Rana B.C., 'Engineering Drawing', Pearson Education, 2005.

K.S.Rangasamy College of Technology – Autonomous								
40 EN 002 Communication Skills								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	50	50	100
Objective(s)	• To equip students with effective speaking and listening skills in English. • To help them develop soft skills and people skills which will make them excel in their jobs. • To enhance students' performance in placement interviews.							
Course Outcomes	**At the end of the course the students will be able to** 1. Look for specific details and overcome speech barriers. 2. Pick key points by listening and improve casual conversational skills. 3. Understand different forms of communication with differences among them. 4. Know about formal speech and descriptive techniques, and use specific words in specific contexts. 5. Fine tune language for different conversational contexts and purposes. 6. Learn telephone etiquette by using language for assent and dissent. 7. Understand grammatical structures, its technical aspects and usage 8. Use discourse markers, enhance punctuation and learn discourse coherence 9. Comprehend content, generate different forms of template and enhance reference skills 10. Construct well-knit documents for job readiness and career competence							

The Listening Process

Barriers in Listening - Listening to academic lectures - Listening to announcements at railway stations, airports, etc - Listening to news on the radio / TV - Listening to casual conversation - Listening to live speech

Suggested activities

Listening to casual conversations, talks, interviews, lectures, specific information relating to technical content, statistical information, retrieving information, gapped texts-listening comprehension through video clippings and lectures.

Nature of Communication

Stages of communication Channels of communication- Barriers to effective communication - Differences between spoken and written communication - Giving directions - Art of small talk-presentation skills - Taking part in casual conversation - Making a short formal speech-Describing people, place, and events.

Suggested activities

Motivating and conducting prepared speech – debate on topics of interest **-** conversation (dialogue based on particular situation by using pleasantries) – extempore - picture description (people, place, things and events)

Telephonic Conversational Skill

Using the telephone - Greeting and introduction - Making requests - Asking for permission, Giving / Denying permission - Giving information on the phone – Leaving messages on Answer Machines - Making / changing appointments - Making complaints – Reminding - Listening and Taking messages - Giving instructions & Responding to instructions

Suggested activities

Familiarizing the telephone etiquette and telephone jargon – use of role play cards – conversational practices – games for spelling out proper nouns, long words, numbers, etc., -- useful phrases for complaints or making appointments – providing the needed vocabulary and expressions for agreeing and disagreeing – video clippings of speeches to drill note taking – providing context for framing yes or no questions for making requests.

Remedial Grammar

Tenses - 'Do' forms – Impersonal Passive voice - Imperatives – using should form – Direct, Indirect speech – Discourse markers – SI Units - Numerical adjectives – Prepositions (intermediate level) - Phrasal verbs (usage)- Correct use of words - Use of formal words in informal situations - Commonly confused words – Editing.

Suggested activities

Providing various contexts to fill tense gaps (stories , demos, future plans etc.,) Technical context for impersonal passive structures – transformation drills for imperatives – elucidating suggestion and recommendation formats – contextual frames for preposition and phrasal verbs – editing exercises – standard paradigm for negative structures – use of SI units (25 common units to be taught) numerical adjectives in various contexts – providing examples and drill units for commonly confused words-exemplifying the structures for direct and indirect speech – monitoring the drill units for conversion of direct to indirect, imperatives to recommendations and vice versa – reinforcing skills for discourse markers.

Written Communication & Career Skills

Writing e-mails - Writing Reports – Lab Reports - Preparing Curriculum Vitae and cover letters - Facing an Interview - Flow Charts, Interpreting the data from Tables– Recommendations – Check List – Slide Preparation –Theme Detection – Deriving Conclusions from the passages – Situation Reaction Test – Statements - Conclusions-Statement and Courses of Action

Suggested activities

Deliberating the content, format and diction for drafting e-mails -- elucidating the structure and content for writing reports especially Accident and Lab Reports -- mentoring strategy to construe the difference between Résumé and CV , and preparing the wards for the recruitment -- building self confidence in facing an interview with flawless presentation and persuasion skills -- reinforcing the interpretative skills of transcoding flow charts and Tables by employing appropriate discourse markers -- inculcating the language and format of writing Recommendations and Checklists -- enforcing innovatively the Reasoning and Logical Detection in Verbal Ability for the effective equipment of grooming for the primary leg of the recruitment process.

Text book :

1.	Ashraf M Rizvi, 'Effective Technical Communication', Tata McGraw-Hill Publishing Company Ltd., 1st Edition, New Delhi, 2005.

Reference(s) :

1.	P.Kiranmai Dutt, Geetha Rajeevan and CLN.Prakash, 'A Course in Communication Skills', by Ebek – Cambridge University Press India Pvt. Ltd., 2008.
2.	B. Jean Naterop, 'Telephoning in English' – Cambridge University Press India Pvt.Ltd., 2007.
3.	Jack. C. Richards, 'New Interchange Services (Student's Book)' – Introduction, Level – 1, Level – 2, Level – 3, Cambridge University Press India Pvt.Ltd., 2007.
4.	R.S. Aggarwal, 'A Modern Approach to Verbal & Non – Verbal Reasoning',S.Chand & Company Ltd., New Delhi, Revised Edition, 2012.
5.	NPTEL Video Courses on Communication Skills.

K.S.Rangasamy College of Technology - Autonomous								
40 MA 003 Fourier Series and Transform Methods								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	50	50	100

Objective(s)	• To provide an overview of functions of complex variables which helps in solving many complex problems • To give an ability to apply Laplace transform technique for solving engineering problems • To apply Fourier series and Fourier transform for engineering discipline. • To acquire analytical skills in the areas of one dimensional and two dimensional boundary value problems.
Course Outcomes	**At the end of the course, the students will be able to** 1. Know about the construction of analytic and conjugate harmonic functions and their properties. 2. Employ conformal maps to determine images of curves and find the bilinear transformation. 3. Understand the concepts of Laplace transforms for some elementary functions, some special functions, periodic functions, derivatives and integrals. 4. Apply the techniques of inverse Laplace transform to solve linear ordinary differential equation and simultaneous differential equations. 5. Obtain the Fourier series expansion for the periodic function. 6. Understand the notions of half – range Fourier series and harmonic analysis. 7. Know about the procedure to find the solution of one-dimensional wave equation with zero or non-zero velocity. 8. Understand the procedure to find the solution of one-dimensional heat equation with steady state or unsteady state condition. 9. Apply Fourier transform technique and Parseval's identity for the continuous function. 10. Discuss the Fourier sine and cosine transforms and properties of Fourier transforms.

Complex Variables

Functions of a complex variable – Analytic function – Necessary conditions (Cauchy–Riemann equations) – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic function – Conjugate harmonic function – Construction of analytic function – Conformal mapping: w = z + a, az, 1/z and bilinear transformation.

Laplace Transform

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Derivatives and integrals of transforms – Initial and final value theorem – Transform of unit step function and Dirac's delta function – Transform of periodic functions. Inverse Laplace transform – Convolution theorem – Solution of linear ordinary differential equation with constant co-efficients and first order simultaneous differential equations with constant co-efficients.

Fourier Series

Dirichlet's conditions – Fourier series – Odd and even functions – Half range Fourier series – Root mean square value of a function – Parseval's identity – Harmonic analysis.

Applications of Partial Differential Equations

Classification of second order quasi - linear partial differential equations – Solution of one-dimensional wave equation – Solution of one-dimensional heat equation – Problems.

Fourier Transform

Fourier transform pair – Fourier transform of simple functions – Fourier sine and cosine transform – Properties – Convolution theorem – Parseval's identity – Problems.

Text book(s):

1	Kreyszig E, 'Advanced Engineering Mathematics', John Wiley & Sons (Asia) Limited, 9th Edition,New Delhi, Reprint 2012.

Reference(s):

1	Grewal B.S, 'Higher Engineering Mathematics', Khanna Publishers, 43rd Edition, Delhi, 2013.
2	Bali N.P and Manish Goyal, ''A Text book of Engineering Mathematics', Lakshmi Publications Pvt Ltd, 9th Edition, New Delhi, 2014.

K.S. Rangasamy College of Technology - Autonomous

40 CH 001 Engineering Chemistry

Common to EE, EC, CS, EI& IT

Semester	Hours / Week			Total hrs	Credit	Maximum marks		
	L	T	P	45	C	CA	ES	Total
II	3	0	0		3	50	50	100

Objective(s)

- To help the learners to analyze the hardness of water and its removal.
- To familiarize the learners with the basics of electrochemistry, its applications, corrosion and its control.
- To endow with an overview of batteries and fuel cells.
- To impart the knowledge of photochemistry and its applications.
- To enlighten the learners on polymers.

Course Outcomes

At the end of the course, the students will be able to

1. Recognize sources of water, quality parameter and hardness of water.
2. Analyze and appraise methods to overcome hardness.
3. Relate the basic tenets of electrochemistry to arrive at mathematical expression and outline its various applications.
4. Identify the types, mechanism, and factors influencing corrosion and describe its control measures.
5. Analyze the principle and applications of batteries.
6. Apply the knowledge of electro chemistry in fuel cells and working principle of solar battery.
7. Recall the laws of photochemistry and infer their applications.
8. Analyze the principle and applications of colorimeter and UV-VIS spectrophotometer.
9. Explain the basic concepts, characteristics of polymer and mechanisms of polymerization.
10. Discuss the preparation, properties and uses of select polymers.

Water Treatment

Sources of water and its properties - Water quality parameter (EPA) - Hard and soft water - Hardness of water - Types - Units of hardness - ppm and mg/L - Estimation of hardness - EDTA method - Boiler feed water - Boiler problems - Internal treatment - Carbonate, Phosphate and Calgon conditioning. External treatment - Zeolite and deionization process - Desalination - Reverse osmosis and Electro dialysis.

Electrochemistry and Corrosion

Basics of electrochemistry - Reversible and irreversible cells - Nernst equation (problems) - EMF - measurement - EMF series - Applications - Types of electrodes - Reference electrodes - Conductometric titration. Corrosion - Types - Galvanic and differential aeration corrosion - Mechanism (Dry and wet) - Factors influencing corrosion - Corrosion control - Cathodic protection - Corrosion inhibitors. Electroplating of nickel and chromium.

Batteries and Fuel Cells

Batteries - Characteristics - Primary and secondary batteries - Principle - Working - Charging and discharging - Applications of Laclanche cell - Alkaline battery - NICAD battery - Lithium battery - Lead acid battery - Nickel-metal hydride battery. Fuel cells - Types - Hydrogen - Oxygen fuel cell, PEFC and SOFC - Principle, operation and uses - Construction and applications of solar battery.

Photochemistry and Instrumental Methods of Analysis

Photochemistry - Lambert's law - Beer's Law - Quantum efficiency - Applications of photo chemistry - Photo electric effect - Definition - Jablonski diagram - Fluorescence - Phosphorescence - Chemiluminescence. Colorimeter and UV-Visible spectrophotometer - Principle, instrumentation and applications (Block diagram only).

Polymers

Introduction - Types of polymerization - Mechanism of polymerization - Free radical polymerization - Co-ordination polymerization - Properties of polymers - Tg, tacticity and degradation of polymers - Plastics - Thermo and thermosetting - Preparation, properties and uses of PE, PVC, PTFE, PMMA, epoxy resin, nylon 6,6 and bakelite. Basic materials and properties of LCD and LED.

Text book(s):

1. Vairam S 'Engineering Chemistry', Wiley India, Delhi, 2nd Edition, 2013.

Reference(s) :

1. Dara.S.S. 'A Text Book of Engineering Chemistry', S Chand & Co.Ltd., 2003
2. Bill Mayer F. W., 'Text Book of Polymer Science', Wiley - New York, 3rd Edition, 1991.
3. Jain and Jain, Engineering Chemistry, Dhanpat Rai Publishing Company Pvt. Ltd., 15th Edition, 2008, Delhi.

K.S.Rangasamy College of Technology – Autonomous

40 ME 001 Basics of Mechanical Engineering

Common to EC, CS, IT & NST

Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	50	50	100

Objective(s)	To impart knowledge on power plants, thermodynamics, heat transfer, IC engines, refrigeration and air-conditioning
Course Outcomes	**At the end of the course, the student will be able to** 1. Discuss on types of Fossil fuels and their use for power generation. 2. Discuss on renewable sources of energy and their application for power generation. 3. State the laws of thermodynamics and applied to open thermodynamic system. 4. Apply the second law of thermodynamics to heat engines and heat pumps. 5. Explain the modes of heat transfer. 6. Apply the principles of conduction in solving heat transfer problems 7. Explain the operation of Internal Combustion engine. 8. Describe fuel supply and injection system in an internal combustion engine. 9. Explain the components of refrigeration systems and its operation. 10. Demonstrate the principle of operation of air-conditioning systems.

Sources of Energy and Power Plants

Introduction – Energy- Classification of Energy Sources - Conventional Energy Sources: Working principle of Thermal, Gas, Diesel, Hydro-electric and Nuclear power plants. Non - Conventional Energy Sources: working principle of Solar, Wind, Tidal and Geothermal power plants.

Thermodynamics – Laws and Entropy

Basic concepts – Thermodynamic systems – Laws of Thermodynamics: Zeroth law of Thermodynamics, First law of thermodynamics - Steady Flow Energy Equation – Application of SFEE to nozzle, boiler, turbine and compressor (simple problems). Second law of Thermodynamics – cyclic heat engine, heat pump, Carnot cycle (simple problems), Entropy.

Heat Transfer

Introduction – Modes of Heat Transfer: Conduction, Convection and Radiation – Laws of Conduction - Types of Convection – Laws of Radiation – Radiation Shields - Fourier law of heat conduction in simple and composite wall geometrics, types of boundary and initial conditions – Fins: types – fin efficiency (simple problems).

Internal Combustion Engines

Introduction - working principle of petrol and diesel engines - two and four stroke cycle engines – Comparison of two and four stroke engine – Fuel supply system – Ignition system – Calculation of Mechanical and Brake thermal efficiency - Layout of Automobile Vehicle.

Refrigeration

Introduction – Terminology of Refrigeration and Air conditioning systems – working principle of vapour compression and absorption system – Layout of typical domestic refrigerator,

Air-Conditioning

Introduction – Types of Air conditioner: Window, Split and Central air conditioners – Calculation of CoP (simple problems).

Text Book(s):

1	Pravin Kumar, 'Basic Mechanical Engineering', Pearson India Education Services Pvt. Ltd, 1st Edition, Chennai, 2014.

Reference(s):

1	Arora, S. C., Domkundwar.S., 'A Course in Power Plant Engineering', Dhanpat rai & Co., New Delhi, 2014.
2	Cengel, YA and Boles, M.A, 'Thermodynamics: An Engineering Approach', Mc Graw-Hill; 4th edition, 2002.
3	Yunus A.Cengel, 'Heat Transfer: A Practical Approach', Mc graw-Hill, 2nd edition, 2002.
4	V.Ganesan ,'Internal Combustion Engines', Tata Mc Graw-Hill Education, 2002.
5	Arora.C.P., 'Refrigeration and Airconditioning', Tata McGraw Hill Education Pvt. Ltd., 3rd Edition, New Delhi, 2008.

K.S.Rangasamy College of Technology - Autonomous Regulation

40 CE 002 Fundamentals of Civil Engineering and Mechanics

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	50	50	100

Objective(s)

- To impart the fundamental knowledge about building materials and building components.
- To study the basics of engineering mechanics which includes statics, dynamics, mechanics of solids and fluids

Course Outcomes

At the end of the course, the students will be able to

1. Identify the construction materials required and describe its uses.
2. Discuss the Objective(s) and types of surveying.
3. Identify and explain the substructure of building.
4. Identify and explain the superstructure of building.
5. Apply the laws of mechanics.
6. Illustrate the free body diagram of a system and calculate displacement velocity and acceleration of particles.
7. Compute the centroid and first moment of area of various sections.
8. Apply the parallel and perpendicular axis theorem to find out the moment of inertia of various sections.
9. Recall the properties and application of fluids.
10. Describe the basic fluid – flow properties and losses in pipes.

Introduction and Civil Engineering Materials

Introduction – Construction Materials – Classification – Uses –Requirements:- – Bricks-stone – Cement – Sand – Concrete – Steel Sections, Surveying – Objective(s) and Types.

Building Components and Structures

Components: – Selection of site for building- Substructure- Bearing capacity of soil - Requirement of good foundation– Types of foundation- Superstructure– Technical terms: - Types – Brick masonry – Stone masonry.

Statics and Dynamics of Particles

Introduction to Mechanics - Laws of Mechanics – Lame's theorem - Parallelogram law of forces - System of forces - Free body diagram – Displacement – Velocity - Acceleration and their relationships.

Mechanics of Solids

Determination of areas – First moment of area and the centroid of section - Second moment of area - Rectangle, circle, triangle by integration – T section, I section and angle section by using standard formula - Parallel axis theorem and Perpendicular axis theorem.

Mechanics of Fluids

Introduction – Application of Fluid Mechanics – Fluid Properties – Pascal's Law – Law of Hydrostatics – Euler's Equations – Bernoulli's Equation – Losses in Pipes.

Text book (s) :

1. M.S. Palanichamy, 'Basic of Civil Engineering' Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. Kottiswaran.N, 'Engineering Mechanics – Statics and Dynamics', Sri Balaji Publications, Coimbatore, 2006.
3. Bansal R.K, 'Fluid Mechanics and Hydraulic Machines', Laxmi Publications, New Delhi, 2010.

Reference(s) :

1. Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain ' Basic Civil Engineering', Laxmi Publication, New Delhi, 2010.
2. Bansal, R.K., 'Engineering Mechanics', Laxmi Publications Private Ltd, New Delhi, 2008.
3. Rajput. R.K, 'A text Book of Fluid Mechanics', S. Chand and Company Ltd, New Delhi, 2008.

K.S.Rangasamy College of Technology - Autonomous								
40 EE 004 Electric Circuit Theory								
Common to EE,EC& EI								
Semester	**Hours/ Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	50	50	100

Objective(s)	• To calculate the branch current, node voltage and power of series, parallel and series- parallel combination of DC & AC circuits by applying circuit laws and theorems. • To draw the phasor diagram and determine the Impedance, Admittance, Power and Power factor of single phase AC series RL, RC and RLC circuits, and three phase AC circuits. • To calculate the z,y,h and ABCD parameters of electrical networks by using circuits laws and identify their applications. • To determine the frequency response of AC Series and parallel circuits under resonance condition. • To determine the variation of output voltage with respect to frequency of tuned circuits by applying the principle of magnetic coupling. • To analyze the transient behavior of source free and source driven RL, RC and RLC circuits.
Course Outcomes	**At the end of the course the students will be able to** 1. Identify the elements of electric circuits and illustrate their properties 2. Apply ohm's law and Kirchoff's law to solve electric circuits 3. Analyze the steady state response of AC circuits with phasor diagram 4. Analyze the three phase AC circuits in star and delta connection. 5. Apply network theorems to reduce more complicated circuits and find the response of electric circuits. 6. Solve and express the given electrical circuit in terms of Z, Y, h and ABCD parameters and interrelate them. 7. Analyze the frequency response of electric circuits under resonance 8. Analyze the coupled and tuned circuits and identify their applications. 9. Analyze the transient and steady state behavior of source free RL, RC and RLC circuits. 10. Analyze the transient and steady state behavior of source driven RL, RC and RLC circuits.

Basic Circuit Analysis

Basic circuit elements - Ohm'sl aw -Kirchhoff's laws- series and parallel combination of resistances, inductances and capacitances- Energy Sources- voltage and current division - source transformation – star delta transformation. Mesh and Nodal analysis.

A.C Circuits

Impedance – admittance-steady state sinusoidal response of AC circuits - Phasor diagram – Harmonics.3 phase A.C circuits: Advantages of 3 phase AC systems – relationship between line and phase voltage and currents in star and delta connection –power measurements.

Network Theorems

Thevenin'sandNorton'stheorem–Superpositiontheorem–Maximumpowertransfer theorem–Reciprocity Theorem.

Two Port Networks

Two port networks: Z, Y, ABCD, h parameters and their inter relationships.

Resonance

Series and parallel Resonance, their frequency response – Quality factor and Bandwidth.

Coupled Circuits

Self and Mutual Inductance-coefficient of coupling, Tuned circuits, single tuned circuits.

Transients

Transient response of source free and source driven RL, RC and RLC circuits.

Text book (s) :

1.	Van Valkenburg M.E., 'Network Analysis', Prentice Hall of India Ltd, 3rd Edition,New Delhi, 1995,
2.	William Hayt, Jack Kemmerly, Steven Durbin,' Engineering Circuit Analysis', Tata McGraw-Hill,New Delhi,2007.

Reference(s):

1.	Sudhakar A, Shyam Mohan SP, 'Circuits and Networks: Analysis and Synthesis', Tata McGraw-Hill, NewDelhi,2007.
2.	Chakrabarti A,'Circuit Theory (Analysis andSynthesis)', Dhanpath Rai& Sons, NewDelhi,2010.
3.	Paranjothi S R,' Electric Circuit Analysis', New Age InternationalLtd., 4th edition, NewDelhi,2011.
4.	Joseph A.Edminister, MahmoodNahvi, 'Electric Circuits', Schaum's Series, Tata McGraw-Hill,NewDelhi,2010.

K.S. Rangasamy College of Technology - Autonomous								
40 CH 0P1 Chemistry Laboratory								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum marks**		
	L	T	P		C	CA	ES	Total
II	0	0	3	45	2	50	50	100

Objective(s)	• Test the knowledge of theoretical concepts. • To develop the experimental skills of the learners. • To facilitate data interpretation • To expose the learners to various industrial and environmental applications.
Course Outcomes	**At the end of the course, the students will be able to** 1. Estimate the hardness of water sample. 2. Estimate the alkalinity of water sample. 3. Estimate the chloride content in water sample. 4. Determine the dissolved oxygen in water. 5. Determine the molecular weight of polymer. 6. Estimate the mixture of acids by conductometry 7. Estimate the ferrous ion by potentiometry. 8. Estimate the strength of acid by pH metry and apply the knowledge of pH determination for health drinks, beverages, soil, effluent and other biological samples. 9. Estimateferrous ion by spectrophotometry. 10. Determine the corrosion by weight loss method.

List of Experiments

1. Estimation of hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of chloride content in water sample (Argentometric method)
4. Determination of dissolved oxygen in boiler feed water (Winkler's method)
5. Determination of molecular weight of a polymer by viscometry method.
6. Estimation of mixture of acids by conductometric titration.
7. Estimation of ferrous ion by potentiometric titration.
8. Estimation of HCl beverages and other biological samples by pH meter.
9. Estimation of iron content by spectrophotometry method.
10. Determination of corrosion by weight loss method.

Lab Manual:

1	Vairam S 'Engineering Chemistry', Wiley India, Delhi, 2nd Edition, 2013

Reference(s):

1.	Mendham. J, Denney. R.C, Barnes. J.D and Thomas. N.J.K, 'Vogel's text book of quantitative chemical analysis', 6th Edition, Pearson Education, 2004.

K.S.Rangasamy College of Technology – Autonomous

40 ME 0P2 Engineering Practices Laboratory

Common to ME,EE,CS,IT,EI &NST

Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	3	45	2	50	50	100

Objective(s)	To provide exposure to the students with hands on experience on various basic engineering practices in Mechanical Engineering
Course Outcomes	**At the end of the course, the student will be able to** 1. Make a model of fitting like Square and V fitting using fitting tools 2. Make a model of carpentry like Dovetail joint, and cross lap joint using carpentry tools 3. Fabricate the models of sheet metal in sheet metal shop. 4. Prepare joints by arc welding 5. Construct electrical wiring circuit and demonstrate in electrical wiring section 6. Construct the water pipe line in plumbing shop

Fitting

Safety aspects in Fitting, Study of tools and equipments, Preparation of models- Filing, Square, Vee.

Carpentry

Safety aspects in Carpentry, Study of tools and equipments, Preparation of models- Planning, Dove tail, Cross Lap.

Sheet Metal

Safety aspects in Sheet metal, Study of tools and equipments, Preparation of models- Scoope, Cone, Tray.

Welding

Safety aspects of welding, Study of arc welding equipments, Preparation of models -Lap, butt, T-joints. Study of Gas Welding and Equipments.

Electrical Wiring and Plumbing

Safety aspects of Electrical wiring, Study of Electrical Materials and wiring components, Wiring circuit for a lamp using single and stair case switches. Wiring circuit for fluorescent lamps, wiring circuit for 3 phase motor.

Study of plumbing tools, assembly of G.I. pipes/ PVC and pipe fittings, Cutting of threads in G.I.Pipes/PVC by thread cutting dies.

Lab Manual :

1. ‘Engineering Practices Lab Manual’, Department of Mechanical Engineering, KSRCT.

K.S.Rangasamy College of Technology - Autonomous								
40 MA 005 Linear Algebra and Numerical Methods								
Common to EC, EE & EI								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objective(s)

- To introduce the concepts of linear algebra in the fields of communication systems and signal processing.
- To describe the concepts of solving system of equations.
- To explain the method of finding Eigen values and Eigen vectors.
- To discuss the concepts of solving first order linear differential equations.
- To handle large datasets using interpolation.

Course Outcomes

At the end of the course, the students will be able to

1. (i)Prove algebraic statements about vector spaces, linear independent sets, bases, dimension and rank.
   (ii) Determine the bases, dimension and rank of vector spaces.
2. Know about the concepts of inner product spaces and applications to difference equations and Markov chains.
3. Understand some application problems of system of linear equations.
4. Find matrix form of the linear transformation and its geometric representation.
5. Employ different techniques to approximate roots of an algebraic and transcendental equation of higher degrees.
6. (i) Solve the system of linear equations using direct and indirect methods.
   (ii) Find the largest Eigen value of a matrix of order 2x2 and 3x3.
7. Compute intermediate values from a set of tabular values of equal and unequal intervals of a function by using interpolation techniques.
8. Apply different integration techniques to evaluate single and double definite integrals.
9. Compute point wise solutions for first order initial value problems using single step methods.
10. Compute point wise solutions for first order initial value problems using multi step methods.

Vector Spaces

Vector spaces and subspaces – Null spaces – Row and column spaces – Linear independent sets, basis and dimension of vector spaces – Rank, Inner product spaces, Length and Angle in inner product spaces, Change of basis – Applications to difference equations and Markov chains.

Linear Equations

Row reduction and Echelon forms – Solution of linear systems – Existence and uniqueness theorem – Vector equations – Linear combinations of vectors – Linear independence. Introduction to linear transformation – Matrix of a linear transformation – Geometric linear transformations of R^2 –Transformation from R^n to R^m – Linear models in network flow.

Solution Of Equations And Eigen Value Problems

Linear interpolation methods (method of false position) – Newton-Raphson method – Horner's method – Graeffe's root squaring method – Solution of linear system by Gaussian elimination and Gauss-Jordan methods – Iterative methods: Gauss-Jacobi and Gauss-Seidel methods – Review of Eigen values, Eigen vectors and orthogonalisation of symmetric matrix – Eigen value of a matrix by power method.

Interpolation And Integration

Lagrangian polynomials – Divided differences – Newton's forward and backward difference formulae – Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and three point Gaussian quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

Initial Value Problems For Ordinary Differential Equations

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

Text book(s):	
1	David C. Lay, 'Linear Algebra and its Applications', Pearson Education, 4th Edition, 2011.
2	Gerald C.F and Wheatley, P.O, 'Applied Numerical Analysis', Pearson Education (Asia), 7th Edition, New Delhi, 2007.
Reference(s):	
1	Howard Anton and Chris Rorres, 'Elementary Linear Algebra', 10th Edition, John Wiley & Sons, 7th Edition, 2010.
2	Gilbert Strang, 'Linear Algebra and Its Applications', Brooks/Cole/Cengage, 4th Edition 2006.
3	Kandasamy P, Thilagavathy K and Gunavathi K, 'Numerical Methods', S.Chand & Company Ltd, New Delhi, 3rd Edition, 2003.
4	Subramaniam N, 'Numerical Methods', SCM Publisher, Erode, 2010.
5	Vittal Rao, 'NPTEL Video Courses'.

K.S. Rangasamy College of Technology - Autonomous								
40 CS 003 Data Structures								
Common to CS,IT,EE,EC,EI								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	50	50	100

Objective(s)	• To choose the appropriate data structure for a specified application • Design and implement abstract data types such as linked list, stack , queue and trees • Demonstrate various sorting , searching and graph algorithms
Course Outcomes	**At the end of the course, the students will be able to** 1. Express the concept of List ADT and its implementations 2. Describe the operations of Stack and Queue ADT and its applications 3. Compare the concept of Binary, Binary Search and AVL Trees with its operations 4. Gain the knowledge of Splay ,B-Trees and B+ Trees 5. Apprise the various Hashing techniques 6. Review various implementations and operations of Priority Queue 7. Recognize the concept of Sorting ,Searching and its types 8. Employ various Internal and External sorting techniques 9. Apply Shortest Path and Minimum Spanning Tree algorithms 10. Illustrate the concept of Depth First Search and Biconnectivity

Lists, Stacks And Queues

Abstract Data Type (ADT) – The List ADT – The Stack ADT – The Queue ADT

Trees

Preliminaries – Binary Trees – The Search Tree ADT – Binary Search Trees – AVL Trees – Tree Traversals – Splay Trees – B – Trees –B+Trees.

Hashing And Priority Queues (Heaps)

Hashing – Hash Function – Separate chaining – Open addressing – Rehashing – Extendible hashing – Priority Queues (Heaps) – Model – Simple Implementations – Binary Heap – Applications of Priority Queues – d - Heaps.

Sorting and Searching

Preliminaries – Insertion Sort – Shellsort – Heapsort – Mergesort – Quicksort – External Sorting –Searching: Sequential search- Binary Search –Hashed list searches

Graphs

Definitions – Topological Sort – Shortest-Path Algorithms – Unweighted Shortest Paths – Dijkstra's Algorithm – Minimum Spanning Tree – Prim's Algorithm, Kruskal's Algorithm – Applications of Depth-First Search – Undirected Graphs – Biconnectivity.

Text book:

1	M. A. Weiss, 'Data Structures and Algorithm Analysis in C', Pearson Education Asia, 2nd Edition, 2008.

Reference(s) :

1.	Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, 'Data Structures using C', Pearson Education Asia, 2009.
2.	Rajesh K.Sukla,' Data structure using C & C++', Wiley India, 2012.

K.S.Rangasamy College of Technology–Autonomous								
40 EE 006 Electrical Technology								
B.E. Electronics and Communication Engineering								
Semester	**Hours/Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	50	50	100

Course Objectives	• To illustrate the operation and performance of DC machines by drawing the characteristic curves. • To deduce the equivalent circuit and determine the regulation and efficiency of a single phase transformer. • To explain the working principle of single phase and three phase induction motor. • To determine the voltage regulation of synchronous machines from its working principle. • To describe the construction and principle of operation of various special machines with its Characteristics
Course Outcomes	At the end of the course, the students will be able to 1. Illustrate the operating principle of DC generator and their performance characteristics. 2. Explain the working principle of DC motor and classify the torque production in dc motor. 3. Elucidate the working principle and performance characteristics of single phase transformer. 4. Discuss the operating principle of various special purpose transformers. 5. Understand the working principle of three phase and single phase Induction Motors. 6. Determine the performance of three phase induction motor under various loads and unload conditions. 7. Analyze the speed control techniques of three phase induction motor. 8. Identify the various parts of synchronous machines and explain its operating principle with the EMF equation. 9. Explain the construction and operation of special electrical machines. 10. Describe the Structure of power system and identify the power Quality issues.

D.C. Machines

D.C Generator- Principle of operation- EMF equation –Types –series, shunt & compound-Characteristics of series, shunt and compound generators.

D.C Motor – Principle of operation of D.C. motor – Back EMF-Torque Equation- Characteristics of shunt series and compound motors- Starting of D.C. motors- Speed control of D.C. motors.

Transformers

Constructional details–Principle of operation–EMF equation–Voltage Transformation ratio– Transformer on no load – Transformer on load – Equivalent circuit – Regulation – CT, PT, Pulse transformers.

Induction Motors

3 phase Induction motors-Construction –Principle of operation–Equivalent circuit–Torque speed characteristics– speed control-starting-star delta starter, singlephase Induction motors – Double field revolving theory –capacitor start and run motor, shaded pole motor.

Synchronous Machines

Synchronous machines-Construction-principle of operation-types–cylindrical-salient pole-Induced EMF– Voltage regulation: EMF method.

Special Machines

Stepper motor-types-permanent magnet stepping motor – permanent magnet DC motor –switched reluctance motor-.linear Induction motor (construction and working principle only)

Power Systems and Power Quality

Power System: Structure of power system – Generation system – Transmission System – Distribution system – Power system protection- House wiring – Wiring material and Accessories – layout – Earthing – Lightning Arrestor – UPS – Energy Conservation – Power quality-definition-Transients-Voltage sag-Voltage swell -Harmonics.

Textbook(s):

1	B.L.Theraja and A.K.Theraja, 'A text book of Electrical Technology-Volume II (AC&DC Machines)',S.Chand & Company Ltd., New Delhi, 2005.
2	Roger C.Dugan and Mark.F.McGranaghan, 'Electrical Power systems Quality' Tata McGraw Hill, Second edition, 2008.

Reference(s):

1	D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill publishing company ltd, Second edition, 2002.
2	C.L. Wadhwa, 'Electrical Power Systems', Wiley eastern ltd India, 1985.
3	V.K Mehta and Rohit Mehta, ' Principle of Electrical Engineering', S.Chand & Company,2008

K.S.Rangasamy College of Technology – Autonomous

40 EC 003 Digital Principles and System Design

Common to CS, EC, IT, EE& EI

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objective(s)	• To introduce number systems and codes, basic postulates of Boolean algebra and show the correlation between Boolean expressions. • To design and analyse combinational circuits and sequential circuits. • To introduce the concept of memories and programmable logic devices.
Course Outcomes	**At the end of the course, the students will be able to** 1. Explain the fundamentals of numbering system, Binary arithmetic and codes 2. Apply the Boolean laws and reduce the Boolean functions using K-map. 3. Implement the Boolean functions using logic gates. 4. Design the combinational logic circuits 5. Discuss the basics of flip flops and realize one flip flop from other flip flop 6. Design the clocked sequential circuits 7. Analyse the asynchronous sequential circuits. 8. Design the fundamental mode circuits. 9. Discuss the operation of various memory devices and their applications. 10. Describe the operation of programmable logic devices and implement combinational logic using PLDs.

Number Systems

Review of Binary, Octal and Hexadecimal Number Systems –Conversion methods – complements – signed and unsigned Binary numbers. - Binary codes: Weighted and non Weighted codes - ASCII – Error detecting code –Boolean postulates and laws – De-Morgan's Theorem - Boolean function - Minimization of Boolean expressions – Sum of Products (SOP) – Product of Sums (POS)- Canonical forms — Karnaugh map Minimization – Don't care conditions.

Logic Gates & Combinational Circuits

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR - Implementations of Logic Functions using gates, NAND – NOR implementations – TTL and CMOS Logic families and their characteristics –Tristate gates.

COMBINATIONAL CIRCUITS: Design procedure – Adders - Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor - BCD adder - Magnitude Comparator – Multiplexer / Demultiplexer - encoder / decoder – parity checker – code converters: binary to gray, gray to binary, BCD to excess 3 code. Implementation of combinational logic using MUX.

Sequential Circuits

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation – Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – Asynchronous / Ripple counters – Synchronous counters – Modulo – n counter – Classification of sequential circuits – Moore and Mealy machines – Analysis of clocked sequential circuits: state equation - State table – State diagram – State reduction & assignment - Register : shift registers - Universal shift register– Shift counters.

Asynchronous Sequential Circuits

Analysis procedure – Transition table - Flow table – Race conditions -Design of fundamental mode circuits – Primitive flow table – Reduction of state and flow table – Race free state assignment - Hazards: Static – Dynamic – Essential – Hazards elimination.

Memory Devices

Classification of memories : ROM - PROM – EPROM – EEPROM – EAPROM, RAM – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices : Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL.

Text book(s):

1	M. Morris Mano, Michael D. Ciletti, 'Digital Design', 5th Edition, Pearson Education, New Delhi, 2012.

Reference(s) :

1	Anand Kumar, 'Fundamentals of Digital Circuits', 3rd Edition, Prentice Hall, 2014.
2	Donald P.Leach and Albert Paul Malvino, Goutam Saha, 'Digital Principles and Applications', 7th Edition, Tata McGraw-Hill, New Delhi, 2010.
3	S. Salivahanan and S. Arivazhagan, 'Digital Circuits and Design'3rd Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2009.
4	John F.Wakerly, 'Digital Design: principles and practices', 4th Edition, Pearson Education, 2008.
5	Charles H.Roth, 'Fundamentals of Logic Design', 5th Edition, Brooks/cole, 2004.
6	John .M Yarbrough, 'Digital Logic Applications and Design', 1st Edition, Nelson Engineering, 2006.

K.S.Rangasamy College of Technology - Autonomous								
40 EC 301 Electronic Circuits I								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	50	50	100

Objective(s)	• To design and analyze various types of filters • To design and analyze small signal single stage amplifiers • To analyze the performance of multistage amplifiers
Course Outcomes	**At the end of the course, the students will be able to** 1. Design and analyze constant k filters 2. Design and analyze m- derived filters 3. Design and analyze transistor biasing circuits 4. Design and analyze the appropriate biasing circuits for FET 5. Design and analyze BJT single stage amplifier 6. Design and analyze FET single stage amplifiers 7. Outline the concept of multistage amplifiers and the parameters involved 8. Analyse the performance of differential amplifier 9. Distinguish high frequency and low frequency analysis of BJT 10.Distinguish high frequency and low frequency analysis of FET

Filters

Parameters-Classification of filters- Basic filter networks –Constant k filters – m-Derived filters.

Transistor Biasing

Transistor Biasing: Need for biasing – Operating Point – Different types of BJT biasing: Fixed bias, Emitter bias, Voltage divider bias, Collector feedback bias – BJT as constant current source – Stabilization of Q-point and stability factor – Bias compensation: Diode, Thermistor & sensistor compensation – Thermal runaway – FET biasing: Fixed bias, Self-bias, Voltage divider bias – FET as a Voltage Variable Resistor–MOSFET biasing.

Small Signal Analysis Of Amplifiers

CE,CB and CC amplifiers – General frequency considerations– Transistor hybrid model – Miller's theorem – Analysis of a transistor amplifier using complete h - parameter model – Analysis of transistor amplifier configurations using simplified h- parameter model – Comparison of CE,CB and CC amplifiers-Low frequency model of a FET – CS, CG and CD amplifiers.

Multistage Amplifiers

Cascading amplifiers - Darlington Pair –Bootstrapped Darlington amplifier– Cascode amplifier- BJT Differential amplifier - Small signal operation-Non ideal characteristics - Differential amplifiers with active load.

Frequency Response of Amplifiers

Frequency Response Of Amplifiers: Low frequency analysis of amplifiers to obtain lower cut off frequency - Hybrid – π equivalent circuit of BJT – Miller effect capacitance – High frequency analysis of BJT amplifiers to obtain upper cut off frequency – Gain-bandwidth product – High frequency equivalent circuit of FET – High frequency analysis of FET amplifiers– Multistage frequency Effects – Amplifier rise time and sag and their relation to cut off frequencies.

Text book(s):

1	Robert L. Boylestad , Louis Nashelsky, 'Electronic Devices and Circuit Theory', 11th Edition, Pearson,
2	Anil K. Maini, Varsha Agrawal, 'Electronics Devices and Circuits', Wiley India Pvt.Ltd, 2012.

Reference(s) :

1	David A. Bell, 'Electronic Devices and Circuits ',5th Edition, Oxford University press, 2008.
2	Sudhakar A, Shyam Mohan SP, 'Circuits and Networks: Analysis and Synthesis', Tata McGraw- Hill, New Delhi, 2007.
3	S.Salivahanan, N.Sureshkumar, 'Electronic Devices and circuits', 3rd Edition, McGraw-Hill, 2013.

K.S.Rangasamy College of Technology - Autonomous								
40 EC 302 Electromagnetic Fields								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objective(s)	• To introduce the basic concepts of electromagnetic theory. • To illustrate the behaviors of static and dynamic electromagnetic fields by vector differential and integral techniques. • To explore the behavior of electromagnetic wave using Maxwell's equations.
Course Outcomes	**At the end of the course, the students will be able to** 1. Describe the manipulation of vector quantities and coordinate systems 2. Apply vector integration and differentiation in different coordinate systems 3. Apply vector calculus to compute electrostatic field produced by static charge distributions in free space 4. Determine the mechanism by which materials influences an electric field 5. Compute the magnetic field due to different current distributions in free space 6. Explain magnetic field due to different materials 7. Apply Faraday's law to find the electromotive force 8. Derive displacement current using Maxwell's equation for time varying magnetic field 9. Solve Maxwell's equation and describe EM wave motion in unbounded media 10. Apply Maxwell's equation to identify the propagation of uniform plane wave in bounded media

Vector Analysis

Vector Algebra: scalars and vectors – Unit vector – Vector Addition and Subtraction – Position and Distance vectors – Vector multiplication – Components of a Vector – Coordinate Systems and Transformation: Cartesian, Cylindrical and Spherical Coordinates – Constant coordinate Surfaces – Vector Calculus: Differential Length, Area and Volume – Line, Surface and Volume Integrals – Del Operator – Gradient of a Scalar – Divergence of a Vector – Divergence Theorem – Curl of a Vector – Stokes Theorem – Laplacian of a scalar – Classification of vector fields.

Electrostatics

Electrostatic fields: Coulomb's Law – Electric Field Intensity – Electric Fields due to Continuous Charge Distributions – Electric Flux Density - Gauss's Law – Applications of Gauss's Law – Electric Potential – Relationship between E and V – Electric Dipole and Flux Lines – Energy Density in Electrostatic Fields.

Electric Fields in Materials: Properties of Materials - Convection and Conduction Currents – Conductors – Polarization in Dielectrics – Dielectric constant and Strength – Linear, Isotropic and Homogeneous Dielectrics – Continuity Equation and Relaxation Time – Boundary Conditions – Poisson's and Laplace's Equations – Resistance and Capacitance.

Magnetostatics

Magnetostatic Fields: Biot-Savart Law – Ampere's Circuit Law – Applications of Ampere's Law – Magnetic Flux Density – Maxwell's Equations for Static EM Fields – Magnetic Scalar and Vector Potentials – Poisson's Equation.

Magnetic Fields in Materials: Forces due to Magnetic Fields – Magnetic Torque and Moment – Magnetic Dipole – Magnetization in Materials – Classification of Magnetic Materials – Magnetic Boundary Conditions – Inductors and Inductances – Magnetic Energy – Magnetic Circuits.

Maxwell's Equations

Faraday's Law – Transformer and Motional EMFs – Displacement Current – Maxwell's Equations in Integral and Differential forms – Time-Varying Potentials – Time-Harmonic Fields.

Electromagnetic Wave Propagation

Waves – Wave Propagation in Lossy Dielectrics – Plane waves in Lossless Dielectrics – Plane waves in Free space – Plane waves in Good Conductors – Power and the Poynting Vector – Reflection of a Plane wave at Normal Incidence – Reflection of a Plane wave at Oblique Incidence.

Text book(s):

1	Matthew N.O.Sadiku , 'Elements of Electromagnetics', 6th Edition , Oxford University Press , 2014.
2	William H.Hayt , John.A.Buck , 'Engineering Electromagnetics', 8th Edition, Tata McGraw-Hill, 2012.

Reference(s) :

1	John D.Kraus, 'Electromagnetics', 4th Edition, Tata McGraw-Hill International Edition, 1992.
2	E.C. Jordan & K.G. Balmain, 'Electromagnetic Waves and Radiating Systems', 2nd Edition, Prentice Hall, 2003, (Unit IV, V), Tata McGraw-Hill, 9th reprint.
3	K.A.Gangadhar, 'Field Theory', Khanna Publishers, New Delhi.
4	Narayana Rao, N, 'Elements of Engineering Electromagnetics', 6th Edition, Prentice Hall, 2004.

K.S. Rangasamy College of Technology – Autonomous								
40 CS 0P3 Data Structures Laboratory								
Common to CS,IT,EE & EC								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	2	50	50	100
Objective(s)	• To design and implement simple linear and non linear data structures • To strengthen the ability to identify and apply the suitable data structure for the given real world problem • To gain knowledge of graph applications							
Course Outcomes	**At the end of the course, the students will be able to** 1. Demonstrate the implementation of List ADT 2. Demonstrate the implementation of Stack ADT 3. Demonstrate the implementation of Queue ADT 4. Investigate Balanced Parenthesis and Postfix expressions with the help of Stack ADT 5. Implement Search Tree ADT 6. Demonstrate various collision resolution techniques in Hashing 7. Implement Internal sorting 8. Perform various Searching Techniques 9. Implement Shortest Path algorithm 10. Implement Minimum Spanning Tree algorithm							

1. Implementation of List Abstract Data Type (ADT)
2. Implementation of Stack ADT
3. Implementation of Queue ADT
4. Implementation of stack applications:
   (a) Program for ‘Balanced Paranthesis’
   (b) Program for ‘Evaluating Postfix Expressions’
5. Search Tree ADT
6. Develop a program for various collision resolution techniques in Hashing
7. Implementation of Internal Sorting
8. Develop a program for various Searching Techniques
9. Implementation of Shortest Path algorithm
10. Implementation of Minimum Spanning tree algorithm

K.S.Rangasamy College of Technology – Autonomous

40 EE 0P2 Electrical Technology Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	2	50	50	100

Objective(s)

- To determine or predetermine the internal and external characteristics of the given DC generators from the test data.
- To determine or predetermine the performance characteristics of the given DC motors from the test data.
- To determine or predetermine the regulation and efficiency of the given transformers from the test data.

Course Outcomes

At the end of the course, the students will be able to

1. Test and analyze the performance of DC Generators.
2. Test and analyze the performance of DC Motors.
3. Test and analyze the performance of transformer.
4. Control the speed of DC motor by applying different techniques.
5. Predetermine the regulation of alternators.
6. Test and draw the load characteristics of three phase induction motor
7. Predetermine the performance of the three phase induction motor.
8. Test and draw the performance of the single phase induction motor
9. Predetermine the performance of the single phase induction motor.
10. Simulate and Analyze the THD value of an electronic circuit.

LIST OF EXPERIMENTS

1. Open circuit and load characteristics of separately excited and self excited D.Cgenerator.
2. Determinations of performance characteristics of D.C. shunt motor.
3. Determination of performance characteristics of D.C. series motor.
4. Speed control of D.C. shunt motor operation of D.C. shunt motor above and below the rated speed.
5. Determination of efficiency and regulation of single phase transformer.
6. Predetermination of regulation of three phase alternator by EMF method.
7. Determination of performance characteristics of three phase induction motor.
8. Drawing the speed-torque characteristics of three phase induction motor using equivalent circuit.
9. Determination of performance characteristics of single phase induction motor.
10. Determination of THD value in electronic circuits by simulation.

Lab Manual:

'Electrical & Electronics Engineering Laboratory Manual', Department of EEE, KSRCT.

K.S.Rangasamy College of Technology – Autonomous

40 EC 3P1 Analog and Digital Electronics Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	2	50	50	100

Objective(s)	• To demonstrate the characteristics of Electronic Devices • To illustrate the working principle of rectifiers • To design combinational and sequential circuits
Course Outcomes	**At the end of the course, the students will be able to** 1. Demonstrate the characteristics of PN junction diode , Zener diode and SCR 2. Test the characteristics of Bipolar Junction Transistor in Common Emitter configuration and evaluate the h-parameters 3. Determine the characteristics of JFET and UJT 4. Determine the characteristics of photo diode and photo transistor 5. Test the rectifiers with and without filters 6. Test and simulate logic gates 7. Design, implement and simulate combinational circuits 8. Design and simulate Synchronous and Asynchronous sequential circuits 9. Develop an application using the concepts learned

LIST OF EXPERIMENTS

1. Characteristics of PN Junction diode , Zener Diode and SCR
2. Characteristics of BJT (Common emitter configuration) and Measurement of Hybrid parameters of the Transistor.
3. Characteristics of JFET and UJT
4. Characteristics of Photo Diode and Photo Transistor.
5. Half Wave Rectifier and Full Wave Bridge Rectifier.
6. a) Study of logic gates. b) Design and implementation of Adders and Subtractors using logic gates.
7. Design and implementation of 4 bit binary Adder/ subtractor using IC 7483.
8. Design and implementation of Multiplexer and De-multiplexer using logic gates and study of IC74150 and IC 74154.
9. Design and implementation of encoder and decoder using logic gates and study of IC7445 and IC74147.
10. Characteristics of SR, D, JK and T flip flops using logic gates and implementation of shift registers
11. Construction and verification of 4 bit ripple counter and Mod-10 Ripple counter.
12. Design and implementation of Asynchronous sequential circuit (Edge triggered T flip flop)

K.S.Rangasamy College of Technology - Autonomous

40 TP 0P1 Career Competency Development I

Common to all Branches

Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	2	30	0	100	00	100

Objective(s) To enhance employability skills and to develop career competency

Written Communication – Part 1

Usage of noun, pronoun, adjective (Comparative Forms), Verb, Adjectives, Adverb, Tenses, Articles and Preposition - Change of Voice - Change of Speech - Synonyms & Antonyms - One Word Substitution - Using the Same Word as Different Parts of Speech - Odd Man Out

Materials: Instructor Manual, Word Power Made Easy Book

Written Communication – Part 2

Analogies - Sentence Formation - Sentence Completion - Sentence Correction - Idioms & Phrases - Jumbled Sentences, Letter Drafting (Formal Letters) - Reading Comprehension(Level 1) - Contextual Usage -

Materials: Instructor Manual, Word Power Made Easy Book

Written Communication – Part 3

Jumbled Sentences, Letter Drafting (Formal Letters) - Foreign Language Words used in English - - Spelling & Punctuation (Editing)

Materials: Instructor Manual, News Papers

Oral Communication – Part 1

Self Introduction - Situational Dialogues / Role Play (Telephonic Skills) - Oral Presentations- Prepared -'Just A Minute' Sessions (JAM)

Materials: Instructor Manual, News Papers

Oral Communication – Part 2

Describing Objects / Situations / People, Information Transfer - Picture Talk - News Paper and Book Review

Materials: Instructor Manual, News Papers

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	50 Questions – 30Questions from Unit 1 & 2, 20 Questions from Unit 5, (External Evaluation)	50
2	Evaluation 2 Oral Communication 1	Self Introduction, Role Play & Picture Talk from Unit-3 (External Evaluation by English and MBA Dept)	30
3	Evaluation 3 Oral Communication 2	Book Review & Prepared Speech from Unit-4 (External Evaluation by English and MBA Dept)	20
		Total	**100**

Reference Books

1. Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note :

- Instructor can cover the syllabus by Class room activities and Assignments(5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 questions from Unit 1, 2 and Unit 5 and 5 questions from Unit 3 and 4
- Evaluation has to be conducted as like Lab Examination.

K.S.Rangasamy College of Technology - Autonomous								
40 MA 009 Statistics and Random Processes								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total**	**Credit**	**Maximum Marks**		
	L	T	P	**hrs**	C	CA	ES	Total
IV	3	1	0	60	4	50	50	100

Objective(s)

- To introduce the basic concepts of probability and random variable.
- To explain about standard distributions and random processes.
- To discuss about the concepts of spectral density.
- To analyse datasets by using different testing methods.

Course Outcomes

At the end of the course, the students will be able to

1. Understand the concepts of probability.
2. (i) Describe the properties of a random variable.
   (ii) *F*ind moments and moment generating function of a random variable*.*
3. (i) Find moment generating function, mean and variance of standard distributions.
   (ii) Understand the notions of stationary and ergodic random processes.
4. Explain Markov, Binomial, Poisson, Normal and Sine wave processes.
5. Discuss the properties of auto correlation and cross correlation.
6. Understand the relationship between spectral density and correlation function.
7. State and apply t, F and χ^2 tests for testing the hypothesis about parent population.
8. Apply ANOVA techniques to test the equality of means for more than two populations.
9. Know the components of time series and methods to measure the trend.
10. Apply suitable methods for measuring seasonal variations in time series.

Probability And Random Variable

Axioms of probability – Conditional probability – Total probability – Baye's theorem – Random variable – Probability mass function – Probability density functions – Properties – Moments – Moment generating functions and their properties.

Distributions and Classification Of Random Processes

Distributions: Mean, variance and moment generating function of Binomial, Poisson, Uniform and Normal distributions (excluding problems). Definitions and examples of first order, second order, strictly stationary, wide-sense stationary and ergodic processes – Markov process – Binomial, Poisson and Normal processes – Sine wave process.

Correlation and Spectral Densities

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

Testing of Hypothesis and Anova

Testing of hypothesis for mean, variance using t, Chi-square and F distributions –Tests for independence of attributes and Goodness of fit. Analysis of variance (ANOVA) – One-way classification – Two-way classification.

Time Series

Components of a time series – Method of least square – Parabolic trend – Exponential trend – Method of seasonal variations – Ratio to trend method – Ratio to moving average method – Link relative method.

Text book(s):

1	Veerarajan T., 'Probability, Statistics and Random process', Tata McGraw-Hill Publications, 2nd Edition, New Delhi, 2002
2	Arora P.N and Arora S, 'Statistics for Management', S. Chand & company Ltd, New Delhi, 2007.
3	Gupta S.C and Kapoor V.K, 'Fundamentals of Mathematical Statistics', Sultan Chand & sons, 11th Edition, New Delhi, 2014.

Reference(s):

1	Peebles Jr. P.Z, 'Probability Random Variables and Random Signal Principles', Tata McGraw-Hill Publications, 4th Edition, New Delhi, 2002. (Chapters 6, 7 and 8).
2	Miller I. and Freund J.E, 'Probability and Statistics for Engineers', Prentice Hall, 2010.
3	Subramaniam N, 'Probability and Random Processes', SCM Publishers, 2nd Edition, Erode.

K.S.Rangasamy College of Technology - Autonomous

40 EC 401 Electronic Circuits II

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	50	50	100

Objective(s)

- To analyze feedback amplifiers
- To design oscillators, wave shaping and multivibrator circuits
- To analyze the performance of power amplifiers
- To familiarize MOSFET amplifiers

Course Outcomes

At the end of the course, the students will be able to

1. Describe the concepts and characteristics of negative feedback amplifiers
2. Analyze the effects of negative feedback on amplifier circuits
3. Design and analyze RC oscillator circuits
4. Design and analyze LC & crystal oscillator circuits
5. Discuss the operation of wave shaping circuits
6. Design and construct multivibrator circuits
7. Describe the working principle of power amplifiers
8. Compare the performance of various power amplifiers
9. Analyze MOSFET small signal amplifiers
10. Distinguish high frequency and low frequency response of MOS amplifier

Feedback Amplifiers

Concept of feedback- Topological classification : Voltage series, Voltage shunt, Current series, Current shunt - Effect of feedback on gain, stability, distortion, bandwidth, input and output impedances – Practical feedback amplifier circuits and their analysis –Multistage feedback amplifier.

Oscillators

Barkhausen criterion for sustained oscillations - RC oscillators : RC phase shift oscillator , Wein bridge oscillator - Resonant circuit oscillators : Tuned drain and Tuned collector oscillator - LC oscillators: Hartley, Colpitts, Clapp– Crystal oscillators and frequency stability.

Wave Shaping and Multivibrator Circuits

RL and RC Integrator and Differentiator circuits – Clipper and Clamper circuits – Voltage doubler, tripler and quadrupler circuits – Multivibrators: Design of astable, monostable and bistable multivibrators using transistors – Schmitt trigger circuit.

Power Amplifiers

Classification of amplifiers (Class A, B, AB, C&D) – Class A direct coupled and transformer-coupled power amplifiers– Class B complementary-symmetry and push-pull power amplifiers – Calculation of power output, efficiency and power dissipation– Crossover distortion and its elimination – Power transistor and heat sinking.

MOSFET Amplifiers

Small signal analysis of Common source, Common gate, Common drain and Differential amplifier- MOSFET internal capacitances and high frequency model-Frequency response of Common source amplifier and Differential amplifier.

Text book(s):

1. Adel S.Sedra, Kenneth C. Smith, 'Micro Electronic Circuits' 6th Edition, Oxford University Press, 2010.
2. Robert L. Boylestad, Louis Nashelsky, 'Electronic Devices and Circuit Theory', 11th Edition, Pearson, 2013.

Reference(s) :

1. Anil K. Maini, Varsha Agrawal, 'Electronics Devices and Circuits', Wiley India Pvt.Ltd, 2012.
2. Behzad Razavi, 'Design of Analog CMOS Integrated Circuits', Tata McGraw-Hill, 2008.
3. S.Salivahanan, N.Sureshkumar, 'Electronic Devices and Circuits', 3rd Edition, Tata McGraw-Hill, 2013.

K.S.Rangasamy College of Technology - Autonomous								
40 EC 402 Transmission Lines and Wave Guides								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	50	50	100

Objective(s)	• To introduce the concept of signal propagation through transmission lines • To describe signal propagation at Radio frequencies • To illustrate the waveguide Structures propagation in TE, TM or TEM modes
Course Outcomes	**At the end of the course, the students will be able to** 1. Describe the meaning and use of fundamental transmission line concepts: Traveling waves, wavelength and velocity of propagation. 2. Design common transmission line to achieve given characteristic impedance and attenuation. 3. Design simple matching networks using lumped elements, quarter - wave sections, and stubtuners. 4. Understand the Smith chart (generalized reflection coefficient plane) and its use for fundamental transmission line calculations 5. Analyse the electromagnetic fields configuration within the guides and general wave behaviors along uniform guiding structures 6. Describe the basic principles associated with waveguides (metallic and dielectric): mode (TM, TE, TEM), cutoff frequency, guided wavelength, velocities. 7. Design common waveguides (metallic parallel – plate and rectangular) to achieve specifications such as frequency range, attenuation. 8. Compute the cutoff frequency, phase constant, group and phase velocity, guiding wavelength for each rectangular waveguide mode. 9. Describe the concept of TE, TM & TEM waves in circular resonator 10. Evaluate the resonant frequency of rectangular cavity and the associated modal field.

Transmission Line Theory

Different types of transmission lines–Definition of Characteristic impedance -Definition of Propagation Constant. General Solution of the transmission line – physical significance of the equation and the infinite line – meaning of reflection coefficient – Wavelength and velocity of propagation - Waveform distortion – distortion less transmission line – The telephone cable – Inductance loading of telephone cables - Input impedance of lossless lines – reflection on a line not terminated in Zo - Transfer impedance – reflection factor and reflection loss.

The Line at Radio Frequencies

Constants for the line of zero dissipation – voltages and currents on the dissipationless line. Input impedance of the dissipationless line. Standing waves and standing wave ratio on a line – One eighth wave line – The quarter wave line and impedance matching – the half wave line – Single stub impedance matching on a line. The Smith Chart – Application of the Smith Chart – Conversion from impedance to reflection coefficient and vice - versa. Impedance to Admittance conversion and vice versa – single stub matching with the smith chart and double stub matching.

Guided Waves

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation – Attenuation of TE, TM and TEM waves in parallel plane guides – Wave impedances.

Rectangular Waveguides

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – Cutoff wavelength and phase velocity – Impossibility of TEM waves in waveguides – Dominant mode in rectangular waveguide – Attenuation of TE_{10} and TM_{11} modes in rectangular waveguides – Wave impedances – characteristic impedance – Excitation of modes.

Circular Wave Guides and Resonators

Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave Resonators - , Rectangular cavity resonators, circular cavity resonator, Q factor of a cavity resonator for TE_{101} mode.

Text book(s):

1. J.D.Ryder, 'Networks, Lines and Fields', 2nd Edition, Prentice Hall, 2010.

2.	E.C. Jordan and K.G.Balmain, 'Electro Magnetic Waves and Radiating System', 2nd Edition ,Prentice Hall, 2009.
Reference(s) :	
1	Ramo, Whineery and Van Duzer, 'Fields and Waves in Communication Electronics', 3rd Edition, John Wiley, 2008.
2	David M.Pozar, 'Microwave Engineering', 4th Edition, John Wiley, 2012.
3	David K.Cheng, 'Field and Waves in Electromagnetism', 2nd Edition, Pearson Education1989.
4	John Daniel Kraus, Keith R.Carver, 'Electromagnetics', 2nd Edition, Tata McGraw-Hill, 1975.

K.S.Rangasamy College of Technology - Autonomous

40 EC 403 Signals and Systems

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	50	50	100

Objective(s)

- To introduce the basic concepts, characteristics of continuous and discrete time signals and systems.
- To analyse signals and systems using various transforms in time and frequency domain.
- To realize systems using digital filters.

Course Outcomes

At the end of the course, the students will be able to

1. Describe the classification of signals with their properties.
2. Describe the classification of systems with their properties.
3. Characterise CT systems using convolution Integral and Differential Equation.
4. Characterise DT systems using convolution Sum and Difference Equation.
5. Apply Fourier series and Fourier transform to analyse CT and DT systems.
6. Apply Laplace transform to characterize CT Linear time invariant systems.
7. Illustrate sampling and reconstruction of signals.
8. Apply Z transform to Characterise DT Linear time invariant systems.
9. Analyse CT systems using Direct form structure.
10. Analyse DT systems using FIR & IIR structure.

Introduction To Signals and Systems

Classification of Signals –Periodic and aperiodic, energy and power, Deterministic and Random, Complex exponential and sinusoidal signals. signal operations – signal models – even and odd functions – systems –Classification of Systems- Continuous time and Discrete time – Stable and unstable - Linear and non linear – Time-variant and Time-invariant – Memory and memoryless – Causal and non causal – Invertible and noninvertible.

Time Domain Analysis of Continuous Time Signals and Systems

Convolution Integral - Propertiesof convolution Integral - graphical method- stability of LTICT Systems - Differential equation representation-Natural response, forced response, complete response. Convolution sum - properties of convolution sum - linear convolution – graphical method– stability of LTIDT Systems- Linear difference equation- natural response – forced response – complete response.

Transform Domain Analysis of Continuous Time Signals and Systems

Review of Fourier series - Fourier Transform – properties of Fourier transform - System function - system analysis using Fourier Transform – frequency response and impulse response. Laplace Transform, properties of Laplace Transform, poles and zeros, Inverse Laplace Transform – System function - Solution of differential equation using Laplace Transform.

Transform Domain Analysis of Discrete Time Signals and Systems

Sampling theorem – reconstruction of signal – Fourier series – DTFT - Inverse DTF - Properties of DTFT - System function - System analysis using DTFT - Frequency response and impulse response - Z transform - two sided and one sided Z transform - Properties of Z transform - Poles, zeros and ROC – Properties of ROC – Inverse Z transform, System function - System analysis using Z transform - frequency response and impulse response.

System Realization

Realization of continuous time systems – Direct form I and Direct form II, Realization of Discrete time systems – IIR system- Direct form I, Direct form II, cascade form, parallel form, FIR system – Direct form, cascade form, Linear phase FIR system.

Text book(s):

1	B P Lathi, 'Signal processing and Linear systems', Oxford University Press, 2010.
2	Ashok Ambardar, 'Analog and Digital Signal Processing', 2nd Edition, CL Engineering,1999.

Reference(s) :

1	John G.Proakis and Dimitris G.Manolakis, 'Digital Signal Processing, Principles, Algorithms and Applications', 4th Edition, Prentice Hall, 2009.
2	M.J.Roberts, 'Signals and Systems Analysis using Transform method and MATLAB', 2nd Edition, Tata McGraw-Hill, 2012.
3	Simon Haykin and Barry Van Veen, 'Signals and Systems', 2nd Edition, John Wiley & Sons, 2012.
4	Alan V.Oppenheim, Alan S.Willsky with S.Hamid Nawab, 'Signals & Systems', 2nd Edition, Pearson Education, 2013.

K.S.Rangasamy College of Technology – Autonomous

40 EC 404 Linear Integrated Circuits

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	50	50	100

Objective(s)

- To illustrate the basic principles characteristics of anop-amp
- To discuss the use of operational amplifier in various applications.
- To introduce the various special function ICs and their applications.

Course Outcomes

At the end of the course, the students will be able to

1. Explain the basic principles and characteristics of an Op-amp
2. Discuss the open and closed loop configurations of an Op - amp
3. Use operational amplifiers in circuits for various applications.
4. Analyze the operation of active filters.
5. Explain the working principle of different types of oscillators using op – amp.
6. Construct various comparator circuits using Op amp
7. Describe the concept of various data converters
8. Describe the function of special function ICs
9. Discuss the applications of special function ICs.

Introduction to Operational Amplifiers

Operational amplifier – Block diagram, Schematic symbol, Integrated circuits – types, development, packages and power Supply Connection, Ideal Op Amp – Equivalent circuit, Voltage Transfer Curve; Open loop Op Amp configurations, Op amp with negative feedback - Voltage Series Feedback amplifier, Voltage Shunt Feedback Amplifier, DC Characteristics, AC Characteristics.

Op - Amp Applications

Op Amp applications – Summing, Scaling and Averaging Amplifier, Instrumentation Amplifier, Voltage to Current Converter, Current to Voltage Converter, Integrator, Differentiator, Op amp with diodes – Peak detector, Clippers, Clampers, Absolute value output circuit, Precision rectifier – Half Wave and Full Wave rectifiers, Log and Antilog amplifier, Analog Multiplier.

Active Filters and Oscillators

Active filters-Low Pass, high pass, Band Pass and Band Reject filters; Oscillators – Principles, Phase shift oscillator, Wein bridge oscillator, Quadrature Oscillator, Square wave generator, Triangular wave generator, Saw tooth wave generator.

Comparators and Convertors

Basic Comparator, Zero Crossing Detector, Window detector, Schmitt Trigger, Comparator Characteristics, Sample and hold circuit, Convertors- V/F Convertor, F/V Convertor, ADC/ DAC specifications, D/A Convertor – binary weighted resistor, R and 2R resistors; A/D Convertors – Successive approximation, single slope, dual slope and flash type ADC.

Specialized IC Applications

Switched capacitor filter, 555 timer – Astable multivibrator, Monostable multivibrator, applications; PLL – Block diagram, applications – Frequency multiplier, Divider, FSK demodulator, Frequency translation, AM detection, FM detection; Power amplifier, Voltage regulators – fixed, adjustable and switching regulators.

Text book(s):

1. Ramakant A., Gayakwad, 'Op – Amps and Linear Integrated Circuits', 4th Edition, Prentice Hall, 2013.
2. Sergio Franco., 'Design with Operational Amplifiers and Analog Integrated Circuits', 4th Edition, Tata McGraw-Hill, 2014.

Reference(s) :

1. D.Roy Choudry , Shail Jain , 'Linear integrated Circuits', 4th Edition, New Age International Pvt Ltd, 2012.
2. Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', 5th Edition, Wiley International, 2010.
3. J.Michael Jacob, 'Applications and Design with Analog Integrated Circuits', Prentice Hall, 1993.
4. K.R.Botkar, 'Integrated Circuits', 8th Edition, Khanna Publishers, 2010.

K.S. Rangasamy College of Technology - Autonomous								
40 CS 004 Object Oriented Programming								
Common to CS,IT,EC,EE,EI & MC								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	50	50	100

Objective(s)	• To enable the students to learn how C++ supports object Oriented properties • To create and use classes and objects for specific applications • To understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code
Course Outcomes	**At the end of the course, the students will be able to** 1. Recognize the principles of object-oriented problem solving and programming. 2. Review the essential features and elements of the C++ programming language 3. Implement the concept of class and objects 4. Comprehend the concept of constructors and destructors 5. Analyze the reusability through various types of Inheritance 6. Interpret the concept of operator overloading 7. Recognize the concept of dynamic memory allocation 8. Implement the concept of runtime polymorphism by using virtual functions 9. Identify the uses of generic programming and exception handling 10. Interpret the file operation concepts to manipulate the data

Introduction to C++ and Functions:

Evolution of C++ - The Object Oriented Technology - Disadvantages of Conventional Programming-Concepts of OOP - Advantages of OOP,Basics of C++:Structure of a C++Program- Streams in C++ and Stream Classes - Formatted Console I/O Operations-Bit Fields - Manipulators - User-defined Manipulators, C++ Declarations, Functions: L Values and RValues - Return by Reference - Returning more Values by Reference - Default Arguments -Constarguments - Inline Functions - Function Overloading.

Classes and Objects, Constructors and Destructors:

Classes in C++ - Declaring Objects- Access Specifiers and their Scope - Defining Member Functions - Static Members - Array of Objects - Constant object and Constant Member Functions - Object as Function Arguments -Friend Function and FriendClasses, Constructors and Destructors: Characteristics - Parameterized Constructors - Overloading Constructors - Copy Constructors - Dynamic Initialization Constructors – Destructors.

Inheritance, Operator Overloading and Type Conversion:

Inheritance: Reusability - Types of Inheritance - Object as Class Member, Operator Overloading: The Keyword Operator - Unary, Binary and Stream Operators Overloading- Constraint on Increment and Decrement Operators - Rules for Operator Overloading -Overloading using Friend Function -Type Conversion.

Pointers, Memory models, Binding and polymorphism:

Pointers: Pointer to Class - Pointer to Object –void, wild and this Pointers, Memory Models: Dynamic Memory Allocation - Heap Consumption - Object Address - Dynamic Objects, Binding: Binding in C++ - Pointer to Base and Derived class objects -Working with Virtual Functions - Pure Virtual Functions -Abstract Classes - Object Slicing - Virtual Destructor, Working with Strings.

Generic Programming with Templates, Exception Handling and Applications of Files:

Class and Function Templates -Overloading of Template Functions, Exception Handling: Principles of Exception Handling -try, catch and throw- Re-throwing Exception - Specifying Exception, Class Templates with Exception, File Stream Classes - Steps of File Operations - File Opening Modes - File Pointers and Manipulators - File Access - Command Line Arguments - Error Handling Functions.

Text book:

1	Ashok N. Kamthane, 'Programming in C++', Pearson, 2nd Edition, 2013.

Reference(s) :

1.	Herbert Schildt, 'The Complete Reference C++', 4th Edition, McGraw-Hill Education, 2013.
2.	BjarneStroustrup, 'The C++ programming language', Addison Wesley, 2013.
3.	Venugopal K.R., Rajkumar Buyya, 'Mastering C++', 2nd Edition, McGraw-Hill Education, 2013.

K.S.Rangasamy College of Technology – Autonomous

40 EC 4P1 Electronic Circuits Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	3	45	2	50	50	100

Objective(s)

- To design biasing circuits for BJT and MOSFET.
- To demonstrate the frequency response of BJT and FET amplifier.
- To illustrate the working principle of oscillators and wave shaping circuits.

Course outcomes

At the end of the course, the students will be able to

1. Design and implement BJT biasing circuits.
2. Design single stage amplifiers using BJT & FET and determine their frequency response.
3. Design and implement MOSFET biasing circuits and test MOS differential amplifier
4. Test the complementary symmetry push pull power amplifier to determine the output power and efficiency.
5. Design and implement the two stage RC coupled amplifier and determine its frequency response.
6. Design and implement the current series, voltage shunt feedback amplifiers and obtain their frequency response.
7. Design and implement Hartley and Colpitt's oscillators.
8. Construct and test wave shaping circuits.
9. Develop an application using the concepts learned.

LIST OF EXPERIMENTS

1. Study of different biasing circuits for BJT
2. Frequency response of CE and CC amplifiers
3. Study of JFET amplifier in voltage divider bias and Frequency response of common source JFET amplifier
4. Study of biasing circuit for MOSFET
5. Differential amplifier using MOSFET
6. Class B Complementary symmetry power amplifier
7. Two stage RC coupled amplifier
8. Series and Shunt feedback amplifiers
9. Design of Hartley and Colpitt's Oscillator
10. Clipper, Clamper, Integrator and Differentiator circuits

K.S.Rangasamy College of Technology – Autonomous

40 EC 4P2 Linear Integrated Circuits Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	3	45	2	50	50	100

Objective(s)

- To design and test the various circuits using Op-amp.
- To design and test the various circuits using 555 timer.
- To construct and test the phase locked loop and DC power supply.

Course Outcomes

At the end of the course, the students will be able to

1. Design and test op-amp as an amplifier with varying gain.
2. Design and test differentiator and integrator using op-amp.
3. Design and test an instrumentation amplifier using op-amp.
4. Design and test active filters.
5. Design and test various types of multivibrators using op-amp.
6. Design and test various types of oscillators using op-amp.
7. Design and test various types of multivibrators using 555 timer.
8. Determine the capture range and lock in range for a PLL.
9. Construct and test the DC power supply using LM317 and LM723.
10. Develop an application using the concepts learnt

LIST OF EXPERIMENTS

1. Inverting, Non inverting and differential amplifier
2. Integrator and Differentiator
3. Instrumentation amplifier
4. Active Low pass and Band pass filters
5. Comparators using op-amp - Schmitt Trigger
6. Waveform Generators using op-amp - Astable and Monostable
7. Phase shift and Wien bridge oscillators using op-amp
8. Astable and Monostable multivibrators using NE555 Timer
9. Characteristics of PLL
10. Applications of PLL - Frequency Multiplier
11. DC power supply using LM317 and LM723
12. Study of SMPS control IC SG3524 / SG3525

K.S. Rangasamy College of Technology – Autonomous

40 CS 0P4 Object Oriented Programming Laboratory

Common to CS,IT,EC,EE,EI & MC

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	3	45	2	50	50	100

Objective(s)

- To use object oriented programming language such as C++ and associated libraries to develop object oriented programs.
- To understand and apply various object oriented features such as inheritance, operator overloading and polymorphism to solve various computing problems using C++ language
- To apply exception handling and use built in classes from STL

Course Outcomes

At the end of the course, the students will be able to

1. Demonstrate the input and output operations using stream classes
2. Create a function to manage large amount of statements
3. Implement the concept of class and objects
4. Demonstrate the concept of constructors and destructors
5. Implement the concept of reusability using inheritance
6. Perform operator overloading and type conversion
7. Implement the concept of dynamic objects
8. Implement virtual function to handle function overriding
9. Demonstrate the concept of templates
10. Perform exception handling

LIST OF EXPERIMENTS

1. Construct a C++ program to manage the input and output operations using stream classes
2. Construct a C++ program to manage large amount of statements using functions
3. Design a C++ program to implement the concept of class and objects
4. Develop a C++ program to initialize the class members using constructors and destroy the objects by using destructor
5. Design a C++ program for reusability using inheritance
6. Write a C++ program to perform operator overloading and type conversion
7. Develop a C++ program to implement the concept of dynamic objects
8. Develop a C++ program to handle function overriding by using virtual function.
9. Develop a C++ program to allow functions and classes to operate with generic types using templates
10. Construct a class in C++ to handle predefined and user defined exceptions
11. Design a C++ program to perform various operations using STL

K.S.Rangasamy College of Technology - Autonomous								
40 TP 0P2 Career Competency Development II								
Common to All Branches								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	0	0	2	30	0	100	00	100
Objective(s)	To enhance employability skills and to develop career competency							

Written Communication – Part 3
Reading Comprehension Level 2 (Paraphrasing Poems) - Letter Drafting - Email Writing - Paragraph Writing - News paper and Book Review Writing - Skimming and Scanning - Interpretation of Pictorial Representations.
Practices: Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Editing
Materials: Instructor Manual, Word power Made Easy Book, News Papers

Oral Communication – Part 3
Self Introduction - Miming (Body Language) - Introduction to the Sounds of English - Vowels, Diphthongs & Consonants, Introduction to Stress and Intonation - Extempore - News Paper and Book Review - Technical Paper Presentation.
Material: Instructor Manual, News Papers

Verbal Reasoning – Part 1
Analogies - Alphabet Test - Theme Detection - Family Tree - Blood Relations (Identifying relationships among group of people) - Coding & Decoding - Situation Reaction Test - Statement & Conclusions
Material: Instructor Manual, Verbal Reasoning by R.S.Aggarwal

Quantitative Aptitude – Part 1
Problem on Ages - Percentages - Profit and Loss - Simple & Compound Interest - Averages - Ratio, Proportion
Material: Instructor Manual, Aptitude Book

Quantitative Aptitude – Part 2
Speed, Time & Work and Distance - Pipes and Cisterns - Mixtures and Allegations - Races - Problem on Trains - Boats and Streams
Practices : Puzzles, Sudoku, Series Completion, Problem on Numbers
Material: Instructor Manual, Aptitude Book

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	15 Questions Each from Unit 1, 3, 4 & 5 (External Evaluation)	60
2	Evaluation 2 Oral Communication	Extempore & Miming – Unit 2 (External Evaluation by English, MBA Dept.)	20
3	Evaluation 3 Technical Paper Presentation	Internal Evaluation by the Dept.	20
		Total	**100**

Reference Books

1. Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, 'Quantitative Aptitude', TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note :

- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 questions from Unit 1, 3, 4 and Unit 5 and 5 questions from Unit 2.
- Evaluation has to be conducted as like Lab Examination.

K.S.Rangasamy College of Technology – Autonomous								
40 EE 007 Control Systems Engineering								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objective(s)	• To learn the concepts of models, transfer function, block diagram and signal flow graph • To gain adequate knowledge in the time response of systems, steady state error and construction of the Root locus • To define the time, frequency domain specifications and analyse the stability of the system • To derive the transfer function of compensators namely lag, lead, lag-lead and draw their frequency response characteristics • To understand the methods of state space representation of discrete time systems and transfer function
Course Outcomes	**At the end of the course, the students will be able to** 1. Identify the basic elements and derive the transfer function of a system 2. Compute the overall gain of a system represented by block diagram/signal flow graph 3. Analyse the time response of the system with different test inputs and determine the error coefficients 4. Analyse the stability of the system using Routh array and apply root locus technique to determine the stability of system 5. List the characteristics of a system in frequency domain 6. Analyse the performance of the system using frequency response plots 7. Design a suitable compensator for the given performance criteria using Bode plot 8. Analyse the stability of the system using Jury stability test 9. Formulate the state space model of a discrete time system 10. Examine the controllability and observability of a discrete time system

Systems and their Representation

Classification of control systems – open and closed loop systems- effect of feedback – Transfer function -Modeling of Mechanical systems- Electrical systems – analogous systems – Block diagram reduction techniques – Signal flow graphs- Transfer function of antenna azimuth position control system – human eye movement.

Time Response

Time response– Types of test input – First and Second order system response – Time domain specifications – Steady state error –static error coefficients –Routh Stability criterion – Root locus construction.

Frequency Response

Frequency response – Frequency domain specifications - Relationship between time & frequency response – Bode plot – Polar plot – Constant M and N circles.

Design of Compensator

Performance criteria – Lag, lead and lag-lead networks – Compensator design using Bode plot.

Stability Analysis of Digital Control Systems

Introduction to digital control systems-Impulse sampling and data hold-Reconstructing original signals from sampled signals-Pulse transfer function-Mapping between the s-plane and the Z-plane -Stability analysis of closed loop systems in the Z-Plane-Jury stability test-Bilinear transformation.

State Space Analysis of Digital Control Systems

State space representation of discrete time systems-Solution of discrete time state space equation –State transition matrix-Decomposition techniques- Controllability and Observability-Multivariable discrete time systems.

Text book(s):

1	I.J. Nagrath & M. Gopal, 'Control Systems Engineering', 5th Edition, New Age International Publishers, 2009.
2	Norman S.Nise, 'Control Systems Engineering', 6th Edition, John Wiley & Sons, 2013.
3.	K. Ogata, 'Discrete time control systems', 2nd Edition, Pearson Education, 2012.

Reference(s):

1	M. Gopal, 'Control Systems, Principles & Design', 3rd Edition, Tata McGraw Hill, 2011.
2	B.C. Kuo, 'Automatic Control Systems', 9th Edition, Wiley, 2011.
3	K. Ogata, 'Modern Control Engineering', 5th Edition, Pearson Education, 2011.
4	B.C.Kuo, 'Digital Control Systems', Oxford University Press, 2010.
5.	Gopal M. 'Digital Control and State Variable methods', 4th Edition, 1st Reprint, McGraw-Hill Education, 2013.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
40 EC 501 VLSI Design								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)	• To acquire basic knowledge on CMOS transistors • To describe the CMOS processing Technology • To analyse the characterisation of different VLSI circuits • To design and verify the digital circuits using HDL and system Verilog • To understand the basic concepts of PLDs and FPGAs
Course Outcomes	**At the end of the course, the students will be able to** 1. Know the basic concept of MOS transistor theory and determine the capacitance value for MOS transistor 2. Analyse the ideal, non-ideal I-V and DC transfer characteristics 3. Know the VLSI design flow and various fabrication processes 4. Understand the rules of layout diagram, stick diagram and enhancement techniques of CMOS 5. Analyse the static and dynamic power dissipation 6. Analyse the different CMOS circuit families 7. Acquire an understanding of the fundamental hierarchical modeling concepts, basic convention and Verilog constructs 8. Design and verify digital circuits using Verilog HDL and system Verilog 9. Understand the various FPGA Technologies 10. Understand the various FPGA architectures

Introduction to MOS Transistor Theory

MOS Transistors, CMOS Logic, Long channel I-V Characteristics, Simple MOS Capacitance Models, Detailed MOS Gate Capacitance Model, Detailed MOS Diffusion capacitance model, Non-ideal I-V effects, DC Transfer Characteristics.

CMOS Processing Technology

Design Partitioning, Logic design, Circuit Design, Physical Design, Design Verification, Fabrication , Packaging and Testing CMOS Fabrication and Layout, CMOS Technologies, CMOS Process Enhancements, Technology Related CAD Issues.

VLSI Circuit Characterisation

RC Delay model, Linear Delay model, Dynamic Power, Static Power, Low Power Architectures, Design margin, Transistor Scaling, Circuit Families.

Digital Design Using Verilog HDL and System Verilog

Electronic Design Automation, Hardware modeling with the Verilog HDL, Logic System, Data Types and Operators for Modeling in Verilog HDL, Behavioral Descriptions in Verilog HDL.

System Verilog HDL: Modules & Files-Identifiers, Spaces and comments-Basic gate models, simple Netlist-Logic values-Continuous assignments, delays and parameters.

Rapid Prototyping With XILINX FPGAS

Introduction to FPGAs, Role of FPGAs in the ASIC Market, FPGA Technologies, XILINX XC3000 FPGA Family, XILINX4000 FPGA Family, Rapid prototyping with Verilog and FPGAs.

Text book(s):

1.	Neil.H.E.Weste and David Money Harris, 'CMOS VLSI Design - A Circuits and Systems Perspective', 4th Edition, Pearson Education, 2016.
2.	Samir Palnitkar, 'Verilog HDL – A Guide to Digital Design and Synthesis', 2nd Edition, Pearson Education, 2011.
3.	Mark Zwolinski, 'Digital System Design with System Verilog', 1st Impression, Pearson Education, 2011.

Reference(s):

1.	Neil.H.E.Weste, David Harris and Ayan Banerjee, 'CMOS VLSI Design - A Circuits and Systems Perspective', 4th Edition, Pearson Education, 2014.
2.	Michael D.Ciletti, 'Advanced Digital Design with the Verilog HDL', 2nd Edition, Pearson Education, 2011.
3.	Jan M.Rabaey, Anantha Chandrakasan, Borivoje Nikolic 'Digital Integrated Circuits-A Design Perspective', 2nd Edition, Pearson Education, 2010.
4.	Douglas A.Pucknell and Kamran Eshraghian, 'Basic VLSI Design', 3rd Edition, Prentice Hall, 2012.
5.	Samir Palnitkar, 'Verilog HDL – A Guide to Digital Design and Synthesis', 2nd Edition, Pearson Education, 2011.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
40 EC 502 Analog Communication								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objective(s)	• To understand the mathematical basis of Random Process in communication • To learn the various modulation and demodulation techniques • To study pulse modulation and detection techniques
Course Outcomes	**At the end of the course, the students will be able to** 1. Explain the mathematical basis of random process in communication 2. Explain the transmission of signals through linear systems 3. Explain the various methods of AM generation 4. Explain the AM demodulators and superheterodyne receiver 5. Describe the techniques for angle modulation 6. Describe the various techniques for FM detection 7. Analyze noise in amplitude modulation systems 8. Analyze noise in angle modulation systems 9. Explain the pulse modulation and detection techniques 10. Design the analog communication systems

Mathematical Foundation of Communication

Random variables – Random process – Stationary process – Mean, Correlation and Covariance function – Power Spectral Density –Ergodic process - Gaussian process- Autocorrelation – Cross correlation – Transmission of signals through linear systems – Hilbert Transform - Transmission of Random processes through a LTI filter.

Amplitude Modulation

Generation of AM – Square law modulators and switching modulators - DSB-SC - Product modulator and Ring modulator - SSB-SC - Filter method, Phase shift method and Modified phase shift method - Generation of VSB Signals. Demodulation of AM - Envelope detection and coherent detection - Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, Super heterodyne receiver.

Angle Modulation

Phase modulation, Frequency modulation, Narrowband and wideband FM, transmission bandwidth of FM signals, Generation of FM signal – Direct FM – indirect FM, Demodulation of FM signals - Phase discriminator method and ratio detector method - FM stereo multiplexing, PLL – Nonlinear model and linear model of PLL.

Noise in CW Modulation

Noise – Narrowband noise – Envelope of sine wave plus narrow band noise, SNR for coherent reception with DSBSC Modulation, SSB Modulation – Noise in AM receivers using envelope detection – Noise in FM reception - Noise in pulse modulation systems - Comparison of performance of AM and FM systems.

Pulse Modulation Systems

Introduction - Method of generation and detection of Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation, Spectra of pulse modulation, concept of time division multiplexing. Analog communication system design.

Text book(s):

1	Simon Haykin, 'Communication Systems', 4th Edition, John Wiley & sons, 2013.
2	Bruce Carlson et al, 'Communication Systems', 5th Edition, McGraw-Hill, 2013.

Reference(s):

1	B.P.Lathi, 'Communication Systems', BS publications, 2013.
2	Taub and Schilling, 'Principles of Communication Systems', 2nd Reprint, McGraw-Hill, 2014.
3	Anokh Singh, 'Principles of Communication Engineering', 1st Edition, S.Chand Pvt.Ltd, Reprint 2006.
4	P. Ramakrishna Rao, 'Analog Communication', McGraw Hill, 2011.
5	Kennedy, Davis, 'Electronic Communication Systems', 5th Edition, McGraw Hill, 2012.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

40 EC 503 Digital Signal Processing

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objective(s)

- To introduce the concepts and techniques associated with digital signal processing
- To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete - time systems
- To develop skills for analyzing and synthesizing algorithms and systems that process digital signals, with emphasis on realization and implementation
- To gain an understanding of audio/video applications of digital signal processing

Course Outcomes

At the end of the course, the students will be able to

1. Understand the concept of Discrete Fourier transform
2. Apply FFT for computation of DFT, linear filtering and correlation
3. Design IIR filters using Impulse Invariant Technique
4. Design IIR filters using Bilinear Transformation
5. Design linear phase FIR filters using Windowing Techniques
6. Design linear phase FIR filters using Frequency Sampling method
7. Understand the concept of signal processing application related to general purpose DSP, Instrumentation, Voice/Speech/Audio, Telecommunication
8. Understand the concept of sampling rate conversion of digital signals in DSP applications
9. Analyse the effects of Finite word length on digital filters
10. Describe the architecture of TMS320C54x DSP processor and Develop ALP for various digital signal processing applications using TMS320C54x processor

Fourier Analysis of Discrete Time Signals

Review of DTFT – Frequency Domain Sampling: Discrete Fourier Transform (DFT) – Properties of DFT – Efficient computation of the DFT: FFT algorithms – Radix 2 FFT algorithms: Decimation in Time and Decimation in Frequency – Applications of FFT algorithms in Linear filtering and correlation.

Design of IIR Filters

Design of IIR filters from Analog filters – Frequency Transformation – IIR filters (Butterworth, Chebyshev): Properties – Design: Impulse Invariant Technique – Bilinear Transformation.

Design of FIR filters

Design of FIR filters – Symmetric and Antisymmetric FIR filters – Design of Linear Phase FIR filters: Windowing Techniques – Frequency Sampling.

Digital Signal Processing Applications

Dual Tone Multi Frequency Signal Detection-Spectral analysis of sinusoidal signals, non stationary signals& random signals-Musical sound Processing-Digital FM generation-Discrete time analytic signal generation-Sub band coding of speech and audio signals- Sparse antenna array design.

Digital Signal Processors

Finite word length effects, Introduction to programmable DSPs – TMS320C54X fixed point, DSP architectures – Instructions sets – Addressing modes, Control operations, Interrupt – Application Programs.

Text book(s):

1. Dimitris Manolakis and Vinay Ingle, 'Applied Digital Signal Processing', 1st Edition, Cambridge University Press, 2012.
2. B.Venkataramani & M.Bhaskar, 'Digital Signal Processor Architecture, Programming and Application', 2nd Edition, McGraw-Hill, 2011.

Reference(s):

1. Mark Owen, 'Practical Signal Processing', Cambridge University Press, 2012.
2. Alan V Oppenheim, Ronald W Schafer, John R Back, 'Discrete Time Signal Processing', 3rd Edition, Pearson, 2013.
3. John G Proakis, Dimitris G Manolakis, 'Digital Signal Processing Principles, Algorithms and Application', 4th Edition, Pearson, 2012.
4. S.K.Mitra, 'Digital Signal Processing: A Computer based approach', 4th Edition, McGraw-Hill, 2011.
5. P.Ramesh Babu, 'Digital Signal Processing', 6th Edition, Scitech Publications, 2015.
6. Avtar Singh, S.Srinivasan, 'DSP Implementation using DSP microprocessor with Examples from TMS32C54XX', Thomson/Brooks/Cole, 2004.
7. Sen M.Kuo, Woon Seng Gan, 'Digital Signal Processing Architectures, Implementations, and Applications', Pearson Education, 2005.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

40 EC 504 Microprocessors and Microcontrollers

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objective(s)

- To introduce the architecture and programming of 8085 microprocessor, interfacing of peripheral devices with 8085 microprocessor.
- To introduce the architecture, programming and interfacing of 8051 micro controller.
- To develop skill in simple applications development with programming 8085 & 8051.

Course Outcomes

At the end of the course, the students will be able to

1. Describe the architecture of 8085 microprocessor
2. Write programs for simple operations in 8085
3. Interface peripheral ICs and I/O devices with 8085 Microprocessor
4. Describe the features and operation of 8051 microcontroller
5. Write programs for simple operations in 8051
6. Program and handle in-built peripherals of 8051 Microcontroller
7. Interface ADC, DAC, Sensors, Displays and Motors with 8051 Microcontroller
8. Describe the block diagram of 8051 Microcontroller based systems
9. Develop algorithm for 8051-Microcontroller based systems

8085 Microprocessor

8085 Architecture - Instruction set - Addressing modes -–Interrupt structure - Timing diagrams - Assembly language programming - Memory interfacing – Interfacing I/O devices.

Peripheral Interfacing

Programmable Peripheral Interface(PPI 8255) –Programmable Interval Timer(PIT 8253) – 8259 Programmable Interrupt Controller – Keyboard & display controller (8279)- Interfacing serial I /O (8251)- ADC/DAC interfacing – DMA Controller

8051 Microcontroller

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

8051 Peripheral Programming

Programming 8051 Timers- Programming 8051 UART- Interrupts and its Programming – Keyboard Interfacing- Seven segment LED, LCD interfacing, Sensor Interfacing - DC & Stepper Motor interfacing.

8051 Based Applications

External Memory Interface- RTC Interfacing using I^2C Standard- Case studies: Traffic Light control, Wash Machine Control, Numerical control Machine, Automation of water supply for a colony, Turbine Monitoring.

Text book(s):

1. Ramesh S Gaonkar,' Microprocessor Architecture, Programming and application with 8085', 5th Edition, Prentice Hall, New Delhi,2002.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, 'The 8051 Microcontroller and Embedded Systems: Using Assembly and C', 2nd Edition, Pearson Education, 2011.

Reference(s):

1. Krishna Kant, 'Microprocessors and microcontrollers Architecture, Programming and System design 8085, 8086, 8051, 8096', 3rd Reprint, Prentice Hall of India, 2013.
2. A.K. Ray and K.M.Burchandi, 'Intel Microprocessors Architecture Programming and Interfacing', 12th Reprint, McGraw Hill, 2009.
3. Soumitra Kumar Mandal, 'Microprocessors and Microcontrollers Architecture, Programming and Interfacing using 8085, 8086 and 8051', 6th Reprint, McGraw Hill, 2012.
4. NPTEL video lectures by M. Krishna Kumar, IISc.

K.S.Rangasamy College of Technology - Autonomous								
40 HS 003 Total Quality Management								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	2	0	0	45	2	50	50	100

Objective(s)	To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management, statistical approach for quality control, ISO and QS certification process and its need for the industries.
Course Outcomes	**At the end of the course, the students will be able to** 1. Recognize the basic concepts of total quality management 2. List the role of senior management. 3. Identify the customer satisfaction, retention and employee involvement. 4. Locate the continuous process improvement techniques. 5. List the seven tools of quality and new seven management tools 6. Demonstrate concept of six sigma. 7. Implement the concept of quality function deployment 8. Assess the total productive maintenance, failure mode and effective analyses 9. Demonstrate the need for ISO 9000 and other quality system. 10. Categorize the quality auditing.

Introduction

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Quality Council, Quality Statements, Deming Philosophy, Barriers to TQM Implementation.

TQM Principles

Customer satisfaction, Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement, Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership, Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures-Basic Concepts, Strategy.

Statistical Process Control (SPC)

The tools of quality, Statistical Fundamentals, Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma.

TQM tools

Benchmarking, Reasons to Benchmark, Benchmarking Process, Quality Circle, Quality Function Deployment (QFD). House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM), Concept, Improvement Needs, FMEA–Stages, Types.

Quality Systems

Need for ISO 9000 Quality Systems, ISO 9001:2008 ISO 14000 Quality Systems, Elements Concepts, Implementation, Documentation, Quality Auditing, Requirements and Benefits, Non Conformance report, Case Studies on Educational System.

Text book (s) :

1	Dale H.Besterfield, et al., 'Total Quality Management', Pearson Education Asia, 1999. (Indian reprint 2002).

Reference(s) :

1	James R.Evans & William M.Lidsay, 'The Management and Control of Quality', (5th Edition), South-Western (Thomson Learning), 2002.
2	Feigenbaum A.V., 'Total Quality Management', McGraw Hill, 1991.
3	Jayakumar V, 'Total Quality Management', Lakshmi Publications, 2006.
4	Subburaj, Ramasamy, 'Total Quality Management', Tata McGraw Hill, 2005.

K.S.Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

40 EC 5P1 VLSI laboratory

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	3	45	2	50	50	100

Objective(s)

- To design static and dynamic CMOS logic circuits
- To design combinational and sequential circuits
- To implement various applications in FPGA

Course Outcomes

At the end of the course, the students will be able to

1. Perform DC and Transient analysis of static CMOS circuits using SPICE tool
2. Perform DC and Transient analysis of dynamic CMOS circuits using SPICE tool
3. Design and simulate layout of CMOS circuits using SPICE tool.
4. Analyse the gain, bandwidth, output impedance and CMRR for MOS differential amplifier using SPICE
5. Perform functional verification of combinational logic and sequential logic circuits
6. Demonstrate FPGA implementation of combinational logic and sequential logic circuits
7. Design and implement digital circuits using schematic entry
8. Demonstrate FPGA implementation of ALU and traffic light controller
9. Develop an application using the concepts learnt

LIST OF EXPERIMENTS

1. DC and Transient analysis of CMOS logic gates using SPICE tool.
2. DC and Transient analysis of D-latch using SPICE tool.
3. Layout of a simple CMOS inverter, parasitic extraction and simulation.
4. Schematic Entry and SPICE simulation of MOS differential amplifier. Determination of gain,bandwidth, output impedance and CMRR**.**
5. Design Entry and simulation of combinational logic circuits (adders, multipliers, decoder, encoder, multiplexer). Functional verification and concepts of concurrent and sequential execution to be highlighted.
6. Design Entry and simulation of sequential logic circuits (flip-flops, counters, shift registers). Functional verification and concepts of concurrent and sequential execution to be highlighted.
7. Synthesis, P&R, Post P&R simulation and configuration/fuse files for all the blocks/codes developed in Expt.No.5 and No.6 given above. Concepts of FPGA floor plan, critical path, design gate count, I/O configuration and pin assignment to be taught in this experiment.
8. Schematic design of digital logic circuits.
9. Implementation of ALU using FPGA.
10. Implementation of traffic light controller using FPGA.

K.S.Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

40 EC 5P2 Digital Signal Processing Laboratory

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	3	45	2	50	50	100

Objective(s)	To develop an intuitive understanding of digital signal processing through hands-on design experience for general and real-time DSP problems.
Course Outcomes	**At the end of the course, the students will be able to** 1. Compute the stability of LTI system 2. Perform convolution and filtering in discrete time systems 3. Design analog low pass filter and verify its performance 4. Evaluate the effects of quantization errors in signals 5. Device and implement algorithms to solve real time signal and image processing applications 6. Perform general purpose DSP computation using digital signal processor 7. Evaluate the effects of sampling in digital signal processor 8. Evaluate DFT computation based on FFT algorithms using digital signal processor and MATLAB 9. Design and test digital filters using digital signal processor

LIST OF EXPERIMENTS

Using MATLAB/SIMULINK*

1. Compute the Stability of LTI system
2. Illustrate the Filtering Concept of discrete-time systems
3. Computation of DFT using FFT algorithms
4. Perform block convolution of the given sequences
5. Design an Analog Low pass filter
6. Compute quantization error in DSP algorithms
7. Application programs related to signal and image processing
   a. Noise Reduction
   b. Echo Cancellation
   c. Image enhancement
   d. Image filtering

Using TMS320C54/6X

8. Implementation of Linear and circular convolution
9. Generate the various waveform signals
10. Computation of FFT of a signal
11. Implementation of FIR filter
12. Implementation of IIR filter
13. Verification of Sampling theorem

* Other open source softwares like SCILAB/PYTHON may also be used.

K.S.Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

40 EC 5P3 Microprocessors and Microcontrollers Laboratory

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	3	45	2	50	50	100

Objective(s)

- To familiarize the architecture of 8085 Microprocessor, assembling language programming and interfacing of various modules with 8085 Microprocessor.
- To use IDE for programming and debugging
- To develop microprocessor or microcontroller based small application projects.

Course Outcomes

At the end of the course, the students will be able to

1. Perform arithmetic operations using 8085 microprocessor by developing assembly language programs
2. Interface keyboard & display controller, interrupt controller with 8085 Microprocessor
3. Interface ADC and DAC with 8085 Microprocessor
4. Operate and control the traffic signal by using 8085 Microprocessor
5. Display the room temperature by using 8051 microcontroller
6. Develop an automatic alarm by using 8051 microcontroller
7. Control the speed of motors by using 8051 microcontroller
8. Develop an elevator control system by using 8051 microcontroller
9. Program the processor/controller by using open source compiler
10. Design and Implement an application based project

LIST OF EXPERIMENTS

1. Programs for arithmetic operations in 8085.
2. Interfacing and programming of keyboard & display controller with 8085.
3. Interfacing and programming of interrupt controller with 8085.
4. Interfacing and Programming ADC and DAC with 8085.
5. Interfacing and Programming of Traffic light controller with 8085.
6. Design and implementation of temperature indicator using 8051 microcontroller.
7. Design an automatic college bell using 8051 microcontroller.
8. Speed control of DC motor using Pulse Width Modulation.
9. Elevator control using 8051 microcontroller.
10. Study of Open source compiler.
11. Project design and implementation.

K.S.Rangasamy College of Technology - Autonomous								
40 TP 0P3 Career Competency Development III								
Common to all Branches								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	0	0	2	30	0	100	00	100

Objective(s)	To enhance employability skills and to develop career competency

Written and Oral Communication – Part 1
Reading Comprehension Level 3 - Self Introduction - News Paper Review - Self Marketing - Debate-Structured and Unstructured GDs Psychometric Assessment – Types & Strategies to answer the questions **Practices:** Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Interpretation of Pictorial Representations - Editing - GD - Debate. **Materials:** Instructor Manual, Word power Made Easy Book, News Papers

Verbal & Logical Reasoning – Part 1
Syllogism - Assertion and Reasons - Statements and Assumptions - Identifying Valid Inferences - identifying Strong Arguments and Weak Arguments - Statements and Conclusions - Cause and Effect - Deriving Conclusions from Passages - Seating Arrangements
Practices: Analogies - Blood Relations - Statement & Conclusions
Materials: Instructor Manual, Verbal Reasoning by R.S.Aggarwal

Quantitative Aptitude – Part 3
Probability - Calendar- Clocks - Logarithms - Permutations and Combinations
Materials: Instructor Manual, Aptitude Book

Quantitative Aptitude – Part 4
Algebra - Linear Equations - Quadratic Equations - Polynomials
Practices: Problem on Numbers - Ages - Train - Time and Work - Sudoku - Puzzles
Materials: Instructor Manual, Aptitude Book

Technical & Programming Skills – Part 1
Core Subject – 1,2 3
Practices : Questions from Gate Material
Materials: Text Book, Gate Material

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	15 Questions each from Unit 1, 2, 3, 4 & 5 (External Evaluation)	60
2	Evaluation 2 - Oral Communication	GD and Debate (External Evaluation by English, MBA Dept & External Trainers)	20
3	Evaluation 3 – Technical Paper Presentation	Internal Evaluation by the Dept.	20
		Total	**100**

Reference Books

1. Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, 'Quantitative Aptitude', TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note :

- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 Questions from Unit 1,2,3,4 and 5 and 5 Questions from Unit 1
- Evaluation has to be conducted as like Lab Examination.

K.S. Rangasamy College of Technology – Autonomous								
40 EC 601 Digital Communication								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	50	50	100

Objective(s)	• To discuss fundamental concepts and limits in information theory in the context of digital communication systems • To study signal space representation of signals and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals • To understand baseband and band pass signal transmission and reception techniques • To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels
Course Outcomes	**At the end of the course, the students will be able to** 1. Discuss the fundamental concepts and limits in information theory in the context of a digital communication system 2. Analyze the sampling process and its various ramifications 3. Discuss the various waveform coding techniques 4. Describe the different channel coding techniques which are used to provide reliable transmission of digital information over the channel 5. Design of optimum receivers in the presence of additive noise for digital communication systems 6. Compare the models used for the transmission of digital data over a band pass channel 7. Examine the transmission of a signal at high modulation rate through a band-limited channel 8. Discuss the baseband data transmission systems employing pulse shaping techniques to avoid distortions

Fundamentals of Information theory

Measure of information – Entropy – Source coding theorem – Discrete memoryless channels – lossless, deterministic, noiseless, BEC, BSC – Mutual information – Channel capacity – Shannon-Hartley law - Shannon-Fano coding, Huffman Coding, run length coding, LZW algorithm.

Waveform Coding Techniques

Pulse code modulation – Sampling, Quantizing, Encoding – Quantization noise and robust quantization- Differential pulse code modulation – Adaptive differential pulse code modulation - Delta modulation –Adaptive Delta Modulation.

Error Control coding

Channel coding theorem – Linear block codes – Hamming codes – Cyclic codes (CRC) – Convolutional codes – Viterbi decoding (Soft/Hard decision decoding).

Baseband Modulation

Gram-Schmidt orthogonalization procedure - Maximum-likelihood detector – Correlation receiver – Matched filter receiver - Generation, Detection, Signal space diagram, BER analysis for Coherent binary modulation schemes: BPSK, BFSK – Coherent quadrature modulation schemes: QPSK, MSK – Non coherent binary modulation schemes: BFSK, DPSK - Comparison of binary and quaternary modulation schemes – M-ary modulation schemes - Carrier and symbol synchronization.

Baseband Pulse transmission

Line codes – PSDs – ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - M-ary schemes – Eye pattern.

Text book(s):

1.	Simon Haykin, 'Digital Communications', 1st Edition, Wiley Publishers, 2010.

Reference(s):

1.	Bernard Sklar & Ray, 'Digital Communications - Fundamentals and applications', 2nd Edition, Pearson Education, 2012.
2.	Taub & Schilling, 'Principles of Digital Communication', 4th Edition, McGraw-Hill, 2015.
3.	Simon Haykin, 'Communication Systems', 4th Edition, Wiley Publishers, 2013.
4.	John G.Proakis, 'Digital Communication', 5th Edition,Tata McGraw Hill, 2014.
5.	B.P.Lathi & Zhi Ding, 'Modern Digital and Analog Communication Systems', 4th Edition, Oxford University Press, 2012.

K.S. Rangasamy College of Technology – Autonomous								
40 PH 008 - Applied Physics								
Common to all Branches								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objective(s)	• To enhance the knowledge of theoretical and modern technological aspects in physics • To correlate the theoretical principles with application oriented studies							
Course Outcomes	**At the end of the course the students will be able to** 1. Explain the principle of laser emission and classification of lasers 2. Identify the applications of lasers 3. Explain the propagation of lights in fibre optic cables, classification of fibre, splicing and their fabrication 4. Describe the fibre optic communication link, its applications and light propagation losses 5. Explain the production and detection of ultrasonic waves 6. Identify the industrial and medical applications of ultrasonic waves 7. Explain the development of quantum theory and its applications 8. Describe the concepts of nuclear physics and identify the elementary particles 9. Classify the sound and analyze its characteristics 10. Give suggestions for buildings with good acoustics							

Laser Technology

Introduction – Principle of spontaneous emission, stimulated absorption and emission – Einstein's co-efficient (derivation)-population inversion-pumping mechanisms – Types of lasers: Nd:YAG, Semiconductor laser (homo junction and hetero junction), CO_2 laser – Industrial applications: Lasers in welding, cutting, drilling and soldering- Medical applications: laser endoscopy,– Holography: Construction and reconstruction of hologram –Applications.

Fiber Optics and Sensors

Principles – cone of acceptance, numerical aperture (derivation)- Modes of propagation –Fabrication: Crucible-crucible technique - Classification: based on materials, modes and refractive index profile– Splicing – types of splicing- Losses in optical fiber – Light sources for fiber optics – Detectors – Fiber optical communication links(Block diagram) – Advantage of fiber optical cable over copper cables- Fiber optic sensors-principle-liquid level sensors- Temperature, Displacement, measurement.

Ultrasonics and Applications

Introduction-Properties-Production: Magnetostriction effect, magnetostriction generator- piezoelectric effect, piezoelectric generator – Ultrasonic detection- acoustical grating-Applications: Cavitation, cleaning, SONAR– Non destructive testing: Pulse echo system, through transmission, resonance system- Medical applications: cardiology, neurology, ultrasonic imaging (A, B and TM- Scan).

Quantum and Nuclear Physics

Quantum physics: Introduction – de-Broglie hypothesis –Matter waves– Uncertainty principle, application: single slit experiment – wave function-physical significance-Schrodinger's wave equation: Time dependent and time independent – Particle in a box (one dimensional and three dimensional)–Microscopy: Scanning Electron Microscope.

Nuclear Physics: Introduction, atomic nucleus, nuclear force, nuclear density, atomic mass unit - mass defect - Binding energy-Nuclear fission-Energy released in fission- Stellar energy-elementary particles:Leptons, Hadrons: Mesons and Baryons

Acoustics

Introduction-Classification of sound – Characteristics of musical sound – sound intensity level – Weber-Fechner law – loudness level and intensity: Bel, Decibel–Reverberation – Reverberation time – Sabine's formula (derivation) – sound absorption coefficient measuring method -Absorption co-efficient (derivation)– Factors affecting the acoustics of buildings and their remedies - basic requirements for acoustically good halls - acoustical materials.

Text book(s):

1. V.Rajendran, 'Engineering Physics', Tata McGraw Hill, 2014.

Reference(s):

1. Jeremy Bernstein, Paul M.Fishbane, Stephen Gasiorowicz, 'Modern Physics', Pearson Education, 2009.
2. S.Kalainathan, A.Ruban kumar, 'Physics for Engineers', RBA Publications, 2010.
3. A.Arumugam, 'Engineering Physics', Anuradha Agencies, 2013.

K.S. Rangasamy College of Technology - Autonomous								
40 EC 602 Embedded Systems								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To learn the fundamental concept of Embedded computing • To understand the architecture of ARM and do programming • To understand concept of RTOS in Embedded computing
Course Outcomes	**At the end of the course the students will be able to** 1. Interpret the basic design process of embedded system 2. Describe the I/O devices used in Embedded System 3. Illustrate the wired and wireless networking protocols for an embedded application 4. Examine the distributed architectures for embedded systems 5. Illustrate the general architecture of ARM processor 6. Developprogramsfor32-bitARMProcessorusingARMdevelopmenttools 7. Examine the ARM processor family and its features 8. Relate memory architecture and task switching in ARM 9. Describe the basic architecture of an operating system and its fundamental operations 10. Implement the basic design using RTOS and Task scheduling models

Introduction to Embedded Computing

Introduction – Characteristics of Embedded computing applications-Challenges in Embedded computing system design - Embedded system design process – Embedded hardware units and devices in a system – Embedded software in a system – Examples of Embedded system – Classifications of embedded system-Skills required for an embedded system designer. Design examples: Automatic chocolate vending machine and digital camera.

Embedded Networks

Introduction to Embedded Networks - Distributed embedded architectures – Network protocols: RS232, RS485, USART, I^2C, SPI, CAN, USB, AMBA, ISA, PCI – Wireless protocols: IrDA, Bluetooth, ZigBee, Wi-Fi, Case study: Elevator controller.

ARM Architecture

Introduction to ARM Processor – ARM programming's model- Registers – ARM architecture – 3 Stage Pipeline architecture – 5 Stage pipeline architecture- Interrupts and Exceptions handlings – ARM Instruction sets – THUMB instruction sets. ARM Programming.

ARM Processor Core

Architectural support for system development-ARM processor families –ARM7TDMI-ARM8-ARM9TDMI-ARM10TDMI - Memory hierarchy: Memory size and speed – On-chip memory – Caches – Memory management– ARM MMU Architecture-Synchronization-Context switching.

Real Time Operating Systems

Basic principles of OS – OS Architecture – System calls – Threads, tasks and process – Task states – Kernel and its function – Scheduling: static, dynamic, priority, preemptive, round robin, Earliest Deadline First, Rate Monotony – Resource allocation: Semaphores, mutual exclusion – Inter process communication – Synchronization and deadlock.

Text book(s):

1. Wayne Wolf, 'Computers as Components: Principles of Embedded Computing System Design', 2nd Edition, Morgan Kaufman Publishers, 2013.
2. Steve Furber, 'ARM System on chip Architecture', 2nd Edition, Addison Wesley, 2013.
3. Rajkamal, 'Embedded Systems Architecture: Programming and Design', 2nd Edition, Tata Mc GrawHill, 2012.

Reference(s):

1. David E.Simon,'An Embedded Software Primer', 3rd Edition, Pearson Education, 2014.
2. Dr K.V.K.K.Prasad,' Embedded/Real-Time systems: Concepts, Design& Programming', New Edition, Dream TechPress, 2013.
3. Andrew N.Sloss, Dominic Symes, Chris Wright, John Rayfield,' ARM System Developer's Guide Designing and Optimizing System Software', Elsevier Publications, 2013.
4. Trevor Martin, 'The Insider's Guide To The Philips ARM7-Based Microcontrollers, An Engineer's Introduction to the LPC2100Series', Hitex Ltd., 2006.
5. Frank Vahid and TonyGivargi, 'Embedded System Design: A Unified Hardware/Software Introduction', 3rd Edition, John Wiley & Sons, 2012.

K.S. Rangasamy College of Technology – Autonomous								
40 EC 603 Antennas and Wave Propagation								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	50	50	100

Objective(s)	• To study the fundamental theory behind the design of different types of antenna for various applications • To understand special antennas and measurement of parameters for antennas • To learn the types of radio wave propagation at different frequencies
Course Outcomes	**At the end of the course the students will be able to** 1. Understand the radiation mechanism of antennas 2. Describe the properties of antennas 3. Formulate the radiation properties of loop antenna 4. Describe the concept of antenna arrays 5. Explain the concept of Travelling wave antennas 6. Describe the mutually coupled antennas 7. Analyse the radiation concepts of special antennas 8. Analyse the various parameters for antenna measurements 9. Describe the basics of Wave propagation and types 10. Describe the concepts of Ionospheric Wave propagation

Antenna Fundamentals

Types of antennas-radiation mechanism-current distribution on a thin wire antenna- antenna parameters-radiation pattern, beam solid angle, radiation intensity, radiation power density, directive gain, effective aperture, polarization, bandwidth, beam width, antenna impedance, pointing vector –Friis transmission formula, duality of antennas, antenna and transmission lines.

Thin Linear Wire Antennas & Loop Antennas

Radiation fields of point source, radiation from a dipole antenna: infinitesimal dipole, and half-wave dipole, Radiation resistance, Directivity and Design procedure, -Loop antenna- Radiation resistance, Directivity, helical antenna, normal mode and axial mode.

Travelling Wave Antennas & Antenna Arrays

Radiation from a travelling wave on a wire. Rhombic Antenna, Coupled antenna, two and three element yagi-uda antenna-Log Periodic antenna. Antenna Arrays :Definition, power patterns, array of two point sources-pattern multiplication, broad side array, end fire array, N-element linear array, evaluation of null directions and maxima, amplitude distributions, binominal arrays, Dolph- Chebychev arrays.

Special Antennas & Antenna Measurements

Design procedure and selection of antenna based on frequency of operation and application, turnstile antenna- phased array antennas- horn antenna-reflector antennas and their feed systems- micro strip antennas- rectangular patch-Smart antennas: Principle, types, array design, antenna beamforming, direction of arrival algorithms, adaptive beam forming.

Antenna Measurements: antenna ranges- measurement of radiation pattern- gain, directivity and impedance measurements.

Wave Propagation

Propagation in free space – propagation around the earth- surface wave propagation- structure of the ionosphere –propagation of plane waves in ionized medium- determination of critical frequencies- maximum usable frequency- effect of the earth's magnetic field- ionospheric variations –fading- tropospheric propagation- space wave propagation- super refraction- refractive index of troposphere- scatter propagation

Text book(s):

1.	K.D.Prasad, 'Antenna and Wave Propagation', 2nd Edition, Satya Prakasham, 2013.
2.	Constantine A, Ballanis, 'Antenna Theory', 2nd Edition, Wiley India (Pvt) Ltd, 2011.

Reference(s):

1.	John D. Kraus Ronald J.Marhefka, and Ahmed S.Khan, 'Antennas and Wave propagation', 4th Edition, McGraw-Hill, 2015.
2.	H. Griffiths, J. Encianas, A. Papierinik & Serge Drabowitch, 'Modern Antennas', 1st Edition, 3rd Indian Reprint, Springer Publishers, 2011.

K.S. Rangasamy College of Technology - Autonomous								
40 EC 604 Computer Networks								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objective(s)	• To understand the functions of the various layers of the network model with reference to OSI and TCP/IP • To understand the architecture and function of SONET and ATM • To know the various protocols in each layer of the network model and their standards • To learn security, hacking and intrusion detection in networks							
Course Outcomes	**At the end of the course the students will be able to** 1. Understand the fundamentals of networks, their types, topologies, protocols and standards 2. Understand the ISO/OSI model 3. Know the various flow and error control protocols 4. Describe the concepts of various LAN protocols 5. Know the various IP addressing methods 6. Outline the concept of routing and algorithms used 7. Describe the various protocols of transport layer 8. Explain the methods to improve the QoS 9. Understand the protocols used in application layer 10. Analyse the various cryptographic algorithms and cryptanalysis methods							

Data Communications and Network Models

Components – Direction of Data flow – networks and their types–Topologies, LAN,WAN, Internetwork, Circuit switching and packet switching- Protocols and Standards – TCP/IP Protocol Suite , ISO / OSI model –OSI Vs TCP/IP , Measurement of network performance-Bandwidth, Throughput, Latency, Jitter.

Data Link Layer

Error – detection and correction: – Introduction –Block coding – CRC – Flow Control and Error control: stop and wait - Piggybacking– HDLC. Media Access Control-Random access, LAN: Ethernet – Fast Ethernet- Gigabit Ethernet, IEEE 802.3, IEEE 802.11–Bluetooth, SONET/SDH architecture, ATM architecture, ATM layers.

Network Layer

Internetworking – IP addressing methods (IPv4 and IPv6) – Sub netting – Routing – Unicast routing protocols (RIP,OSPF, BGP4), Multicast routing-Multicast addresses (DVMRP,MOSPF).

Transport Layer

Transport layer services, protocols-– Go back N – selective repeat - sliding window techniques – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services.

Application Layer

Domain Name Space (DNS) – Simple Mail Transfer Protocol (SMTP) – File Transfer Protocol (FTP) – Hyper Text Transfer Protocol (HTTP) – World Wide Web (WWW) – Security – Cryptography – Ethical Hacking- Intrusion Detection.

Text book(s):

1.	Behrouz A. Forouzan, Sophia Chung Fegan, 'Data communication and Networking', 5th Edition, McGraw-Hill, 2012.

Reference(s):

1.	Andrew S. Tanenbaum, David J.Whetherall, 'Computer Networks', 5th Edition, Pearson Education, 2013.
2.	James .F. Kurose, 'Computer Networking: A Top down Approach', 6th Revised Edition, Pearson Education, 2012.
3.	Larry L.Peterson & Bruce S. Davie, 'Computer Networks', 5th Edition, Morgan Kaufmann, 2011.
4.	William Stallings, 'Data and Computer Communication', 8th Edition, Pearson Education, 2012.
5.	W. Richard Stevens, 'TCP/IP Illustrated, Volume 1: The Protocol', Pearson Education, 3rd Impression, 2009.

K.S.Rangasamy College of Technology - Autonomous								
40 EC 6P1 Analog and Digital Communication Laboratory								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	2	50	50	100

Objective(s)	• To obtain a better understanding of the operation of analog and digital modulation schemes • To analyse and test digital communication systems using simulation software as well as laboratory components • To measure the radiation pattern of antenna
Course Outcomes	**At the end of the course the students will be able to** 1. Construct and test analog modulation and demodulation 2. Demonstrate the various pulse modulation techniques 3. Test the circuits for sampling and TDM 4. Design and test the various digital modulation techniques 5. Generate the line coding and decoding techniques 6. Perform Delta modulation and demodulation 7. Develop a program for error control coding using MATLAB 8. Measure the spectrum of filters 9. Analyze the radiation pattern of RF antenna 10. Develop an application using the concepts learnt

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. Pulse Modulation (PPM, PWM)
4. Signal sampling and time division multiplexing
5. Digital Modulation techniques (ASK, PSK, FSK)
6. Line Coding and decoding
7. Delta Modulation technique
8. Quadrature phase shift keying modulation and detection
9. Implementation of convolutional codes
10. Implementation of cyclic codes
11. Spectrum measurement for filters
12. Antenna design and simulation
13. Project design and implementation

The following tools can be used for antenna design and analysis: Ansys HFSS, ADS, CST, Magus, MATLAB, LABVIEW etc…

K.S.Rangasamy College of Technology - Autonomous

40 EC 6P2 Computer Networks Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	2	50	50	100

Objective(s)	• To simulate different networking protocols • To implement different networking protocols • To design and implement routing algorithms
Course Outcomes	**At the end of the course the students will be able to** 1. Design and implement various LAN protocols 2. Analyse the stop and wait protocol 3. Analyse the Go back-N and selective repeat protocols 4. Design and implement distance vector routing algorithm 5. Design and implement link state routing algorithm 6. Design and implement Data encryption and decryption 7. Generate the IP sub netting address 8. Test the error in data transmission using different error rates 9. Develop an application using the concepts learnt

1. Ethernet LAN protocol.

   To create scenario and study the performance of CSMA/CD protocol through simulation.
2. Token bus and Token ring protocols.

   To create scenario and study the performance of token bus and token ring protocols through simulation.
3. Wireless LAN protocols.

   To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
4. Implementation of Error Detecting Codes.
5. Implementation and study of stop and wait protocol.
6. Implementation and study of Go back-N and selective repeat protocols.
7. Implementation of IP subnet.
8. Implementation of distance vector routing algorithm/ Link state routing algorithm using NS2.
9. Implementation of Routing Information Protocol/Open Shortest Path First protocol using Qualnet.
10. Implementation of Leaky bucket algorithm.
11. Implementation of Data encryption and decryption.
12. Experiment based on Internet.
13. Project design and implementation.

K.S.Rangasamy College of Technology - Autonomous

40 EC 6P3 Embedded Systems Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	2	50	50	100

Objective(s)	• To develop programs using ARM controllers • To interface ARM Controllers using Embedded IDEs • To develop applications using ARM controllers
Course Outcomes	**At the end of the course the students will be able to** 1. Perform arithmetic operations in an embedded system with a combination of C and assembly language 2. Demonstrate the input and output functions of an ARM microcontroller 3. Perform LED and LCD interface with ARM Microcontroller 4. Interface actuators for controlling applications with ARM 5. Demonstrate the analog to digital and digital to analog conversion using ARM microcontroller 6. Test the ISR operation in ARM controller 7. Test the serial data communication of internal UART in ARM 8. Test RTOS environment in high speed clock and system programming using KEIL MDK. 9. Develop application specific project using ARM controller.

LIST OF EXPERIMENTS

1. Arithmetic operations using In-line assembler
2. Read the key and display the key using ARM*
3. Interfacing LED and LCD with ARM*
4. Buzzer and relay interface using ARM processor*
5. Interfacing ADC and DAC with ARM
6. Programming the external interrupts of ARM processor
7. ARM to PC communication by UART
8. ARM internal PLL programming
9. Multitasking using RTOS environment
10. Project design and implementation

* Students may use Open Source IDE

K.S.Rangasamy College of Technology - Autonomous								
40 TP 0P4 Career Competency Development IV								
Common to all Branches								
Semester	**Hours/Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	0	0	2	30	0	100	00	100
Objective(s)	To enhance employability skills and to develop career competency							

Written and Oral Communication – Part 2
Self Introduction – GD - Personal Interview Skills
Practices on Reading Comprehension Level 2 – Paragraph Writing - News paper and Book Review Writing - Skimming and Scanning – Interpretation of Pictorial Representations - Sentence Completion - Sentence Correction - Jumbled Sentences - Synonyms & Antonyms - Using the Same Word as Different Parts of Speech - Editing
Materials: Instructor Manual, Word power Made Easy Book, News Papers
Verbal & Logical Reasoning – Part 2

Analogies – Blood Relations – Seating Arrangements – Syllogism - Statements and Conclusions, Cause and Effect – Deriving Conclusions from Passages – Series Completion (Numbers, Alphabets & Figures) – Analytical Reasoning – Classification – Critical Reasoning **Practices**: Analogies – Blood Relations - Statement & Conclusions
Materials: Instructor Manual, Verbal Reasoning by R.S.Aggarwal

Quantitative Aptitude - Part – 5
Geometry - Straight Line – Triangles – Quadrilaterals – Circles – Co-ordinate Geometry – Cube – Cone – Sphere. **Materials:** Instructor Manual, Aptitude book

Data Interpretation and Analysis
Data Interpretation based on Text – Data Interpretation based on Graphs and Tables. Graphs can be Column Graphs, Bar Graphs, Line Charts, Pie Chart, Graphs representing Area, Venn Diagram & Flow Charts. **Materials:** Instructor Manual, Aptitude Book

Technical & Programming Skills – Part 2
Core Subject – 4,5,6 **Practices :** Questions from Gate Material
Materials: Text Book, Gate Material

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	15 Questions each from Unit 1, 2, 3, 4 & 5 (External Evaluation)	60
2	Evaluation 2 - Oral Communication	GD and HR Interview (External Evaluation by English, MBA Dept.)	20
3	Evaluation 3 – Technical Interview	Internal Evaluation by the Dept. – 3 Core Subjects	20
		Total	**100**

Reference Books

1. Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, 'Quantitative Aptitude', TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note:
- Instructor can cover the syllabus by Class room activities and Assignments (5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough Work pages
- Each Assignment has 20 questions from Unit 1,2,3,4,5 and 5 questions from Unit 1 (Oral Communication) & Unit 5(Programs)
- Evaluation has to be conducted as like Lab Examination.

K.S.Rangasamy College of Technology – Autonomous

40 HS 002 Engineering Economics and Financial Accounting

Common to all Branches

Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	2	0	0	45	2	50	50	100

Course Objective(s)	The main objective of this course is to make the Engineering student to know about the basic of economics, how to organize a business, financial aspects related to business, different methods of appraisal of projects and pricing techniques.
Course Outcomes	**At the end of the course, the students will be able to** 1. Apply suitable demand forecasting techniques. 2. Appraise the prevailing market structure. 3. Describe forms of business in an organization. 4. Distinguish between proprietorship and partnership. 5. Explain the various kinds of banking. 6. Illustrate the balance sheet with a suitable example. 7. Differentiate between fixed cost and variable cost. 8. Interpret technical feasibility and economic feasibility. 9. Apply break even analysis in engineering projects. 10. Summarize the managerial uses of break even analysis.

Basic Economics

Definition of economics – nature and scope of economics – basic concepts of economics – factors of production – demand analysis – definition of demand – Law of demand – Exception to law of demand – Factors affecting demand – elasticity of demand – demand forecasting – definition of supply – factors affecting supply – elasticity of supply – market structure – perfect competition – imperfect competition - monopoly – duopoly – oligopoly and bilateral monopoly .

Organization and Business Financing

Forms of business – proprietorship – partnership - joint stock company - cooperative organization - state Enterprise - mixed economy - Money and banking – kinds of banking - commercial banks - central banking functions - control of credit - monetary policy - credit instrument – Types of financing - Short term borrowing - Long term borrowing - Internal generation of funds - External commercial borrowings - Assistance from government budgeting support and international finance corporations.

Financial Accounting and Capital Budgeting

The balance Sheet and related concepts – The profit and loss statement and related concepts – Financial ratio analysis – Cash flow analysis – fund flow analysis – Capital budgeting– Average rate of return – Payback period – Net present value and internal rate of return.

Cost Analysis

Types of costing – traditional costing approach - activity based costing - Fixed Cost – variable cost – marginal cost – cost output relationship in the short run and in long run – pricing practice – full cost pricing – marginal cost pricing – going rate pricing – bid pricing – pricing for a rate of return – appraising project profitability - cost benefit analysis – feasibility reports – appraisal process – technical feasibility - economic feasibility – financial feasibility.

Break Even Analysis

Basic assumptions –break even chart – managerial uses of break even analysis - applications of break even analysis in engineering projects.

Textbook(s):

1. Khan MY and Jain PK., 'Financial Management' McGraw - Hill Publishing Co., Ltd., New York, 2000.
2. Varshney RL and Maheshwary KL. 'Managerial Economics' S Chand and Co., New Delhi, 2001.

Reference(s):

1. Barthwal R.R., 'Industrial Economics - An Introductory' Text Book, New Age Publications, New Delhi, 2001.
2. Samuelson P.A., 'Economics - An Introductory Analysis', McGraw - Hill & Co., New York, 2000.
3. S.K.Bhattacharyya, John Deardon and Y.M.Koppikar, 'Accounting for Management Text and Cases', Vikas Publishing House Pvt Ltd., New Delhi – 110002, 1984.
4. V.L.Mote, Samuel and G.S.Gupta, 'Managerial Economics – Concepts and Cases', Tata Mcgraw Hill Publishing Company Ltd., New Delhi – 110002, 1981.

K.S. Rangasamy College of Technology – Autonomous								
40 EC 701 Optical Communication and Networks								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	• To learn the basic elements of optical fiber transmission link, fiber modes, configurations and structures. • To facilitate the knowledge about optical fiber sources and transmission techniques • To enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.							
Course outcomes	**At the end of the course, the students will be able to** 1. Explain the basic concepts of optical communication. 2. Explain about different modes and configuration in optical fibers 3. Analyze the different kind of losses in optical waveguides 4. Explain the signal degradation by dispersion factor 5. Explain about LED and Laser diode structures 6. Explain about the fiber to fiber joining techniques 7. Explain the fiber optic receiver operation and configuration 8. Explain the basic geometric parameters measurement techniques 9. Describe the basic concepts of different optical networks. 10. Explain the operation of basic optical components and optical CDMA							

Introduction to Optical Fibers

Evolution of fiber optic system – Element of an Optical Fiber Transmission link – Total internal reflection-Acceptance angle –Numerical aperture – Ray Optics – Optical Fiber Modes and Configurations – Mode theory of Circular Wave guides – Key Modal concepts – Linearly Polarized Modes – Single Mode Fibers – Graded Index fiber structure-fiber materials, fiber fabrication techniques.

Signal Degradation in Optical Fibers

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides – Information Capacity determination – Group Delay - Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers – Polarization Mode dispersion, Intermodal dispersion– Pulse Broadening in GI fibers - Mode Coupling – Design Optimization of SM fibers

Fiber Optical Sources and Coupling

Light source materials – LED structures –Quantum efficiency , laser Diodes – Modes and Threshold condition – Rate equations - External Quantum efficiency – Resonant frequencies – Laser Diode structures -Temperature effects, Power Launching and coupling, Lensing schemes, Fiber alignment ,Fiber -to- Fiber joints, Fiber splicing ,fiber connectors.

Fiber Optical Receivers and Measurements

PIN and APD diodes –Fundamental Receiver Operation – preamplifiers-types - High impedance, Trans impedance amplifiers, Error Sources – Receiver configuration – Probability of Error , Fiber Attenuation measurements-Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

Optical Networks and Components

WDM optical networks, SONET/SDH/FDDI optical networks, layered optical network architecture, Wavelength Routed Networks – Non linear effects on Network performance –-Link Power budget -Rise time budget- Optical couplers, filters, isolators, switches, optical amplifiers - erbium doped fiber amplifiers, Optical CDMA – Ultra High Capacity Networks.

Text book(s):

1.	Gerd Kaiser, 'Optical Fiber Communications', 4th Edition, Tata McGraw Hill Publishers, 2010.
2.	John M. Senior , 'Optical Fiber Communication', 2nd Edition, Pearson Education, 2007.

Reference(s):

1.	Govind P. Agarval, 'Fiber-Optic Communication Systems', 3rd Edition, John Wiley & Sons, 2004.
2.	Rajiv Ramasamy and Kumar. N. Sivarajan, Galen H. Sasaki, 'Optical networks-A practical perspective', 3rd Edition, Morgan Kauffman, 2010.
3.	Ramaswami, Sivarajan and Sasaki 'Optical Networks', Morgan Kaufmann, 2009.

K.S. Rangasamy College of Technology – Autonomous								
40 EC 702 Microwave Engineering								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	• To understand the working of Microwave components and analyse them with high frequency parameters. • To learn the functioning of Microwave sources, integrated circuits and measuring devices. • To design microwave passive components such as 3dB hybrid, Rate race, backward wave directional coupler, power divider.							
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the basic concepts of microwave transmission and the parameters involved 2. Describe the function and characteristics of passive microwave devices 3. Analyse the working of low power microwave sources 4. Analyse the working of high power microwave devices 5. Know the characteristics of strip lines 6. Discuss the materials used and fabrication of monolithic microwave integrated circuits 7. Analyse the various microwave measuring instruments 8. Understand the various parameters for microwave measurements 9. Understand the transformations used in MIC filter design 10. Analyse the design principles of passive microwave components							

Microwave Passive Devices

Introduction to S parameters, properties of S Matrix, relationship between Y-Z & ABCD Parameters with S parameters, Terminations, Attenuators, Phase Shifters, Directional Couplers, Hybrid Junctions, Power Dividers, Microwave Propagation in Ferrites, Faraday Rotation, Microwave Devices Employing Faraday Rotation, Isolators, Circulators, Gyrators.

Microwave Sources

High power sources: Klystron amplifier, Velocity-Modulation Process, Bunching Process, Output Power of Two-Cavity Klystron, Reflex Klystrons, Velocity Modulation, Power Output and Efficiency, Helix Traveling-Wave Tubes (TWTs), Slow-Wave structures, Amplification Process, Magnetron Oscillators, Cylindrical Magnetron, Coaxial Magnetron, Tunable Magnetron, Low power sources: Gunn diodes - Two-Valley Model Theory, Modes of Operation, IMPATT, TRAPATT and BARITT Diodes- Principles of Operation, Power Output and Efficiency

Strip Lines and Monolithic Microwave Integrated Circuits

Microstrip Lines, Characteristic Impedance of Microstrip Lines, Losses in Microstrip Lines, Quality Factor Q of Microstrip Lines, Parallel Strip Lines, Distributed Lines, Characteristic Impedance, Attenuation Losses, Coplanar Strip Lines, Shielded Strip Lines, MONOLITHIC MICROWAVE INTEGRATED CIRCUITS: Introduction, Materials, Substrate Materials, Conductor Materials, Dielectric Materials, Resistive Materials, Monolithic Microwave Integrated-Circuit Growth, MMIC Fabrication Techniques, Fabrication Example.

Microwave Measurements

Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – principles; Measurement of Impedance, frequency, power, VSWR, Q factor, dielectric constant, S Parameter. Non linear measurements: vector signal analyser -Applications.

MIC Components Design

Low pass to high pass, band pass and band stop transformations, 3dB hybrid, Rate race, backward wave directional coupler, power divider, and Realization using microstrip lines.

Text book(s):

1.	Samuel Y.Liao, 'Microwave Devices and Circuits', 3rd Edition, Prentice Hall of India, 2008.
2.	David M.Pozar, 'Microwave Engineering', 4th Edition, John Wiley & Sons, 2014.
3.	Annapurna Das and Sisir K. Das, 'Microwave Engineering', Tata McGraw-Hill, 2007.

Reference(s):

1.	Robert E.Collin, 'Foundations for Microwave Engineering', 2nd Edition, Wiley, Reprint 2009.
2.	P.A.Rizzi, 'Microwave Engineering. (Passive circuits)', Prentice Hall of India, 1988.

K.S.Rangasamy College of Technology – Autonomous

40 EC 703 Wireless Communication

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)

- To study the basic concepts in cellular networks.
- To study modulation techniques and radio propagations.
- To understand the different signal processing and multiple access concepts.
- To study the different wireless standards.

Course Outcomes

At the end of the course, the students will be able to

1. Discuss the evolution and basic concepts of wireless communication and its capacity
2. Analyse radio wave propagation model
3. Implement the various channel modelling techniques
4. Classify the various modulation techniques for wireless communication.
5. Analyse the performance of modulation techniques in fading channels
6. Analyse the various equalization and diversity techniques.
7. Distinguish the various multiple access techniques
8. Describe the existing wireless standards

Introduction

Introduction to wireless communication systems - Modern wireless communication systems: 2G cellular networks - 3G cellular networks - WLAN - PAN - Cellular concept: Frequency reuse - channel assignment - hand off - interference & system capacity - trunking& grade of service - Coverage and capacity improvement.

Mobile Radio Propagation

Free space propagation model - Three basic propagation mechanisms: Reflection - Two-Ray model - Diffraction - Knife-edge diffraction model - Scattering - Log-normal shadowing - Okumara model - Hata model - Log-distance path loss model - Small-scale multipath propagation - Parameters of mobile multipath channels - Types of small scale fading - Rayleigh and Rician distributions.

Modulation Techniques for Mobile Radio

Structure of a wireless communication link - Principles of Offset-QPSK - π/4-DQPSK - Minimum Shift Keying - Gaussian Minimum Shift Keying - Error performance in fading channels - Spread Spectrum Modulation - Orthogonal Frequency Division Multiplexing.

Wireless Signal Processing and Multiple Access Techniques

Equalization - Linear and Non-Linear equalization - Adaptive equalization - Zero forcing and LMS Algorithms - Diversity - Microdiversity - Macrodiversity - Diversity combining techniques Rake receiver - Multiple Access Techniques: FDMA, TDMA, CDMA, SDMA, Introduction to MIMO systems.

Wireless Standards

GSM: features - Architecture - Radio subsystems - Traffic channels - call processing - CDMA: features - Architecture - IS 95 - Forward and reverse channels - power control - system capacity - WiMax - 4G(LTE).

Textbook(s):

1. T.S.Rappaport, 'Wireless Communications: Principles and Practice', 2nd Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint, 2009.
2. Andreas F.Molisch, 'Wireless Communications', 2nd Edition, Wiley and IEEE, 2010.

Reference(s):

1. R. Blake, 'Wireless Communication Technology', Thomson Delmar, 2004.
2. W.C.Y.Lee, 'Mobile Communications Engineering: Theory and applications', 2nd Edition, McGraw-Hill International, 2009.
3. Stephen G. Wilson, ' Digital Modulation and Coding', Pearson Education, 2008.
4. David Tse and Pramod Viswanath, 'Fundamentals of Wireless Communication', Cambridge university press, 2005.
5. Van Nee.R and Ramji Prasad, 'OFDM for wireless multimedia Communication', Artech house, 2000.

K.S. Rangasamy College of Technology – Autonomous

40 EC 7P1 Optical and Microwave Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	0	0	3	45	2	50	50	100

Objective(s)

- To learn the working principle of optical sources and detectors.
- To develop a simple optical communication link.
- To analyse the characteristics of microwave devices.
- To learn the concept of microstrip components.

Course Outcomes

At the end of the course, the students will be able to

1. Calculate the Numerical aperture and Attenuation of given Fibers
2. Test the characteristics of laser diodes
3. Test the P-I Characteristics of LED and photo diode
4. Analyze the bandwidth of Analog transmission of a fiber optical link
5. Calculate the maximum bit rate of a digital fiber optical link
6. Examine the Gain characteristic of APDs
7. Analyze the gain and radiation pattern of Horn antenna.
8. Test the mode characteristics of reflex klystron.
9. Test the characteristics of Microwave passive devices
10. Examine the characteristics of Solid state devices
11. Demonstrate the concepts of a Micro strip antenna

Experiments pertaining to Fiber optics, Optical Communication and Fiber optic sensors:

- Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
- LED & Photo Diode Characteristics.
- PI Characteristic of laser diodes-Threshold current determination
- Gain characteristic of APDs-determination of breakdown voltage and average gain of APD.
- Analog transmission Characteristic of a fiber optical link – Determination of system bandwidth for Plastic fiber links.
- Determination of maximum bit rate of a digital fiber optical link using plastic fiber links.

Microwave Experiments

- Gain and Radiation Pattern Measurement of Horn Antenna.
- Determination of mode characteristic of Reflex Klystron Oscillator
- VSWR, Impedance Measurement.
- Characteristic of Directional Couplers and Multiport Junction.
- Gunn diode characteristics.
- Study of Microstrip components (Filters, Antennas, etc.)
- Case study on design of impedance matching network

The following tools can be used for antenna design and analysis: Ansys HFSS, ADS, CST, Magus, MATLAB, LABVIEW etc…

K.S. Rangasamy College of Technology – Autonomous

40 EC 7P2 System Design Laboratory

B.E. Electronics and Communication Engineering

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	0	0	3	45	2	80	20	100

Objective(s)

- To design a system which meets the desired specifications
- To identify, formulate, and solve engineering problems
- To use the techniques, skills and modern engineering tools necessary for engineering practice

Course Outcomes

At the end of the course, the students will be able to

1. Design the instrumentation amplifier with the bridge type transducer and convert the amplified voltage from the instrumentation amplifier to 4-20mA current using op-amp.
2. Design a sequential timer to switch on & off at least 3 relays in a particular sequence using timer IC.
3. Design a modem system to meet given specifications with realistic engineering constraints.
4. Draw the schematic of simple electronic circuit and design PCB layout using CAD tools.
5. Design a microcontroller based system to perform various tasks in specific applications
6. Design and analyse DSP based system for simple applications like echo generation etc, using TMS320 DSP processors.
7. Design and Synthesis a complex digital function block contains over 1, 00,000gates, using Verilog HDL and Synopsys design compiler.
8. To test a general understanding of selected issues within the field of MATLAB and Simulink.

1. Design of a 4-20mA transmitter for bridge type transducer.

   (or)
2. Design of process control timer.

3. Design of modem.

   (or)
4. PCB layout design using CAD.

5. Microcontroller based system design.

   (or)
6. DSP based system design.

7. ASIC based system design.

   (or)
8. MATLAB based system design.

Note:

- 4 out of 8 systems must be designed by each group of students.
  Groups will be allotted by the faculty in charge

<table>
<tr><td colspan="8">K.S. Rangasamy College of Technology – Autonomous</td></tr>
<tr><td colspan="8">40 EC 7P3 Project Work – Phase I</td></tr>
<tr><td colspan="8">B.E. Electronics and Communication Engineering</td></tr>
<tr><td rowspan="2">Semester</td><td colspan="3">Hours / Week</td><td rowspan="2">Total hrs</td><td>Credit</td><td colspan="2">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CA</td><td>ES</td><td>Total</td></tr>
<tr><td>VII</td><td>0</td><td>0</td><td>3</td><td>45</td><td>2</td><td>100</td><td>0</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">• To impart practical knowledge to the students and also to make them to carry out the technical procedures in their project work.
• To provide an exposure to the students to refer, read and review the research articles, journals and conference proceedings relevant to their project work and placing this as their beginning stage for their final presentation</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">At the end of the course, the students will be able to
1. Identify engineering problems relevant to the domain and carry out literature survey for its support.
2. Analyse and identify an appropriate technique to solve the problem.
3. Do experimentation / simulation / programming / fabrication, collect and interpret data.
4. Document, prepare technical report and do power point presentation.
5. Demonstrate their responsibility as an individual and a leader in group presentation.</td></tr>
<tr><td>Methodology</td><td colspan="7">• A committee is constituted with the project coordinator, project guide and HOD/Senior professor in the department
• Three reviews have to be conducted by the committee
• Problem should be selected by every batch of students
• Students must do a literature survey collecting a minimum of 10 papers related to their work
• Report has to be prepared by the students as per the format
• Preliminary implementation can be done if possible
Internal evaluation has to be done based on the three reviews for 100 marks</td></tr>
</table>

K.S. Rangasamy College of Technology – Autonomous								
40 TP 0P5 Career Competency Development V								
B.E. Electronics and Communication Engineering								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P	45	C	CA	ES	Total
VII	0	0	2		0	100	0	100
Objective(s)	To enhance employability skills and to develop career competency							

Written and Oral Communication
Self-Introduction – GD – HR Interview Skills – Corporate Profile Review Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual

Verbal & Logical Reasoning
Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual

Quantitative Aptitude
Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual

Data Interpretation and Analysis
Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual

Programming & Technical Skills – Part 3
Data Structure - Arrays – Linked List – Stack – Queues – Tree – Graph 6 Practices on Algorithms and Objective Type Questions Materials: Instructor Manual

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	15 Questions each from Unit 1, 2,3, 4 & 5 (External Evaluation)	60
2	Evaluation 2 - Oral Communication	GD and HR Interview (External Evaluation by English, MBA Dept.)	20
3	Evaluation 3 – Technical Interview	Internal Evaluation by the Dept. – 3 Core Subjects	20
		Total	100

Reference Books

1. Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, 'Quantitative Aptitude', TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & Goswami Upkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL Publications

Note:

- Instructor can cover the syllabus by Class room activities and Assignments(5 Assignments/week)
- Instructor Manual has Class work questions, Assignment questions and Rough work pages
- Each Assignment has 20 questions for Unit 1,2,3,4 & 5 and Unit 5 and 5 questions from Unit 5(Algorithms) & Unit 1(Oral Communication)
- Evaluation has to be conducted as like Lab Examination.

K.S.Rangasamy College of Technology- Autonomous								
40 EC 801 Ad Hoc and Sensor Networks								
B.E Electronics and Communication Engineering								
Semester	**Hours/Week**			**Total hrs**	**Credit**	**Maximum Mark**		
VIII	L	T	P		C	CA	ES	Total
	3	0	0	45	3	50	50	100
Objective(s)	• To understand the design issues in ad hoc and sensor networks • To learn the different types of MAC protocols • To be familiar with different types of ad hoc routing protocols • To be expose to the TCP issues in ad hoc networks • To learn the architecture and protocols of wireless sensor networks							
Course Outcomes	**At the end of the course, the students will be able to** 1. Explain the concepts, network architectures and applications of ad hoc networks 2. Explain the concepts, network architectures and applications of wireless sensor networks 3. Analyze the protocol design issues of ad hoc networks 4. Analyze the protocol design issues of wireless sensor networks 5. Design routing protocols for ad hoc networks 6. Design routing protocols for wireless sensor networks 7. Evaluate the QoS related performance measurements of ad hoc networks 8. Evaluate the QoS related performance measurements of sensor networks							

Introduction

Fundamentals of Wireless Communication Technology - The Electromagnetic Spectrum - Radio propagation Mechanisms - Characteristics of the Wireless Channel - Mobile Ad hoc networks (MANETs) and wireless sensor networks (WSNs): Concepts and architectures - Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

MAC Protocols for Ad Hoc 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 AD HOC Wireless Networks

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

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.

WSN Routing, Localization & QOS

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

Text book(s):

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

References:

1	Carlos De Morais Cordeiro, Dharma Prakash Agrawal 'Ad Hoc & Sensor Networks: Theory and Applications', World Scientific Publishing Company, 2006.
2	Feng Zhao and Leonides Guibas, 'Wireless Sensor Networks', Elsevier Publication - 2002.
3	Holger Karl and Andreas Willig 'Protocols and Architectures for Wireless Sensor Networks', Wiley, 2005.
4	Kazem Sohraby, Daniel Minoli, & TaiebZnati, 'Wireless Sensor Networks-Technology, Protocols, and Applications', John Wiley, 2007.
5	Anna Hac, 'Wireless Sensor Network Designs', John Wiley, 2003.

<table>
<tr><th colspan="8">K.S. Rangasamy College of Technology – Autonomous</th></tr>
<tr><th colspan="8">40 EC 8P1 Project Work – Phase II</th></tr>
<tr><th colspan="8">B.E. Electronics and Communication Engineering</th></tr>
<tr><th rowspan="2">Semester</th><th colspan="3">Hours / Week</th><th rowspan="2">Total hrs</th><th>Credit</th><th colspan="3">Maximum Marks</th></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CA</td><td>ES</td><td>Total</td></tr>
<tr><td>VIII</td><td>0</td><td>0</td><td>16</td><td>240</td><td>8</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">To improve the academic and technical skills of the students, choosing the project in one of the technical areas, they have learnt during the course.
To make the students learn to work in teams, gain confidence to solve real world problems related to their area, make presentations and manage a project.</td></tr>
<tr><td>Course Outcomes</td><td colspan="7">At the end of the course, the students will be able to
Identify engineering problems relevant to the domain and carryout literature survey for its support
Analyse and identify an appropriate technique to solve the problem
Do experimentation / simulation / programming / Fabrication, collect and interpret data
Document, prepare technical report and do power point presentation
Demonstrate their responsibility as an individual and a leader in group project work.</td></tr>
<tr><td>Methodology</td><td colspan="7">A committee is constituted with the project coordinator, project guide and HOD/Senior professor in the department.
Three reviews have to be conducted by the committee
Each review has to be evaluated for 100 marks.
Attendance is compulsory for all reviews. If a student fails to attend review for some valid reason, one or more chance may be given.
A senior professor from other departments may be included in the committee for final review
The report should be submitted as per the format by the students during the first week of April.</td></tr>
</table>

K.S.Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective I

40 EC E11 Medical Electronics

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To study the fundamentals of bioelectric signals and methods of recording various bio-potentials • To evaluate the measurement of bio-chemical and non-electrical parameters • To study the operation of various diagnostic and therapeutic equipments, Telemetry and Telemedicine
Course Outcomes	**At the end of the course, the students will be able to** 1. Learn the fundamentals of bioelectric signals, characteristics and recording methods 2. Understand the concepts, operation of electrodes and their types 3. Evaluate the measurement of bio-chemical parameters 4. Evaluate the measurement of non-electrical parameters 5. Understand the operation of assist devices 6. Discuss the types of physical medicine and their applications 7. Describe the various units of bio-telemetry and their applications 8. Discuss the recent trends in medical instrumentation and telemedicine

Electro-Physiology and Biopotential Recording

The origin of Biopotentials; biopotential electrodes; biological amplifiers; ECG, EEG,EMG, PCG, EOG – lead systems and recording methods, typical waveforms and signal characteristics.

Bio-Chemical and Non Electrical Parameter Measurements

pH, pO2, pCO2,pHCO3 Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters, differential count.

Assist Devices

Cardiac pacemakers, DC Defibrillators, Dialyser, Heart-Lung machine, Hearing aids.

Physical Medicine and Bio-Telemetry

Diathermies – Short-wave, ultrasonic and microwave type and their applications, medical stimulator, Telemetry principles, frequency selection, Bio-telemetry, radio pill and tele-stimulation, electrical safety.

Recent Trends In Medical Instrumentation

Thermograph, endoscopy unit, Laser in medicine, Surgical diathermy, cryogenic application, introduction to telemedicine.

Text book(s):

1.	John G.Webster, 'Medical Instrumentation Application and Design', 4th Edition, Wiley India (Pvt) Ltd., 2013.
2.	Leslie Cromwell, 'Biomedical instrumentation and measurement', 2nd Edition, Prentice Hall, 2013.

Reference(s):

1.	Khandpur, R.S. 'Handbook of Biomedical Instrumentation', 2nd Edition, McGraw-Hill, 2015.
2.	Joseph.J, Carr and John M.Brown, 'Introduction to Biomedical Equipment Technology', 4th Edition, Pearson Education, 2009.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective I								
40 EC E12 VLSI Signal Processing								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objective(s)	• To understand the various VLSI architectures for digital signal processing. • To know the techniques of critical path and algorithmic strength reduction in the filter structures. • To learn the performance parameters, viz. area, speed and power.							
Course outcomes	**At the end of the course, the students will be able to** 1.Learning the basics of DSP systems and graphical representations of DSP Algorithms 2. Realizations of digital filters using pipelining and parallel processing for low power 3. Analysis of digital filters using retiming for critical path reduction 4. Analysis of digital filters using unfolding for critical path reduction 5. Analysis of digital filters using folding for critical path reduction 6. Design of folded Multirate systems 7. Understanding the algorithms for fast convolution 8. Design of fast convolution algorithm 9. Understanding the several pipelining process 10. Studying the parallel processed digital filters							

DSP Systems, Pipelining and Parallel Processing

Introduction To DSP Systems -Typical DSP algorithms; Iteration Bound – data flow graph representations, loop bound and iteration bound, Longest path Matrix algorithm; Pipelining and parallel processing – Pipelining of FIR digital filters, parallel processing, pipelining and parallel processing for low power.

Retiming, and Unfolding Techniques

Retiming - definitions and properties; retaining techniques; Unfolding –Algorithm for Unfolding, Properties of Unfolding, Applications of Unfolding.

Folding

Folding transformation, Register minimization techniques, Register minimization in folded Architectures, Folding of Mutilate systems.

Fast Convolution

Introduction, Cook – Toom Algorithm, Modified Cook – Toom Algorithm, Iterated convolution, Cyclic Convolution, Design of Fast convolution Algorithm.

Algorithmic Strength Reduction in Filters and Transforms

Parallel FIR filters – DCT and inverse DCT, Parallel Architectures for rank order filters

Text book(s):

1. Keshab K. Parhi, 'VLSI Digital Signal Processing Systems, Design and Implementation', John Wiley & sons, 2nd Edition, 2014.

Reference(s):

2. U. Meyer Baese, 'Digital Signal Processing with Field Programmable Arrays', 4th Edition, Springer, 2014.
3. S.Y. Kuang, H.J. White house, T. Kailath, 'VLSI and Modern Signal Processing', Prentice Hall of India Private Ltd., 2013.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective I								
40 EC E13 Consumer Electronics								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objective(s)	To learn the working principles, block diagram, main features of consumer electronics gadgets/goods/devices like audio-systems, CD systems ,TV etc.,							
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the working principles of basic audio system 2. Explain the operation of digital sound recording system 3. Describe the operation of various camera tubes 4. Explain the functions of various broadcasting systems 5. Understand the mobile phone architecture 6. Explain the operating principles of home Appliances 7. Explain the operating principles of office systems 8. Understand the safety issues and safety standards of electronic systems							

Audio System

Microphones, their types; Carbon, velocity, crystal, condenser, cordless-Loud Speaker: Direct radiating, horn loaded woofer, tweeter, mid range, multi-speaker system, baffles and enclosures- Digital sound recording on disc-DTS-Dolby systems-CD system- Introduction to Blue ray technology-Hi-Fi system, pre-amplifier, amplifier and equalizer system, stereo amplifiers.

Television

Principles of Television: - TV standards- Scanning- Video Bandwidth - Composite Video signal- TV Camera:-Principle & working of Vidicon TV Camera - Monochrome picture tube-- TV Receiver –block diagram and working of B&W receiver- colour television display tube- Delta gun-Precision- in- line picture tube-HD TV systems-LCD, LED, PLASMA Systems. Block diagram and working principle of cable TV and DTH, set top box, cable TV using internet.

Pervasive Devices

Mobile Phone: Elements – Mobile Information Architecture - Mobile Phone Design – Types of mobile operating system- Android Overview-The Stack – Android User Interface – Preferences, the File System, the Options Menu and Intents.

Home and Office Systems

Conventional telephone block diagram and working-Basic principle and block diagram of microwave oven; washing machine hardware and software-components of air conditioning and refrigeration systems-Construction and working principles of Dot Matrix Printer, Inkjet Printer- Laser Printer- Facsimile: Block diagram and Working principle of FAX- RFID-Ultrasonic remote transmitter, IR remote-control transmitter.

Compliance

Product safety and liability issues- standards related to electrical safety and standards related to fire hazards, e.g., UL and VDE- EMI/EMC requirements and design techniques for compliance - ESD, RF interference and immunity- line current harmonics and mains voltage surge-case study.

Text book(s):

1.	Bali S.P, ‘Consumer Electronics’, Pearson Education, 2012.

Reference(s):

1.	R.R Gulati, ‘Monochrome & Color Television’, 2nd Edition, New Age international, 2010.
2.	R.R Gulati, ‘Complete Satellite & Cable Television’, Revised Edition, New Age international, 2006.
3.	K. Blair, Benson ‘Audio Engineering Hand book’, McGraw-Hill, 2001.
4.	Gupta R.G. ‘Audio Video Systems’, 2nd Edition, McGraw-Hill, 2010.
5.	Brian Fling, ‘Mobile Design & Development’, 1st Edition, O’Reilly, 2011.
6.	Marko Gargenta, ‘Learning Android’, 1st Edition, O’Reilly, 2011.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective I

40 EC E14 High Performance RISC Processor

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)

- To acquire the basic knowledge on 16, 32 bit Advanced Microprocessors
- To describe each module in MSP430, working out to the on-chip peripherals and use low power features of MSP430 to develop embedded solutions
- To acquire knowledge on free scale processor architecture and peripheral interfacings
- To develop the basic programs for MSP430 and Freescale microprocessors

Course Outcomes

At the end of the course, the students will be able to

1. Illustrate the concepts of MSP430 functionalities
2. Apply knowledge of I/O module to develop simple programs
3. Learning the various inbuilt modules of MSP 430 peripheral interface
4. Study of various algorithms and applications of MSP 430
5. Describe the architecture of Free-scale 32 bit Processor
6. Describe internal modules of processor to develop a system
7. Reproduce the Peripheral features of Free-scale Processor
8. Develop an Assembly program for free-scale cold fire processor for a specific application
9. Learning new generation of mobile architectures
10. Compare and contrast various features of mobile processors

MSP430 RISC CPU Architecture

Introduction, Functional block diagram, Memory map, Architecture, Addressing modes, Instruction set Functions, Interrupts, Digital I/O –Digital Input and Output, Parallel ports, Mixed signal systems, Programming examples.

MSP430 Peripheral Interface

Timer – Watchdog Timer, Clock System, Resets, Comparator, Op-Amp. On chip peripherals – ADC, DAC, I^2C, SPI, Programming examples. Case study – Algorithm Execution comparison between Microchip PIC24F16KA and the TI MSP430F2252, Biomedical application, Metering Application.

Free-Scale Cold Fire 32 bit processor core

Introduction to Cold Fire Core - User, Supervisor, EMAC and Interrupt Programming Models, Addressing modes, Exception processing sequence, Exception Vector Table, Interrupt Controller, Interrupt Vector Generation, Reset Controller Module, Clock Module, System Control Module, Chip Configuration Module Programming with S12X processor.

Free-Scale Cold Fire 32 Bit Processor Peripherals and Programming

Analog to Digital Converters, Universal Asynchronous Transmitter Receiver, Timer Unit, Queued Serial Peripheral Interface, Fast Ethernet controller, Tools and Software. C programming examples with Code Warrior tools.

Recent Mobile Processor

Evolution of Processor Architecture in Mobile Phones, Benefits of Multiple CPU Cores in Mobile Devices, Processors for Mobile Applications, features and comparison – Quad Core, Octa Core processor.

Text book(s):

1. John H. Davies, 'MSP430 Microcontroller Basics', 2nd Edition, Elsevier Science & Technology, 2015.
2. Munir Bannoura, Rudan Bettelheim and Richard Soja 'ColdFire Microprocessors & Microcontrollers', AMT Publishing, 2007.

Reference(s):

1. 'ColdFire Family Programmer's Reference Manual', Free scale Semiconductors, 2005.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective I

40 EC E15 Digital Image Processing

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)	• To understand the image fundamentals and mathematical transforms for image processing • To learn the image enhancement techniques and image restoration procedures • To study the image compression techniques and image segmentation procedures • To understand the fundamentals of color image processing
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the fundamentals of Digital image 2. Analyse various transforms and their application 3. Discuss image enhancement techniques in spatial domain 4. Analyse image restoration through various filters 5. Explain the concepts of segmentation and boundary extraction 6. Discuss the basics of boundary representation and various boundary descriptors 7. Understand the basics of colour image processing 8. Describe colour transformation and segmentation based on colour 9. Know the basics of compression and various compression algorithms for lossless compression 10. Understand the algorithms for lossy compression

Digital Image Fundamentals and Transforms

Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms –Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

Image Enhancement and Restoration

Basic gray level transformations – Histogram equalization – Histogram matching –spatial filtering – smoothing spatial filters – sharpening spatial filters- model of the image degradation / Restoration process- mean filters – order – statistics filters- Adaptive filters – Inverse filtering – minimum mean square error filtering – constrained least squares filtering – Geometric mean filter – geometric transformations.

Image Segmentation and Representation

Edge detection – Thresholding – Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors – Regional descriptors –Simple descriptors- Texture

Color Image Processing

Color Fundamentals – Color Models – Pseudo color Image Processing –Basics of Full-Color Image Processing – Color Transformations – Smoothing and Sharpening – Image Segmentation Based on Color.

Image Compression

Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding - DPCM.
Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of Vector quantization.

Text book(s):

1. Rafael C Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson Education, 3rd Edition, 2015.

Reference(s):

1. Rafael C Gonzalez, Richard E. Woods, 'Digital Image Processing', Prentice Hall, 3rd Edition, 2013.
2. A.K. Jain, 'Fundamentals of Digital Image Processing', New Edition, Prentice Hall of India, 2011.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective I

40 EC E16 Foundations for Nanoelectronics

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)

- To understand the fundamentals of Quantum Mechanics
- To learn simple Harmonic Oscillators and their approximations
- To study the concepts of Statistical Mechanics
- To know the applications of Nanoelectronics

Course Outcomes

At the end of the course, the students will be able to

1. Understand the basics of wave mechanics and analyse different states and solutions for different systems using Schrodinger equation
2. Discuss the function of operators used in quantum mechanics and provide conceptual solutions
3. Illustrate Quantitative analysis of an oscillating mass-spring system and wave packet mechanism
4. Describe the function of quantum LC circuit and find the approximation values of Simple Harmonic Oscillators
5. Analyse the concept of coupling in two level systems and solve the problem in multi-dimensional systems
6. Describe the quantization in Electromagnetic field and density of various states
7. Discuss the concept of statistical mechanics and microscopic systems
8. Understand the concepts of quantum systems and statistical analysis of various models
9. Analyse the role of gaseous interaction with nano electric materials and understand the topographical view of thin films
10. Classify newer inorganic materials and electronic, optical and mechanical properties of carbon nano materials

Introduction to Quantum Mechanics

Particles, waves, probability amplitudes, Schrodinger equation, wave packets solutions, operators, expectation values, Eigen functions, piecewise constant potentials.

Simple Harmonic Oscillators and Approximations

SHM Operators, SHM wave packet solutions, Quantum LC circuit, WKB approximations, variational methods.

Systems With Two and Many Degrees Of Freedom

Two level systems with static and dynamic coupling, problems in more than one dimensions, electromagnetic field quantization, density of states.

Statistical Mechanics

Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors.

Applications

Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications.

Text book(s):

1. Hagelstein, Peter L., Stephen D. Senturia, and Terry P. Orlando, 'Introduction to Applied Quantum and Statistical Physics', Wiley, 2004.
2. Rainer Waser, 'Nanoelectronics and Information Technology', 3rd Edition, Wiley-VCH, 2012.
3. Michael A. Nielsen and Isaac L. Chuang, 'Quantum Computation and Quantum Information', 10th Edition, Cambridge University Press, 2010.

Reference(s):

1. Neil Gershenfeld, 'The Physics of Information Technology', Cambridge University Press, 2011.
2. Adrian M.Ionesu and Kaustav Banerjee 'Emerging Nanoelectronics: Life with and after CMOS', Vol I, II and III, Kluwer Academic Publishers, 2005.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective I								
40 EC E17 Micro Electromechanical Systems								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objective(s)	• To understand the concepts of MEMS and Microsystems • To understand the diverse technological and functional approaches of Microsystems • To understand the applications of MEMS which provides an insight of microsensors, actuators and micro fluidics							
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the basic concepts of MEMS, Micro system and types of Microsensors 2. Describe the materials used for MEMS 3. Discuss the manufacturing process of MEMS 4. Understand the working of Microsensors and Microactuators 5. Know the fundamentals of Micro/Nano fluids 6. Understand the design rules, modeling, simulation, verification and testing of actuators. 7. Describe the design considerations of Microsystems 8. Understand assembly and packaging technologies of MEMS							

Foundation in Microsystems
Review of microelectronics manufacture and introduction to MEMS- Overview of Microsystems technology, Laws of scaling- The multi-disciplinary nature of MEMS- Survey of materials central to micro engineering- Applications of MEMS in various industries.

Micro Manufacturing Techniques
Photolithography- Film deposition, Etching Processes-Bulk micro machining, silicon surface micromachining- LIGA process-Rapid micro product development.

Micro Sensors and Micro Actuators
Energy conversion and force generation-Electromagnetic Actuators, Reluctance motors, piezoelectric actuators, bi-metal-actuator Friction and wear –Transducer principles, Signal detection and signal processing- Mechanical and physical sensors-Acceleration sensor, pressure sensor, Sensor arrays.

Introduction to Micro/Nano Fluids
Fundamentals of micro fluidics- Micro pump – introduction – Types – Mechanical Micro pump – Non mechanical micro pumps, Actuating Principles, Design rules for micro pump – modeling and simulation, Verification and testing –Applications.

Microsystem Design and Packaging
Design considerations-Mechanical Design, Process design, Realization of MEMS components using Intellisuite. Micro system packaging-Packing Technologies-Assembly of Microsystems- Reliability in MEMS.

Text book(s):

1.	Maluf, Nadim, 'An introduction to Micro Electro-mechanical Systems Engineering'', 2nd Edition, Artech House, 2000.

Reference(s):

1.	Mohamed Gad – el – Hak, 'MEMS Handbook', Edited CRC Press, 2002.
2.	Sabrie Solomon, 'Sensors Handbook', 2nd Edition, McGraw Hill, 2013.
3.	Marc F madou, 'Fundamentals of Micro Fabrication', 3rd Edition, CRC Press, 2011.
4.	Francis E.H Tay and W. O. Choong, 'Micro Fluidics and Bio MEMS Application', IEEE Press, 1997.
5.	Trimmer William S, 'Micromechanics and MEMS', IEEE Press, 1997.

K.S.Rangasamy College of Technology – Autonomous Regulation

B.E. Electronics and Communication Engineering

Elective I

40 IT E17 Programming in Java

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objective(s)

- Understand the concepts of Object Oriented Programming to develop applications.
- Introduce the concepts of packages and class libraries.
- Design and develop GUI programs with the help of Applet, AWT and JDBC.

Course Outcomes

At the end of the course, the students will be able to

1. Implement classes and control access to members of a class.
2. Demonstrate reusability through inheritance concepts.
3. Extrapolate code reduction and access different operations through single packages, interfaces and error-handling techniques using exception handling.
4. Apply the concept of multithreading applications that can take advantage of multiple processors and perform string operations.
5. Explore the importance of lang package and I/O file system.
6. Analyze the basic differences between byte stream and character stream I/O classes.
7. Explain the functionalities of collections framework classes and interfaces.
8. Design the application using Legacy Classes and Interfaces of utility package.
9. Effectively use layout managers with AWT and build complex screens with the help of one or multiple layout managers using Applet.
10. Designing an event - driven Application using Event Handling concepts and apply JDBC technology to manipulate data from databases.

Java Introduction

An overview of Java, Arrays, Methods, Object oriented java programming - Classes and Objects, Inheritance and Polymorphism.

Java Concepts

Packages and Interfaces, Exception handling, Multithreaded programming, String Handling.

Packages

Introduction to Lang package, I/O packages – File, The stream classes, The byte streams, The character streams, Serialization, Externalizable.

Collection Framework and Utility Classes

The Collection Interfaces, The Collection Classes and Interfaces, Using an Iterator, Working with Maps, The Legacy Classes and Interfaces, String Tokenizer.

Gui Programming With JDBC

Applet Class - Basics, Skeleton, The HTML APPLET Tag, Introducing the AWT - working with windows, Graphics and Text, Using AWT controls, Layout Managers and Menus, Event handling, Java Data Base Connectivity (JDBC).

Text book (s) :

1	Herbert Schildt, 'The complete Reference – Java 2', 5th Edition, Tata McGraw Hill Publishing Company, 2006.
2	H.M. Deitel, P.J. Deitel 'JAVA™ How to program', 6th Edition, Pearson Education – 2007. [JDBC only]
3	K.Rajkumar, 'Java programming', 1st Edition, Pearson Education – 2013.

Reference (s) :

1	Advanced programming in JAVA prentice – Hall of India Private Limited NIIT – 2003.
2	Pratik patel and Karlmoss 'Java Data base programming with JDBC', 2nd Edition, Dream tech press – 2000.

K.S. Rangasamy College of Technology - Autonomous								
B.E. Electronics and Communication Engineering								
Elective II								
40 HS 001 Professional Ethics								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	2	0	0	45	2	50	50	100
Objective(s)	To create an awareness on Ethics and Human Values and instill Moral and Social Values in students							
Course Outcomes	**At the end of the course, the student will be able to** 1. Know the concept of ethics and engineering as a profession. 2. Learn the core qualities of professional practitioners. 3. Realize engineering as experimentation. 4. Study the role of codes and industrial standards as per law. 5. Understand the need of safety in testing and designing. 6. Know about risk benefit analysis and reducing risk. 7. Understand the importance of collegiality, conflict of interest, and professional rights. 8. Know the employee rights and IPR. 9. Understand the ethics in MNC's, Computers and Social Medias. 10. Know the values of engineers as managers and engineers responsibilities in weapons development							

Introduction

Morals, values and ethics – Integrity – Respect for others, Honesty – Commitment – Character– Core qualities of professional practitioners –Theories of right action – Types of inquiry – Kohlberg's stages of moral development – Carol Gilligan theory – Moral dilemmas – Moral autonomy.

Engineering as Social Experimentation

Engineering as Experimentation – Engineers as Responsible Experiments – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study and Volks Wagon's Case Study.

Engineers Responsibility for Safety and Risk

Safety and Risk – Assessment of Safety and Risk – Risk Benefit analysis and reducing Risk – The Three Mile Island Disaster Case Study and Chennai Moulivakkam Building Accident case study.

Responsibilities and Rights

Collegiality and Loyalty – Respect for Authority – Conflict of Interest – Collective Bargaining – Confidentiality - Occupational Crime – Professional Rights – Employee Rights – Customers Rights - Intellectual Property Rights (IPR) – Discrimination – Nestle Maggi Case Study.

Global Issues

Multinational corporations(MNC) – Environmental Ethics – Computer ethics – Social Media Ethics – Engineers as Managers, Expert Witnesses and Advisors – Moral leadership - Weapons development – The Bhopal Gas Tragedy Case Study.

Text book(s):	
1.	Govindarajan M, Natarajan S, Senthil Kumar V.S, 'Engineering Ethics', Prentice Hall of India (P) Ltd, New Delhi, 10th Reprint, 2009.
Reference(s):	
1.	Mike W. Martin and Roland Schinzinger, 'Ethics in Engineering', Tata McGraw Hill Publishing Company Limited, New Delhi, 2007.
2.	Govindan K.R., and Sendhil Kumar S., 'Professional Ethics and Human Values', Anuradha Publications, Chennai, 2011.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective II

40 EC E21 Advanced Digital Signal Processing

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)

The purpose of this course is to provide in depth treatment on methods and techniques in

- Discrete time signal transforms, digital filter design, optimal filtering
- Power spectrum estimation, multirate digital signal processing
- DSP architectures which are of importance in the areas of signal processing, control and communications

Course Outcomes

At the end of the course, the students will be able to

1. Understand the basic theory of discrete time random process.
2. Understand various approaches to spectrum estimation problem based on signal modeling techniques.
3. Understand various approaches for estimating the power spectrum of a stationary random process
4. Analysis various algorithms for solving a set of linear equation for several signal modeling problems.
5. Design of various filter structures for analyzing satiability and quantization effect in digital filters
6. Understand the basic concept of Adaptive filter
7. Analyse various techniques for processing non stationary signals using adaptive filters.
8. Discuss the fundamental concepts of multirate DSP
9. Illustrate the various applications of multirate signal processing

Discrete Random Signal Processing

Weiner Khitchine relation Power spectral density – filtering random process, Spectral Factorization Theorem, special types of random process – Signal modeling Least Squares method, Pade approximation, Prony's method, iterative Prefiltering, Finite Data records, Stochastic Models.

Spectrum Estimation

Non-Parametric methods Correlation method Covariance estimator Performance analysis of estimators – Unbiased consistent estimators Periodogram estimator Barlett spectrum estimation Welch estimation Model based approach AR, MA, ARMA Signal modeling Parameter estimation using YuleWalker method.

Linear Estimation and Prediction

Maximum likelihood criterion Efficiency of estimator Least mean squared error criterion Wiener filter Discrete Wiener Hoff equations Recursive estimators Kalman filter Linear prediction, Prediction error Whitening filter, Inverse filter Levinson recursion, Lattice realization, Levinson recursion algorithm for solving Toeplitz system of equations.

Adaptive Filters

FIR Adaptive filters Newton's steepest descent method Adaptive filters based on steepest descent method Widrow Hoff LMS Adaptive algorithm Adaptive channel equalization Adaptive echo canceller Adaptive noise cancellation RLS Adaptive filters Exponentially weighted RLS Sliding window RLS Simplified IIR LMS Adaptive filter.

Multirate Digital Signal Processing

Mathematical description of change of sampling rate Interpolation and Decimation Continuous time model Direct digital domain approach Decimation by integer factor Interpolation by an integer factor Single and multistage realization Poly phase realization Applications to sub band coding Wavelet transform and filter bank implementation of wavelet expansion of signals.

Text book(s):

1	Monson H. Hayes, 'Statistical Digital Signal Processing and Modeling', John Wiley and Sons Inc., New York, 2008.
2	P. P. Vaidyanathan, 'Multirate Systems and Filter Banks', Prentice Hall, 1992.

Reference(s):

1	Sophoncles J. Orfanidis, 'Optimum Signal Processing', McGrawHill, 2007.
2	Dimitris Manolakis and Vinay Ingle, 'Applied Digital Signal Processing', Cambridge University Press, 2012
3	Simon Haykin, 'Adaptive Filter Theory', Prentice Hall, Englehood Cliffs, NJ1986.
4	S. Kay,' Modern Spectrum Estimation Theory And Application', Prentice Hall, Englehood Cliffs, Nj1988.
5	Sophoncles J. Orfanidis, 'Optimum Signal Processing', McGrawHill, 2007.
6	Mark Owen, 'Practical Signal Processing', Cambridge University Press, 2012
7	Alan V Oppenheim, Ronald W Schafer, John R Back, 'Discrete Time Signal Processing', Prentice-Hall, 2nd Edition 2000.
8	Sen M.Kuo, Woon – Seng Gan, 'Digital Signal Processing Architectures, Implementations, and Applications', Pearson Education, 2005

K.S. Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

Elective II

40 EC E22 Robotics

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To introduce the basic concepts, parts of robots and types of robots. • To make the student familiar with the various drive systems for robot and power transmission system in robots • To discuss about the robot manipulator and end effector • To enhance the knowledge about localization and path planning • To broaden the importance of robot vision and robotic operating systems
Course Outcomes	**At the end of the course, the students will be able to** 1. Know about the specification and classification of robots 2. Gain knowledge about the forward and inverse kinematics of robots 3. Acquire good knowledge about the robot drive systems 4. Learn about the power transmission of robots 5. Describe the construction of robot manipulator 6. Gain good knowledge of end effectors 7. Analyze the challenges of localization 8. Evaluate the path planning 9. Learn about the elements of visual perception and Image processing 10. Acquire good knowledge about Robotic Operating Systems

Introduction

Specifications of Robots- Classifications of robots – Robot anatomy - Work envelope - Flexible automation versus Robotic technology – Applications of Robots. Robot Kinematics and Dynamics**:** Positions, Orientations and frames, Mappings: Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics Of Six Degree of Freedom Robot Arm – Robot Arm dynamics

Robot Drives and Power Transmission Systems

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link – Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws

Robot Manipulators and End Effectors

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators
Classification of End effectors – Tools as end effectors. Drive system for grippers Mechanical adhesive-vacuum-magnetic-grippers. Hooks & scoops. Gripper force analysis and gripper design. Active and passive grippers

Localization and Path planning

Introduction-Challenges of Localization- Map Representation- Probabilistic Map based Localization- Monte carlo localization- Landmark based navigation -Globally unique localization- Positioning beacon systems- Route based localization.
Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion –straight line Motion-Robot languages -. Computer control and Robot software.

Robot Vision

Basic Components – Elements of visual perception, Lenses: Pinhole cameras, Gaussian Optics – Cameras – Camera-Computer interfaces. Vision and Tracking: Following the road, Iconic image processing, Multiscale image processing, Video Tracking - Learning landmarks: Landmark spatiograms, K-means Clustering, EM Clustering. Basic introduction to Robotic operating System (ROS) - Real and Simulated Robots - Introduction to OpenCV, Open NI and PCL, installing and testing ROS camera Drivers, ROS to OpenCV - The cv_ bridge Package.

Reference book(s):

1.	Barry Leatham - Jones, 'Elements of industrial Robotics', Pitman, 1987.
2.	MikellP.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, 'Industrial Robotics Technology, Programming and Applications', McGraw Hill Book Company, 2008
3.	R.Patrick Goebel, ' ROS by Example: A Do-It-Yourself Guide to Robot Operating System –Volume I', A Pi Robot Production, 2012.
4.	Fu K.S. Gonzaleaz R.C. and Lee C.S.G., 'Robotics Control Sensing, Vision and Intelligence', McGraw Hill International Editions, 1987
5.	Bernard Hodges and Paul Hallam, 'Industrial Robotics', British Library Cataloging in Publication, 1990
6.	Deb, S.R., 'Robotics Technology and flexible automation', Tata McGrawHill, 2010

K.S. Rangasamy College of Technology - Autonomous								
B.E. Electronics and Communication Engineering								
Elective II								
40 EC E23 Radar and Navigational Aids								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	To understand the basic concepts, types of radars and antennas, principles of navigation, in addition to the basic ideas and learning aids related to navigation.							
Course Outcomes	**At the end of the course, the students will be able to** 1. Analyse the radar parameters and frequency and describe the block diagram of radar 2. Determine the noises in radar system and describe and Analyse the different types of radar. 3. Design LNA and describe the types of displays used in radar. 4. Design the antenna used for radar system and understand the detection of radar signal in noise and clutter. 5. Design matched filter used in radar system and understand the detection of non fluctuation target in noise. 6. Explain the general principals of radio navigation and identify the radio compass suitable for radar system. 7. Describe the different types of landing and basics of satellite navigation 8. Identify the usage of GPS and DGPS and Analyse the parameter of GPS 9. Understand the usage of radar in different applications and describe the signal processing in radar application. 10. Describe the integration of GPD and INS and design a radar for simple application.							

Range Equation and Types of Radar

Basic Radar, Radar equation, Block diagram, Radar frequencies. Types of Radar: CW, Doppler, MTI, FMCW, Pulsed, Tracking Radar. Digital MTI processing (MTD)

Radar System Concepts

Different type of Noise, Noise figure, LNA. False alarm & Missed detection, Radar cross section, TR, ATR, Types of Displays -Color CRT, Bright displays, synthetic video displays, A scope, PPI.

Detection of Radar Signals in Noise and Antennas

Detection of radar signals in Noise and clutter, detection criteria and detectors, Matched filter, Matched filter response to delayed Doppler shifted signals, Radar measurements. Types of Antennas: Parabolic, Cassegrain and Electronically steered phased array antennas.

Radio Navigation and Landing Aids

General principles, NDB, ADF, VOR, DME, Hyperbolic Navigation DECCA, OMEGA, LORAN, Mechanics of Landing: Instrument Landing System, Microwave Landing System

Satellite Navigation and Hybrid Navigation System

Basics of Satellite Navigation, Introduction to Global Positioning System., System Description, Basic principles, position, velocity determination, Signal structure- DGPS, Integration of GPS & INS.

Text book(s):	
1.	M.I.Skolnik, 'Introduction to Radar Systems', Tata McGraw Hill, 2007.
2.	Myron Kyton and W.R.Fried, 'Avionics Navigation Systems', 2nd Edition, John Wiley & Sons, 1997.
Reference(s):	
1	Nagaraja, 'Elements of Electronic Navigation', Tata McGraw Hill, 2nd Edition, 2000.
2	Albert Helfrick. D, 'Principles of Avionics', Avionics communications Inc., 2000.
3	Nathansan, 'Radar design principles-Signal processing and environment', PHI, 2nd Edition, 2007.
4	Hofmann-Wellenhof, Hlichlinegger and J.Collins, 'GPS Theory and Practice', 5th Edition, Springer International Edition, 2007.
5	Roger J.Sullivan, 'Radar foundations for Imaging and advanced concepts', PHI, 2004.
6	Mark A.Richards, 'Fundamentals of Radar Signal Processing', Tata McGraw Hill, 2005.
7	Bassem R.Mahafza, 'Radar systems analysis & Desgin using Matlab', Chapman & Hall/CRC, 2000.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective II								
40 EC E24 Advanced Digital Communication								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	• To study the advanced digital modulation/demodulation techniques suitable for band limited fading channels • To learn the advanced error control coding techniques and multi carrier spread spectrum techniques							
Course Outcomes	**At the end of the course, the students will be able to** 1. Discuss advanced digital modulation techniques suitable for band limited fading channels 2. Discuss advanced digital demodulation techniques suitable for band limited fading channels 3. Describe the various types optimum receivers and its performances 4. Analyse the various diversity techniques for multipath channels 5. Discuss the various signal detection and equalization techniques 6. Examine the advanced error control coding techniques 7. Describe the various multi carrier and spread spectrum techniques							

Advanced Digital Modulation

Memory less modulation methods: PAM, M-QAM, one shot minimum distance receiver, minimum distance sequence detection, optimum detection and error probability for PAM and QAM in AWGN channels, modulation schemes with memory: continuous-phase frequency-shift keying (CPFSK), continuous-phase modulation (CPM).

Digital Communication Through Band Limited and Fading Channels

Characterization of band-limited channels, optimum receiver for channels with ISI and AWGN: maximum likelihood receiver, discrete time model for a channel with ISI, maximum likelihood sequence estimation, performance of MLSE for channels with ISI, characterization of fading multipath channels: channel correlation functions and power spectra, statistical model for fading channels, the effect of signal characteristics on the choice of a channel model, frequency non selective and slowly fading channel, diversity techniques for fading multipath channels.

Detection and Equalization

Detection of a single real valued symbol, detection of a signal vector, known signal in gaussian noise, ml sequence detection: VITERBI algorithm, map detection: BCJR algorithm, equalization: optimal zero forcing equalizer, generalized equalization methods, fractionally spaced equalizer (FSE), decision feedback equalizer (DFE), adaptive DFE**.**

Error Control Signal Space Coding

Capacity penalty of binary coding, binary linear block code, convolution codes, low density parity check, turbo codes, trellis codes, COSET codes, signal space coding and ISI.

Multicarrier Systems and Spread Spectrum Technique

Single carrier Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), modulation and demodulation in an OFDM system, FFT algorithm implementation of an OFDM system, spectral characteristics of multicarrier signals, performance degradation of an OFDM system due to doppler spreading, direct sequence spread spectrum technique, frequency-hop spread spectrum technique, rake demodulator.

Text book(s):

1.	Proakis J G, 'Digital Communications', McGraw Hill Inc , New York, 2010.
2.	Barry S, Lee E A and Messershmitt D J, 'Digital Communications', Kluwer Academic Press , 2009.

Reference(s):

1.	Marvin K Simon,and Mohamed-Slim Alouini, 'Digital Communication over fading channels', John Wiley & sons Inc. singapore, 2005.
2.	Robert G Gallager, 'Principles of Digital Communication', Cambridge University Press, New Delhi ,2008.
3.	Won Y. Yang et al, 'MATLAB/Simulink for Digital Signal Processing' Hongrung Publishing, Korea, Indian Edition, 2012.

K.S. Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

Elective II

40 EC E25 Cryptography and Network Security

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To know concepts of modern symmetric key ciphers and number theory, the network security tools and understanding the system level security used. • To learn the basics of symmetric key encipherment
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the concepts of Ciphers. 2. Examine the different GF (2) fields. 3. Understand the different ciphers and its Encryption Standards. 4. Know the multiple uses of modern block ciphers and modern stream ciphers 5. Evaluate the mathematics of cryptography, Primarily Testing and Factorization. 6. Design the different Asymmetric key Encipherment algorithms. 7. Understand the message integrity and formulate the message authentication. 8. Analyze the digital signature schemes and understand the concepts of key management 9. Examine the security at the Application, Transport and Network layer. 10. Understand the Two Security Protocol.

Number Theoretic and Algebraic Algorithms

Introduction – Integer Arithmetic Modular Arithmetic – matrices – Linear congruence - Substitution ciphers – Transposition ciphers – Algebraic structure – GF(2) field.

Modern Symmetric Key Ciphers

Modern block ciphers – Modern stream ciphers – DES – AES – Multiple uses of modern block ciphers and stream cipher.

Asymmetric Key Encipherment

Primarily Testing – Factorization – Chinese Remainder Theorem – Quadratic congruence – Exponentiation & Logarithm – RSA Rabin – Elgamal – Elliptic curve

Integrity Authentication and Key Management

Message integrity –message authentication – SHA-512 – WHIRL POOL - Digital signature schemes – Biometrics – Kerberos – symmetric key management – public key distribution – steganography .

Network Security

Security at the Application Layer, Security at the transport layer, Security at the network layer, Two Security Protocol – Security Association – Internet Key Exchange.

Text book(s):

1.	Behrouz A. Ferouzan, 'Cryptography & Network Security', Tata McGraw Hill, 2nd Edition, 2011.
2.	W.Stallings, 'Cryptography & Network Security: Principles and Practice', Prentice Hall of India, 4th Edition, 2007.

Reference(s):

1.	Douglas R.Stlinson, 'Cryptography Theory and Practice', CRC Press series on Discrete Mathematics and its application 1995
2.	Charlie Kaufman, Radia Perlman, Mike Speciner, 'Network Security Private Communication in a Public World', Pearson Education, 2nd Edition, 2003.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective II								
40 EC E26 Electromagnetic Interference and Compatibility								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To understand the basics of EMI • To study EMI Sources • To understand EMI problems • To understand Measurement technique for emission • To understand Measurement technique for immunity • To understand Solution methods in PCB
Course Outcomes	**At the end of the course, the students will be able to** 1. Design a EMI free system 2. Reduce system level crosstalk 3. Understand the EMI standards and measurement methods 4. Design high speed Printed Circuit board with minimum interference 5. Make our world free from unwanted electromagnetic environment

EMI/EMC Concepts
EMI-EMC definitions and Units of parameters; Sources and victim of EMI; Conducted and Radiated EMI Emission and Susceptibility; Transient EMI, ESD; Radiation Hazards.

EMI Coupling Principles
Conducted, radiated and transient coupling; Common ground impedance coupling; Common mode and ground loop coupling; Differential mode coupling; Near field cable to cable coupling, cross talk; Field to cable coupling; Power mains and Power supply coupling.

EMI Control Techniques

Shielding- Shielding Material-Shielding integrity at discontinuities, Filtering- Characteristics of Filters Impedance and Lumped element filters-Telephone line filter, Power line filter design, Filter installation and Evaluation, Grounding- Measurement of Ground resistance-system grounding for EMI/EMC- Cable shielded grounding, Bonding, Isolation transformer, Transient suppressors, Cable routing, Signal control. EMI gaskets.

EMI Measurements and Standards
Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Tx /Rx Antennas, Sensors, Injectors / Couplers, and coupling factors; EMI Rx and spectrum analyzer; Civilian standards-CISPR, FCC, IEC, EN; Military standards-MIL461E/462. Frequency assignment - spectrum conversation. British VDE standards, Euro norms standards in japan - comparisons. EN Emission and Susceptibility standards and Specifications.

EMC Design Of PCBS
PCB Traces Cross Talk, Impedance Control, Power Distribution Decoupling, Zoning, Motherboard Designs and Propagation Delay Performance Models.

Text book(s):

1.	V.P.Kodali, 'Engineering EMC Principles, Measurements and Technologies', IEEE Press, Newyork, 2nd Edition 2010
2.	Clayton R.Paul,' Introduction to Electromagnetic Compatibility', John Wiley Publications, 2nd Edition 2010

Reference(s):

1.	Henry W.Ott, ' Noise Reduction Techniques in Electronics Systems.A Wiley Inter Science Publication John Wiley and Sons New York 2009
2.	Bemhard Keiser, 'Principles of Electromagnetic Compatibility', Artech house, Norwood, 2008.
3.	White Donald R J Consultant Incorporate, Handbook of EMI/EMC, Vol I-V, 1988

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective III

40 EC E31 Testing and Fault Diagnosis of VLSI Circuits

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To know the various types of faults and also to study about fault detection, dominance. • To know the concepts of the test generation methods-DFT-BIST. • To understand the fault diagnosis methods.
Course Outcomes	**At the end of the course, the students will be able to** 1. Apply test pattern for the detection of logical faults in digital circuits 2. Describe the various logical fault models simulation 3. Analyze test generation of various algorithms for combinational circuit 4. Apply test generation of various algorithms for sequential circuit 5. Describe the various techniques for design for testability 6. Explain the concepts of system level DFT approaches 7. Know the various BIST architecture 8. Understand the various BIST test algorithms 9. Illustrate the fault diagnosis method 10. Design a self-checking for digital circuit and system

Testing and Fault Modeling

Introduction to testing – Faults in Digital Circuits – Modeling of faults – Logical Fault Models simulation – Delay models – Gate Level Event – driven simulation.

Test Generation

Test generation for combinational logic circuits – Testable combinational logic circuit design – Test generation for sequential circuits – design of testable sequential circuits.

Design for Testability

Design for Testability – Ad-hoc design – generic scan based design – classical scan based design – system level DFT approaches.

Self – Test and Test Algorithms

Built-In self Test – test pattern generation for BIST – Circular BIST – BIST Architectures – Testable Memory Design – Test Algorithms – Test generation for Embedded RAMs.

Fault Diagnosis

Logical Level Diagnosis – Diagnosis by UUT reduction – Fault Diagnosis for Combinational Circuits – Self-checking design – System Level Diagnosis.

Reference(s):

1.	M.Abramovici, M.A.Breuer and A.D. Friedman, 'Digital systems testing and Testable Design', Jaico Publishing House, 2002.
2.	P.K. Lala, 'Digital Circuit Testing and Testability', Academic Press, 2002.
3.	M.L.Bushnell and V.D.Agrawal, 'Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits', Kluwer Academic Publishers, 2002.
4.	A.L.Crouch, 'Design-For-Test For Digital IC's And Embedded Core Systems', Prentice Hall International, 2002.
5.	http://www.facweb.iitkgp.ernet.in/~isg/TESTING/

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective III								
40 EC E32 High Speed Networks								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	• To familiarize High Speed Networks • To understand Congestion and Traffic Management • To know the QoS of High speed networks							
Course Outcomes	**At the end of the course, the students will be able to** 1. Describe the concepts of asynchronous transfer mode. 2. Describe the architecture of high speed LANs. 3. Discuss congestion control and its effects. 4. Describe traffic management in data transmission. 5. Discuss TCP congestion control protocol. 6. Discuss ATP congestion control protocol. 7. Describe the architecture of integrated services. 8. Describe the various integrated and differentiated services. 9. Analysis the protocol mechanism for QoS. 10. Discuss multiprotocol label switching and RTP.							

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

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

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

Integrated and Differentiated Services
Integrated Services -Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection.

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

Text book(s):

1.	William Stallings, High Speed Networks and Internet, Pearson Education, 2002.

Reference(s):

1.	Warland, PravinVaraiya, High Performance Communication Networks, Jean Harcourt Asia ,2001.
2.	IrvanPepelnjk, Jim Guichard and Jeff Apcar, MPLS and VPN Architecture, Cisco Press, Volume 1 and 2, 2003

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective III

40 EC E33 Measurements and Instrumentation

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To introduce principles of various measurement techniques using analog and digital equipments • To teach Importance of signal generators and analyzers in measurements • To emphasize the need for data acquisition systems and optical domain measurement techniques
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the basic concepts measurement system 2. Learn the characteristics of various measurement techniques 3. Discuss the classification of various transducer 4. Understand the concepts of various sensors 5. Determine the relevant parameter measurement using AC and DC bridges 6. Learn the concepts of various signal analyzer 7. Understand the principle of digital instruments 8. Learn the basic concepts of IEEE buses 9. Discuss the storage oscilloscope device 10. Understand the virtual instrumentation and its application

Science of Measurement

Measurement System – Instrumentation – Characteristics of measurement systems – Static and Dynamic – Errors in Measurements – Calibration and Standards.

Transducers

Classification of Transducers – Variable Resistive transducers – Strain gauges , Thermistor, RTD-Variable Inductive transducers- LVDT, RVDT,- Variable Capacitive Transducers – Capacitor microphone- Photo electric transducers – Piezo electric transducers – Thermocouple – IC sensors - Fibre optic sensors – Smart/intelligent sensors.

Signal Conditioning and Signal Analyzers

DC and AC bridges – Wheatstone, Kelvin, Maxwell, Hay and Schering. Pre- amplifier – Isolation amplifier – Filters – Data acquisition systems. Spectrum Analyzers – Wave analyzers – Logic analyzers.

Digital Instruments

Digital Voltmeters – Millimeters – automation in Voltmeter – Accuracy and Resolution in DVM - Guarding techniques – Frequency counter- Data Loggers – Introduction to IEEE 488/GPIB Buses.

Data Display and Recording Systems

Dual trace CRO – Digital storage and Analog storage oscilloscope. Analog and Digital Recorders and printers. Virtual Instrumentation - Block diagram and architecture – Applications in various fields. Measurement systems applied to Micro and Nanotechnology.

Text book(s):

1.	Albert D.Helfrick and William D. Cooper, 'Modern Electronic Instrumentation and Measurement Techniques', Prentice Hall of India, 2007.
2.	Ernest O. Doebelin and Dhanesh N. Manik, 'Measurement Systems', 5th Edition, McGraw- Hill, 2007.

Reference(s):

1.	John P. Bentley, 'Principles of Measurement Systems', 4th Edition, Pearson Education Limited, 2005.
2.	A. K. Sawhney, 'Course In Electrical and Electronic Measurement and Instrumentation', Dhanpat Rai Publisher, 2000.
3.	Bouwens,A.J, 'Digital Instrumentation', Tata Mc-Graw Hill, 1986
4.	David A.Bell, 'Electronic Instrumentation and Measurements', 2nd Edition, Prentice Hall of India, 2007.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective III								
40 EC E34 Satellite Communication								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• Overview of satellite systems in relation to other terrestrial systems. • Study of satellite orbits and launching. • Study of earth segment and space segment components. • Study of satellite access by various users. • Study of DTH and compression standards.
Course outcome(s)	**At the end of the course, the students will be able to** 1 . Learn basic concepts and operation of satellite communication systems 2. Understand the concepts of coordinate systems for launching satellite. 3. Acquire knowledge about geostationary orbits. 4. Discuss the concepts on blocks of space segment. 5. Design of Earth station and tracking of the satellites. 6. Discuss the various parameters of space linking satellite system. 7. Understand how analog and digital technologies are used for satellite communication networks. 8. Understand the concept of broadcasting signals. 9. Learn MPEG compression methods and satellite mobile services

Overview of Satellite Systems, Orbits and Launching Methods

Introduction – Frequency Allocations for Satellite Services – Intelsat – U.S.Domsats – Polar Orbiting Satellites –Problems – Kepler's Law –Definitions of Terms for Earth-orbiting Satellites – Orbital Elements – Apogee and Perigee Heights – Orbital Perturbations –Inclined Orbits – Calendars – Universal Time – Julian Dates – Sidereal Time – The Orbital Plane – The Geocentric-Equatorial Coordinate System – Earth Station Referred to the IJK Frame – The Top centric-Horizon Co-ordinate System – The Sub-satellite Point – Predicting Satellite Position.

Geostationary Orbit & Space Segment

Introduction – Antenna Look Angels – The Polar Mount Antenna – Limits of Visibility – Near Geostationary Orbits – Earth Eclipse of Satellite – Sun Transit Outage – Launching Orbits – Problems – Power Supply – Attitude Control – Spinning Satellite Stabilization – Momentum Wheel Stabilization – Station Keeping – Thermal Control – TT&C Subsystem – Transponders – Wideband Receiver – Input Demultiplexer – Power Amplifier – Antenna Subsystem – Morelos – Anik-E – Advanced Tiros-N Spacecraft

Earth Segment & Space Link

Introduction – Receive-Only Home TV Systems – Master Antenna TV System – Community Antenna TV System – Transmit-Receive Earth Stations – Problems – Equivalent Isotropic Radiated Power – Transmission Losses – Free-Space Transmission – Feeder Losses – Antenna Misalignment Losses – Fixed Atmospheric and Ionospheric Losses – Link Power Budget Equation – System Noise – Carrier-to-Noise Ratio – Uplink – Saturation Flux Density – Input Back Off – The Earth Station HPA – Downlink – Output Back off – Satellite TWTA Output – Effects of Rain –Combined Uplink and Downlink C/N Ratio.

Satellite Access

Single Access – Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth- limited a Power-limited TWT amplifier operation, FDMA downlink analysis. TDMA : Reference Burst; Preamble and Postamble, Carrier recovery, Network synchronization, unique word detection, Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA & TDMA. On-board signal Processing for TDMA / FDMA operation, Satellite switched TDMA. Code -Division Multiple Access. Network Layers – TCP Link – Satellite Links and TCP – Enhancing TCP Over Satellite Channels Using Standard Mechanisms – Requests for comments – Split TCP connections – Asymmetric Channels – Proposed Systems

Direct Broadcast Satellite Services

Introduction – Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization --Transponder Capacity – Bit Rates for Digital Television – MPEG Compression Standards – Forward Error Correction – Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU) – Downlink Analysis – Uplink -Problems - Satellite Mobile Services – VSATs – Radarsat – Global Positioning Satellite System – Orbcomm.

Text book(s):

1. Dennis Roddy, 'Satellite Communications', McGraw-Hill Publication,3rd Edition,2001.

Reference(s):

1. Timothy Pratt , Charles Bostian & Jeremy Allmuti, 'Satellite Communications', John Willy & Sons (Asia) Pvt. Ltd. 2004.
2. Wilbur L. Pritchars Henri G. SuyderHond Robert A.Nelson, 'Satellite Communication Systems Engineering', Pearson Education Ltd., 2ND Edition 2003.
3. M.Richharia , 'Satellite Communication Systems (Design Principles)', Macmillan Press Ltd. 2nd Edition 2003.

K.S. Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

Elective III

40 EC E35 Advanced Microcontrollers

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objective(s)	• To understand the embedded electronic systems and microcontrollers • To introduce the Texas MSP430 • To develop the knowledge of Texas MSP430 • To enhance the knowledge about functions, interrupts and low power modes • To broaden the importance of mixed signal peripherals
Course Outcomes	**At the end of the course, the students will be able to:** 1. Know about the embedded electronic systems and microcontrollers 2. Learn about C programming language and assembly language to access the microcontroller 3. Analyze the architecture of Texas MSP430 4. Learn about the CPU instruction set and exceptions 5. Gain knowledge about the MSP430 6. Acquire good knowledge about automatic control 7. Describe functions, interrupts and low power modes 8. Gain good knowledge about interrupt service routines

Embedded Electronic Systems and Microcontrollers

Introduction to Embedded System, and microcontrollers, Anatomy of a typical small microcontroller, Memory, Software, The C programming language, Assembly language, Access to microcontroller for programming and debugging. Where does the MSP430 fit.

TEXAS MSP430

Architecture of the MSP430, Memory, addressing modes, Constant generator and emulated instructions, Instruction set, Reflections on the CPU instruction set, Reset, Clock system, Exceptions: Interrupts and resets.

A Simple Tour of the MSP430

First program on a conventional desktop computer, Light LEDs in C, Light LEDs in assembly language, Read input from a switch, Automatic control: flashing light by software delay, Automatic control: Use of subroutines, Automatic control: Flashing light by polling Timer A, Header files and issues that have been brushed under the carpet.

Functions, Interrupts and Low-Power modes

Functions and subroutines, Storage for local variables, passing parameters to a subroutine and returning a result, Mixing C and assembly language, Interrupts, Interrupt service routines, Issues associated with interrupts, Low-power modes of operation.

Mixed Signal Peripherals

Digital input/output, LCD Displays, Watchdog timers, timers, ADC, DAC,SPI, I2C,UART, Low power embedded system design using MSP430 processors.

Reference book(s):

1.	Steve Furber,'ARM System-on-ChipArchitecture', 2nd Edition, Addison Wesley, 2000.
2.	David Seal,'ARM Architecture Reference Manual', 2nd Edition, Addison Wesley, 2007.
3.	Alex Van Somer anand Carol Attack,'The ARM RISC Chip: A Programmer"s Guide', Addison Wesley, 1993.
4.	Trevor Martin,Theinsider"s guide to Philips ARM1-based microcontroller.www.hitex.co.uk/arm
5.	Sen.M.Kuo, Woon - Seng Gan, Digital signal processors architectures, Implementation and Applications Pearson education.
6.	C.P. Ravi Kumar, MSP430 ,Micro controller in Embedded system Projects, TI.
7.	John Davies, Newness, MSP430 Microcontroller Basics.
8.	Chris Nagy, Embedded system design using the TI MSP430 series, Elsevier Publications

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective III								
40 EC E36 RFID and Biometrics								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	• To understand the principle of RF ID • To know the different modes in RF ID • To understand the problems in the data transmission							
Course outcomes	**At the end of the course, the students will be able to** 1. Able to gain knowledge about RFID technology 2. Able to understand the operation modes of RFID 3. Able to learn basic working of Biometrics 4. Able to learn the various scans in Biometrics							

Introduction to RFID

Definitions and Vocabulary, History, Frequencies and their Classification, RFID vs. Barcodes, Fundamentals of RFID-RFID Tags, Passive Transponders, Passive RFID Coupling, Active Transponder, Semi-passive Transponders, Middleware, Radio Frequency (or Contact less) Identification and its range of applications

Communication and Operating Modes In RFID

Contact less Communication Concepts, Elements of RFID, Energy Transfer and Communication Modes, Forward Link and Return Link, Data Communications, Principle of Communication, Concept of Operating Modes, General Operating modes, Problems in Data Transmission, Problems Relating to 'Long Distance' RFID Systems.

Introduction to Biometrics

Over view of bio metrics - Benefits of biometric security – Verification and identification and enrollment – Basic working of biometric matching – Accuracy – False match rate – False non-match rate – Failure to enroll rate – Derived metrics – Layered biometric solutions. Biometric system security.

Finger Scan and Facial Scan

Finger scan, Features, Components, Operation (steps), Competing finger Scan technologies, Strength and weakness. Types of algorithms used for interpretation. Facial Scan, Features, Components, Operation (steps), Competing facial Scan technologies – Strength and weakness.

Iris Scan, Voice Scan

Features, Components, Operation (steps),Competing iris Scan and voice scan technologies – Strength and weakness. Other physiological biometrics ,Hand scan ,Retina scan, AFIS (Automatic Finger Print Identification Systems), Behavioral Biometrics ,Signature scan, keystroke scan, Biometrics Application ,Biometric Solution Matrix ,Bio privacy ,Comparison of privacy factor in different biometrics technologies ,Designing privacy sympathetic biometric systems. Biometric standards - (BioAPI, BAPI), Biometric middleware.

Text book(s):

1.	Samir Nanavati,Michael Thieme, Raj Nanavati, Biometrics - Identity Verification in a Networked World, Khanna Publications , WILEY- Dream Tech,2002.
2.	Domanique Paret, RFID At Ultra And Super High Frequencies Theory And Application, Wiley Publications, 2009.

Reference(s):

1.	Paul Reid, Biometrics for Network Security, Pearson Education, 2000.
2.	Albert Lozano-Nieto, RFID Design Fundamentals and Applications, CRC Press, 2010

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective III								
40 EC E37 CMOS RF System design								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objective(s)	To understand the analysis and design of RF front end systems including the circuits, blocks and architecture.							
Course Outcomes	**At the end of the course, the students will be able to:** 1. Understand the RF characteristics and semiconductor realization of passive components. 2. Discuss the design guidelines of coaxial line, stripline, microstrip line and their RF behaviors. Describe the concepts of long and short channel approximations and estimate the MOS bandwidth at Radio frequency. 3. Illustrate the open and short circuit time constant procedures and high frequency amplifiers 4. Discriminate the working principle, gain and stability factors of shunt and tuned amplifiers 5. Understand the working principle of power amplifiers and analyse the characteristics of PA at RF range. 6. Summarise the topologies in LNA and the problems of input matching, Gain switching, Band switching in LNA. 7. Analyse the characteristics of different types of mixer circuits. 8. Describe the working of RF oscillators. 9. Illustrate the design, quantitative analysis and applications of PLL. 10. Understand the RF characteristics and semiconductor realization of passive Components.							

RF Characteristics of Passive Components
RF characteristics of chip resistor, capacitor and inductors, semiconductor realization of resistors, capacitors, inductors, transformers. Coaxial, stripline, and microstrip line design guidelines and behavior at RF.

MOS Characteristics at RF
Long and Short channel approximations, bandwidth estimation techniques, open and short circuit time constant procedures, high frequency amplifiers.

Amplifier Design
Series shunt amplifiers, tuned amplifiers, neutralization, feedback and RF stability criteria, gain and phase margins, compensation techniques Class A,B,C,D,E,F power amplifier definitions, PA characteristics, RF PA design examples.

LNAS and Mixers
Noise definitions and noise models, two port noise parameters of MOSFET, LNA topologies, noise match and power match design considerations, linearity and large signal performance of LNAs, Mixer fundamentals, nonlinear mixers, multiplier based mixers, sub-sampling mixers.

Oscillators, Phase Locked Loops
Colpitts oscillator, Ring Oscillators, VCOs, Linearized PLL models, noise properties of PLLs, phase detectors, loop filters, charge pumps, PLL design examples, detailed considerations of phase noise.

Text book(s):	
1	Thomas Lee, 'The Design of Radio Frequency CMOS Integrated Circuits', Cambridge University Press, 2nd Edition, 2007.
2	Behzad Razavi, 'RF Microelectronics', John Wiley, 2006.
Reference(s):	
1	Reinhold Ludwig, Pavel Bretchko, 'RF Circuit Design-Theory and Applications', Pearson Education, 2002.
2	Ulrich Rohde, 'RF/Microwave Circuit Design for Wireless Applications', John Wiley, 2000.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective IV

40 EC E41 Software for Embedded Systems

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)

- To Introduce the GNU C Programming Tool Chain in Linux.
- To study the basic concepts of embedded C and Embedded OS
- To introduce time driven architecture, Serial Interface with a case study.
- To introduce the concept of embedded Java for Web Enabling of systems.

Course Outcomes

At the end of the course, the students will be able to

1. Interpret the essential features and elements of embedded programming.
2. Identify the various open source tools used in embedded systems
3. Illustrate the features of GNU C programming in Linux
4. Examine the application constraints of embedded C
5. Understand the basic concepts of Embedded OS
6. Describe the fundamental operations of Multi state architecture
7. Illustrate the wired networking protocols for embedded systems
8. Understand the basic concepts of Embedded JAVA
9. Implement the Embedded JAVA in Web Applications.

Embedded Programming

C and Assembly - Programming Style - Declarations and Expressions - Arrays, Qualifiers and Reading Numbers - Decision and Control Statements - Programming Process - More Control Statements - Variable Scope and Functions - C Preprocessor - Advanced Types – Simple Pointers - Debugging and Optimization – In-line Assembly.

C Programming Tool chain In Linux

C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB – TheMake utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using *gprof*-Memory Leak Detection with valgrind- Introduction to GNU C Library

Embedded C And Embedded OS

Adding Structure to 'C' Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts. Creating embedded operating system: Basis of a simple embedded OS, Introduction to sEOS, Using Timer 0 and Timer 1, Portability issue, Alternative system architecture, Important design considerations when using sEOS.

Time-Driven Multi-State Architecture and Hardware

Multi-State systems and function sequences: Implementing multi-state (Timed) system -Implementing a Multi-state (Input/Timed) system. Using the Serial Interface: RS232 - The BasicRS-232 Protocol - Asynchronous data transmission and baud rates - Flow control – Software architecture - Using on-chip UART for RS-232 communication - Memory requirements – Theserial menu architecture - Examples. Case study: Intruder alarm system.

Embedded Java

Introduction to Embedded Java and J2ME – Smart Card basics – Java card technology overview – Java card objects – Java card applets – working with APDUs – Web Technology for Embedded Systems.

Text book(s):

1. Steve Oualline, 'Practical C Programming 3rd Edition', O'Reilly Media, Inc, 2006.

Reference(s):

1. Stephen Kochan, 'Programming in C', 3rd Edition, Sams Publishing, 2009.
2. Michael J Pont, 'Embedded C', Pearson Education, 2007.
3. Zhiqun Chen, 'Java Card Technology for Smart Cards: Architecture and Programmer's Guide', Addison-Wesley Professional, 2000.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective IV

40 EC E42 Electronic Product Design

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)

- To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.
- Understanding the various types of power supplies and to design it
- To acquire the basic knowledge of PCB and RF systems

Course Outcomes

At the end of the course, the students will be able to

1. Design power supply using transistors
2. Design SMPS and power supply using SCRs
3. Describe shielding and grounding techniques and fundamentals of DAS
4. Discuss analog to digital converters and its types
5. Describe basic concepts of RF networks
6. Design filters for radio frequency applications
7. Describe the fundamentals of RF amplifiers
8. Design amplifiers for radio frequency applications
9. Discuss the general layout, rules and parameters for low frequency circuit PCBs
10. Discuss the general layout, rules and parameters for high frequency circuit PCBs and CAD of PCBs

Design of Power Supplies

DC power supply using transistors and SCRs - Design of crowbar and fold back protection circuits - Switched mode power supplies - Forward- fly back- buck and boost converters - Design of transformers and control circuits for SMPS.

Design of Data Acquisition System

Low level signals Amplification - Principles of Grounding - Shielding and Guarding techniques - A/D converters: Dual slope, quad slope and high speed - Microprocessors Compatible A/D converters - Logarithmic A/D converters- Sample and Hold circuit

RF Design Methodology

Behavior of RF passive components - Chip components and circuit board considerations - Review of transmission lines, Impedance and admittance transformation, Parallel and series connection of networks - ABCD and scattering parameters - RF filter - Basic resonator and filter configurations - Butterworth and Chebyshev filters - Implementation of micro strip filter and Band pass filter - cascading of band pass filter elements.

RF Transistor Amplifier Design

Amplifier classes of operation and biasing networks - Amplifier power gain, Unilateral design(S12 =0) - Simple input and output matching networks - Bilateral design - Stability circle - conditional stability- Simultaneous conjugate matching for unconditionally stable transistors - Broadband amplifiers - High power amplifiers - Multistage amplifiers.

Design of Printed Circuited Boards

Technology of printed circuit boards (PCB), General layout - rules and parameters - PCB design rules for Digital - High Frequency, Analog, Power Electronics and Microwave circuits - Computer Aided design of PCBs.

Text book(s):

1.	Reinfold Ludwig and Pavel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education, Asia publication, New Delhi, 2011.
2.	Sydney Soclof, Applications of Analog Integrated Circuits, PHI, 2004.

Reference(s):

1.	Walter C Bosshart, Printed circuit Boards – Design and Technology, Tata McGraw-Hill, 2003.
2.	Keith H Billings, Handbook of Switched Mode Supplies, McGraw-Hill, Third Edition 2010.
3.	Michael Jaacob, Applications and Design with Analog Integrated Circuits, PHI, 2000.
4.	D M Pozar, Microwave Engineering, John Wiley, 2012.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective IV								
40 EC E43 Virtual Instrumentation								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100
Objective(s)	• To understand the concepts of Virtual Instrumentation. • To study the fundamentals of DAQ Hardware and Software. • To impart knowledge on Lab VIEW.							
Course outcome(s)	**At the end of the course, the students will be able to** 1. Learn the basic programming concepts in LabVIEW 2. Develop programs by using graphical environment 3. Learn the different data acquisition system concepts 4. Apply the knowledge of different programming techniques for VI 5. Develop real time applications by using LabVIEW							

Fundamentals of Virtual Instrumentation

LabVIEW – graphical user interfaces- controls and Indicators – 'G' programming –data types –data flow programming –Editing Debugging and Running a Virtual Instrument –Graphical programming palettes and Tools – Front panel objects.

Graphical Programming Environment in VI

FOR Loops, WHILE loops, Shift Registers, CASE structure, formula nodes-Sequence structures- Arrays and Clusters- Array operations – Bundle, Unbundle – Bundle/Unbundle by name, graphs and charts – string and file I/O – High level and Low level file I/Os.

Interfacing DAQ System With PC

Basics of DAQ Hardware and Software – Concepts of Data Acquisition and terminology – Installing Hardware, Installing drivers -Configuring the Hardware – addressing the hardware in LabVIEW- Digital and Analog I/O function – Buffered I/O..

Simple Programming in VI

Simple programs in VI- Advanced concepts in LabVIEW- TCP/IP VI's, Synchronization – other elements of Virtual Instrumentation – Bus extensions – PXI - Computer based instruments.

Analysis Tools and Simple Applications In VI

Fourier transform - Power spectrum - Filtering tools – CRO emulation –Audio signal processing using Signal processing toolkit-Virtual instrumentation application in Biomedical, Process Control and Mechatronics.

Text book(s):	
1.	Jovitha Jerome, Virtual Instrumentation using LabVIEW, PHI, 2010
2.	Garry M. Johnson, LabVIEW Graphical Programming, Tata McGraw Hill, 1996.
Reference(s):	
1.	Labview Basics I and II Manual, National Instruments
2.	Barry Paton, Sensor, Transducers and LabVIEW, PHI, 2000.
3.	Lisa K Wlls, LabVIEW for Everyone,PHI,1996

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective IV								
40 EC E44 Optoelectronic Devices								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To learn the basics of solid state physics. • To learn the basics of display devices. • To learn the operation of optical modulators and detectors • To enrich the idea of optoelectronic integrated circuits
Course outcomes	**At the end of the course, the students will be able to** 1. Explain the concept of light wave theory 2. Discuss the basics of solid state physics 3. Explain the operation of various display devices 4. Analyze the threshold conditions of laser 5. Explain the working principle of thermal detectors 6. Describe the working principle of quantum detector 7. Explain the working principle of OE modulators 8. Discuss about optical switching 9. Explain about optoelectronic integrated circuits 10. Explain the concept of light wave propagation through guided wave devices

Elements of Light and Solid State Physics

Wave nature of light, Polarization, Interference, Diffraction, Quantum mechanics and band theory, Band structure and carrier effective masses, Scattering and carrier mobilities, Semiconductors statistics, Carrier recombination.

Display Devices and Lasers

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes.

Optical Detection Devices

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Junction Photo diodes, High speed diodes, Metal-Semiconductor-Metal (MSM) diodes, Solar Cells, CCD sensors.

Optoelectronic Modulators and Switches

Electro-optic modulators, Franz-Keldysh effect, Quantum confined Stark effect in quantum well semiconductors, Electro-absorption modulators, electro-refraction devices .Optical, Switching and Logic Devices.

Optoelectronic Integrated Circuits

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

Text book(s):

1.	Pallab Bhattacharya ‘Semiconductor Opto Electronic Devices’, Prentice Hall of India Pvt., Ltd., New Delhi, 2006.
2.	Jasprit Singh, ‘Opto Electronics – As Introduction to Materials and Devices’, McGraw-Hill International Edition, 1998.

Reference(s):

1.	S C Gupta, Opto Electronic Devices and Systems, Prentice Hall of India, 2005.
2.	J. Wilson and J.Haukes, ‘Opto Electronics – An Introduction’, Prentice Hall, 1995

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective IV								
40 EC E45 Avionics								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100
Objective(s)	• To introduce the hardware required for aircraft • To introduce communication and navigation techniques used in aircrafts • To introduce autopilot and cockpit display related concepts							
Course Outcomes	**At the end of the course, the students will be able to** 1. Describe the concepts of aircraft axis sensor systems. 2. Describe the avionics architecture and data buses. 3. Describe the concepts of radio navigation. 4. Discuss the different types of navigation. 5. Discuss the inertial navigation systems. 6. Discuss the satellite navigation systems. 7. Describe the air data quantities altitude, speed, temperature. 8. Describe the basic principles of autopilot mode. 9. Discuss the electronic displays. 10. Describe the different display technologies used in avionics.							

Introduction

Introduction to aircraft – Axes system – Parts, importance and role of Avionics – systems which interface directly with pilot – Aircraft state sensor systems – Navigation systems – External world sensor systems – task automation systems. Avionics architecture evolution. Avionics Data buses - MIL STD 1553, ARINC 429, ARINC 629.

Radio Navigation

Types of Radio Navigation – ADF, DME, VOR, LORAN, DECCA, OMEGA. ILS, MLS

Inertial and Satellite Navigation Systems

Inertial sensors – Gyroscopes, Accelerometers, Inertial navigation systems – Block diagram, Platform and strap down INS. Satellite Navigation - GPS

Air Data Systems and Autopilot

Air data quantities – Altitude, Airspeed, Mach no., Vertical speed, Total Air temperature, Stall warning, Altitude warning. Autopilot – basic principles – longitudinal and lateral autopilot.

Aircraft Displays

Display technologies – LED, LCD, CRT, Flat Panel Display. Primary Flight parameter displays - Head Up Display, Helmet Mounted Display, Night vision goggles, Head Down Display, MFD, MFK, Virtual cockpit.

Text book(s):

1.	Albert Helfrick. D, 'Principles of Avionics', 8th Edition, Avionics communications Inc., 2013.
2.	Myron Kayton and Walter R. Fried, 'Avionics Navigation Systems', 2nd Edition, John Wiley & Sons, 1997.

Reference(s):

1.	Collinson, R.P.G, 'Introduction to Avionics', 2nd Edition, Chapman and Hall, 1996.
2.	Middleton, D.H, 'Avionics Systems', Longman Scientific and Technical, Longman Group UK Ltd, England, 1989.
3.	Spitzer, C.R. 'Digital Avionics Systems', Prentice Hall, Englewood Cliffs, N.J., USA 1993.
4.	Pallet, E.H.J, 'Aircraft Instruments and Integrated Systems', Longman Scientific and Technical Series, 1992.
5.	Spitzer, C.R, 'The Avionics Handbook', CRC Press, 2000.

K.S.Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective IV								
40 EC E46 Autotronics and Vehicle Intelligence								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100
Objective(s)	• To understand the fundamentals of automotives • To develop the knowledge of automotive sensors • To introduce the different fuel injection and ignition systems • To enhance the knowledge on different vehicle systems • To understand the importance of vehicle intelligence system							
Course Outcomes	**At the end of the course, the students will be able to** 1. Know about the engine components 2. Analyze the performance of Brakes and steering system 3. Gain knowledge about the temperature and pressure sensors 4. Describe the advantages and applications of smart sensors 5. Acquire knowledge on fuel injection system 6. Gain knowledge about ignition system 7. Learn about Electric vehicles 8. Learn about hybrid vehicles 9. Acquire the knowledge to design vision based autonomous road vehicles 10. Acquire the knowledge to design a Mobile robot vision to a vehicle information system							

Automotive Fundamentals

The engine-components-Drive train-Starting &charging systems operation-Ignition system-Suspension Systems-brakes-ABS-Steering system.

Automotive Sensors

Temperature sensor-gas sensor-knock sensor-pressure sensor-flow sensor-torque sensor-crash sensor-Speed sensor and acceleration sensor-micro sensor-smart sensor-operation, types, characteristics, advantages and their applications.

Fuel Injection and Ignition System

Introduction -fuel system components-electronic fuel system-fuel injection-types-throttle body versus port injection-electronic control fuel injection-operation-different types-fuel injectors-idle speed control-continuous injection system-high pressure diesel fuel injection-MPFI system-Electronic ignition system-operation-types-Electronic spark timing control.

Electric Vehicles and Hybrid Vehicles

Introduction-Electric Vehicle development- system layout- basic system components-Electric battery-solar cells-rapid charging system-motor drive system-fuel cell Electric vehicle-hybrid vehicle-series Hybrid Vehicle-parallel Hybrid Vehicle-CNG Electric hybrid vehicle.

Vehicle Intelligence

Introduction-basic structure-vision based autonomous road vehicles-architecture for dynamic vision system-features-applications-A visual control system using image processing and fuzzy theory-An application of mobile robot vision to a vehicle information system.-object detection, collision warning and Avoidance system- low tire pressure warning system.

Text book(s):

1.	William B.Ribbens, 'Understanding Automotive Electronics', 7th Edition, Elsevier Science, 2012.

Reference(s):

1.	Jack Erjavec, Robert Scharff, 'Automotive Technology', 6th Edition, Delmar publications, 2014.
2.	Ichiro Masaki, 'Vision-based Vehicle Guidance', Springer Verlag, 2012.
3.	Jay Webster, 'Class Room Manual For Automotive Service and System', Delmer Publications Inc, 2012.
4.	Ronald K.Jurgen, 'Electric and Hybrid-electric vehicles', SAE International, 2010.
5.	Ronald K.Jurgen, 'Sensors and Transducers', 2nd Edition, SAE International, 2003.
6.	Ron Hodkinson, John Fenton, 'Light Weight Electric/Hybrid Vehicle Design', Reed Educational and Professional Publishing Ltd, 2001.

K.S.Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective IV								
40 EC E47 Principles of Medical Imaging								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100
Objective(s)	• To understand the basics of image acquisition. • To learn mathematical preliminaries for image reconstruction. • To understand the concepts of various imaging modalities and image quality.							
Course Outcomes	**At the end of the course, the students will be able to** 1. Learn the fundamentals of image acquisition 2. Develop knowledge about radiography techniques 3. Understand the concepts of two dimensional image reconstruction from projections 4. Understand the concepts of three dimensional and iterative image reconstructions 5. Discuss the principles of fluoroscopy and computed tomography 6. Analyse image noise, distortion and artifacts 7. Discuss the fundamentals of magnetic resonance 8. Explain the contrast agents used in different imaging modalities 9. Discuss the principles of ultrasound imaging 10. Explain the model, reconstruction and instrumentation of neuro magnetic imaging							

Acquisition of Images

Introduction to Imaging Techniques - Single crystal scintillation camera - Principles of scintillation camera operation - multiple crystal scintillation camera- solid state camera - rectilinear scanner- Emission computed Tomography- Radiography: Digital Radiography.

Mathematical Preliminaries for Image Reconstructions

Image Reconstruction from Projections in Two dimensions - Mathematical Preliminaries for Two and Three dimensional Image Reconstructions- Radon Transform- Projection Theorem-central slice Theorem- Sinogram – Two Dimensional Projection Reconstruction - Three Dimensional Projection Reconstruction - Iterative Reconstruction Techniques- Fourier Reconstruction.

Fluoroscopy, CT, Images Quality

Digital fluoroscopy - Automatic Brightness control cinefluorography - Principles of computed Tomographic Imaging - Reconstruction algorithms – Scan motions- X-ray sources Influences of Images quality: Unsharpness - contrast- Image Noise-,Image distortion -Artifacts.

Magnetic Resonance Imaging and Spectroscopy

Fundamentals of Magnetic Resonance overview - Pulse sequences - spatial encoding of magnetic Resonance Imaging signal - Motion suppression Techniques - Contrast Agents - tissue contrast in MRI - MR Angiography, spectroscopy - chemical shift Imaging.

Ultra Sound, Neuro Magnetic Imaging

Ultra sound:Presentation modes -Time required to obtain Images - System components, signal processing - dynamic Range - Ultrasound Image Artifacts - Quality control, Origin of Doppler shift - Limitations of Doppler systems. Neuro magnetic Imaging*:* Background - Models and Image Reconstruction - Instrumentation.

Text book(s):

1. William R. Hendee, E. Russell Ritenour, ‘Medical Imaging Physics’, A John Wiley & sons, Inc., Publication, Fourth Edition, 2002.(Units I,III,IV,V)
2. Zang-Hee Cho, Joie P. Jones and Manbir Singh, ‘Foundations of Medical Imaging’, John Wiley and sons Inc.,1993.(Units II &V)

Reference(s):

1. Avinash C. Kak, Malcolm Slaney, ‘Principles of Computerized Tomographic Imaging’, IEEE Press, New york,1998.

K.S. Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

Elective V

40 EC E51 Real Time Digital Signal Processing Design

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)

The objective of this course is to provide indepth knowledge on

- Digital Signal Processor basics
- Third generation DSP Architecture and programming skills
- Advanced DSP architectures and some applications.

Course Outcomes

At the end of the course, the students will be able to

1. Understand the concept of real time digital signal processing.
2. Understand the various software development tool and hardware platform for DSP applications.
3. Analyse the time-varying adaptive filters with changing characteristics in DSP applications.
4. Investigate different methods for the generation of digital signals and their applications
5. Understand speech coding techniques for transmission or storage in digital media and decoding the signal with the best perceptual quality.
6. Design and implementation of speech enhancement algorithms to enhance the speech corrupted by background noises.
7. Understand the fundamental concept of image processing methods.

Introduction to Real Time Digital Signal Processing

Basic Elements of Real-Time DSP Systems - Analog Interface - DSP Hardware - DSP System Design - Introduction to DSP Development Tools.

Adaptive Filtering

Introduction to Random Processes - Adaptive Filters - Performance Analysis - Implementation Considerations - Practical Applications: Adaptive Linear Prediction, Noise Cancelation, Channel Equalization.

Digital Signal Generators

Sinewave Generators - Noise Generators - Practical Applications: Siren Generators, White Gaussian Noise, Dual-Tone Multifrequency Tone Generator and Comfort Noise in Voice Communication Systems.

Speech Coding and Enhancement Techniques

Introduction to Speech-Coding - Overview of CELP Vocoders - Overview of Some Popular CODECs - Voice over Internet Protocol Applications - Introduction to Noise Reduction Techniques - Spectral Subtraction Techniques - Voice Activity Detection - Combination of Acoustic Echo Cancelation with NR - Voice Enhancement and Automatic Level Control.

Introduction to Digital Image Processing

Digital Images and Systems - RGB Color Spaces and Color Filter Array Interpolation - Color Spaces - Color Balance and Correction - Image Histogram - Image Filtering - Image Filtering Using Fast Convolution.

Text book(s):

1. Sen M Kuo, Bob H Lee and Wenshun Tian, 'Real-Time Digital Signal Processing Implementations and Applications', John Wiley & Sons Ltd, 2006.

Reference(s):

1. Behrouz Farhang-Boroujeny, 'Adaptive Filters: Theory and Applications', Wiley, 2013.
2. Pejman Mowlaee, Josef Kulmer, Johannes Stahl, Florian Mayer, 'Real-Time Digital Signal Processing: Fundamentals, Implementations and Applications', Wiley, 3rd Edition, 2013.
3. Rafael C Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson Education, 3rd Edition, 2015

K.S. Rangasamy College of Technology - Autonomous

B.E. Electronics and Communication Engineering

Elective V

40 EC E52 Wavelets and Its Applications

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	To learn the properties of Fourier transform and STFT, To analyse the CWT and DWT, To learn the various application of wavelets.
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the properties of Fourier transform 2. Analyse the short time Fourier transform 3. Understand the concept of CWT 4. Understand the properties of various scaling functions and their wavelets. 5. Describe the basic concepts of multirate systems 6. Develop the two channel filter bank 7. Understand the concepts of DWT 8. Learn the concepts of multi wavelets 9. Analyse the wavelet packet transform 10. Discuss the applications of wavelet in image processing.

Fourier Analysis

Fourier basis & Fourier Transform–failure of Fourier Transform–Need for Time-Frequency Analysis–Heisenberg's Uncertainty principle – Short time Fourier transform(STFT)-short comings of STFT- Need for Wavelets

Continuous Time Wavelet Transform and Multi-Resolution Analysis

Wavelet basis– Continuous time Wavelet Transform (CWT)–need for scaling function–Multi-Resolution Analysis (MRA)–important wavelets : Haar ,Mexican hat, Meyer, Shannon, Daubechies.

Introduction to Multirate Systems

Decimation and Interpolation in Time domain-Decimation and Interpolation in Frequency domain–Multi rate systems for a rational factor.

Filter Banks and Discrete Wavelet Transform

Two channel filter bank–Perfect Reconstruction (PR) condition–relationship between filter banks and wavelet basis–DWT–Filter banks for Daubechies wavelet function**.**

Special Topics (Only Introductory Level)

Multi wavelets, Multidimensional wavelets– wavelet packet transform.

Applications

Feature extraction using wavelet coefficients, Image compression, Wavelet based denoising.

Text book(s):

1	Jaideva C Goswami and Andrew K Chan, 'Fundamentals of Wavelets–Theory, Algorithms and Applications', John Wiley &Sons, Inc., Singapore, 2011.
2	Soman K P and Ramachandran K I,' In sight into wavelets from Theory to practice', Prentice Hall, NewDelhi,2010.

Reference(s):

1	Sidney Burrus C, 'Introduction to Wavelets and Wavelets Transforms', Prentice Hall, New Delhi, 2002.
2	Stephane G Mallat, 'A Wavelet Tour of Signal Processing', Academic Press, 2009.
3	Raghuveer M Rao and Ajit S Bopardikar,' Wavelet Transforms: Introduction to Theory & Applications', Pearson Education Asia, NewDelhi,2003

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective V

40 EC E53 Multimedia Compression and Communication

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)

- To introduce the concept of multimedia system
- To outline the formal procedure for digital audio processing
- To introduce the concept of text and image compression
- To introduce the concept of multimedia networking

Course Outcomes

At the end of the course, the students will be able to

1. Explain the basic concepts of multimedia system
2. Discuss the components of multimedia and their characteristics
3. Explain the audio compression techniques
4. Explain the video compression of moving picture
5. Explain about text compression
6. Explain about image compression
7. Discuss about VOIP challenges
8. Explain the architecture of VOIP
9. Describe the concepts of multimedia networks and its application
10. Explain the services in multimedia networks

Multimedia Components

Introduction -Multimedia skills -Multimedia components and their characteristics -Text, sound, images, graphics, animation, video, hardware.

Audio and Video Compression

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, and 4.

Text and Image Compression

Compression principles-source encoders and destination encoders-lossless and Lossy compression-entropy encoding–source encoding-text compression –static Huffman coding dynamic coding –arithmetic coding – Lempel ziv-welsh Compression-image compression.

VOIP Technology

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service-CODEC Methods-VOIP applicability.

Multimedia Networking

Multimedia networking -Applications-streamed stored and audio-making the best Effort service-protocols for real time interactive Applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

Text book(s):

1.	Fred Halshall ‘Multimedia communication -Applications, Networks, Protocols and Standards’, Pearson Education, 2007.

Reference(s):

1.	Tay Vaughan, ‘Multimedia: Making it work’, 7th Edition, TMH 2008 98
2.	Kurose and W.Ross ‘Computer Networking ‘a Top Down Approach’, Pearson Education, 2005
3.	Marcus Goncalves ‘Voice over IP Networks’, McGraw Hill, 1999.
4.	KR.Rao,Z S Bojkovic, D A Milovanovic, ‘Multimedia Communication Systems: Techniques,Standards, and Networks’, Pearson Education, 2007.
5.	R. Steimnetz, K. Nahrstedt, ‘Multimedia Computing, Communications and Applications’, Pearson Education.
6.	Ranjan Parekh, ‘Principles of Multimedia’, TMH, 2007.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
40 EC E54 Speech Processing								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To introduce speech production and related parameters of speech. • To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech. • To understand different speech modeling procedures such as Markov and their implementation issues.
Course Outcomes	**At the end of the course, the students will be able to** 1. Describe and Analyse the modeling of speech signal. 2. Understand the basic concept of speech signal fundamentals. 3. Analyse linear predictive coding technique. 4. Categories linear predictive problems in various domains. 5. Choose an appropriate statistical speech model for a given application. 6. Design a speech recognition system. 7. Learn different speech synthesis techniques. 8. Describe the present status and application of speech synthesis.

Basic Concepts

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

Speech Analysis

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures– mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

Speech Modeling

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

Speech Recognition

Large Vocabulary Continuous Speech Recognition: Architecture of large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

Speech Synthesis

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

Text book(s):

1.	Lawrence Rabiner and Biing-Hwang Juang, ‘Fundamentals of Speech Recognition’, Pearson Education, 2003.
2.	Daniel Jurafsky and James H Martin, ‘Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition’, Pearson Education, 2002.
3.	Frederick Jelinek, ‘Statistical Methods of Speech Recognition’, MIT Press, 1997.

Reference(s):

1.	Steven W. Smith, ‘The Scientist and Engineers Guide to Digital Signal Processing’, California Technical Publishing, 1997.
2.	Thomas F Quatieri, ‘Discrete-Time Speech Signal Processing – Principles and Practice’, Pearson Education, 2004.
3.	Claudio Becchetti and Lucio Prina Ricotti, ‘Speech Recognition’, John Wiley and Sons, 1999.
4.	Ben Gold and Nelson Morgan, ‘Speech and Audio Signal Processing, Processing and Perception of Speech and Music’, Wiley- India Edition, 2006.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective V								
40 EC E55 Telecommunication Switching Techniques								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)	• To study the concepts of multiplexing, digital hierarchy and digital switching. • To understand the need for network synchronization and its issues, ISDN, DSL/ADSL and statistical modeling of telephone traffic.
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the concepts of multiplexing and line coding techniques in digital transmission 2. Describe the function, structure and application of SONET/SDH. 3. Describe the function and application of various digital switching techniques. 4. Analyse digital switching in analog environment. 5. Analyse network synchronization considering all parameters. 6. Describe synchronization, control and management of various networks 7. Describe the basic architecture, frame structure of ISDN and interface of ISDN 8. Analyse DLCS with minimum hardware requirement 9. Understand the concept of traffic analysis in a probabilistic frame work 10. Categorise the various techniques of traffic systems and their service times in a Network

Multiplexing

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings.

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.

Network Synchronization Control and Management

Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S 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 and Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

Traffic Engineering and Analysis

Traffic Characterization: Arrival Distributions, Holding Time Distributions, Network traffic load and parameters-Grade of service and blocking probability-Incoming traffic and service time Characterization, Loss Systems, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

Text book(s):

1. John.C. Bellamy, 'Digital Telephony', John Wiley & Sons, 3rd Edition, 2009.

Reference(s):

1. Viswanathan.T., 'Telecommunication Switching System and Networks', Prentice Hall of India Ltd., 2006.
2. Flood J.E., 'Telecommunications Switching Traffic and Networks', Pearson Education Ltd, 2007.

K.S. Rangasamy College of Technology – Autonomous

B.E. Electronics and Communication Engineering

Elective V

40 EC E56 Green Communication

Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objective(s)

- To familiarize different concepts and basic principles of green communication strategies
- To help the learners to design a future architecture for green communication and networking
- To give exposure to implement green communication by overcoming technical challenges and in measurement of energy gain for future opportunities

Course Outcomes

At the end of the course, the students will be able to

1. Analyze the location based services and energy scavenging systems
2. Describe the energy optimization and coding schemes in wireless network
3. Illustration of energy conservation of WLAN and mobile Ad Hoc network
4. Explain the different level of energy optimization techniques
5. Analyzes of design issues in EM energy harvesting schemes
6. Understand energy scavenging techniques for communication devices
7. Understand the mixed signal and low power techniques and its comparison
8. Illustration of energy constraints and energy harvesting
9. Analyze energy consumption of WSN
10. Describe RF energy harvesting and management

Green Communication Energy Management and Modulation

Energy Management for Location-Based Services on Mobile Devices, Energy Efficient Supply of Mobile Devices, Green Radio network- PHY and MAC layer optimization for energy-harvesting wireless networks - Green modulation and coding schemes in energy-constrained wireless networks

Energy Conservation on Various Applications

QoE-Based Energy Conservation for VoIP Applications in WLAN, Minimum Energy Multi-criteria Relay Selection in Mobile Ad Hoc
Networks; Energy Optimization Techniques for Wireless Sensor Networks

Energy Harvesting Systems

Design Issues in EM Energy Harvesting Systems, Energy Scavenging for Magnetically Coupled Communication Devices-Case study

Techniques on Energy Harvesting Systems

Mixed-Signal, Low-Power Techniques in Energy Harvesting Systems, Toward Modeling Support for Low-Power and Harvesting Wireless Sensors for Realistic Simulation of Intelligent Energy-Aware Middleware

Energy Harvesting and Management On WSNS

Energy Consumption Profile for Energy Harvested WSNs, Radio Frequency Energy Harvesting and Management for Wireless Sensor Networks

Text book(s):

1.	Green Mobile Devices and Networks: Energy Optimization and Scavenging Techniques, H. Venkataraman, Gabriel-miroMuntean- CRC Press 2012.
2.	Green Radio Communication Networks, Ekram Hossain, Vijay K. Bhargava, Gerhard P. Fettweis Cambridge University Press, 30-Jun-2012.

Reference(s):

1.	Green Communications: Theoretical Fundamentals, Algorithms and Applications, Jinsong Wu, Sundeep Rangan , Hong gang Zhang- September 20, 2012 by CRC Press.
2.	Green Communications and Networking, F. Richard Yu, Xi Zhang, Victor C.M. Leung - December 7, 2012 by CRC Press.
3.	Green IT Strategies and Applications: Using Environmental Intelligence, Bhuvan Unhelkar, June 22, 2011 by CRC Press.

K.S. Rangasamy College of Technology – Autonomous								
B.E. Electronics and Communication Engineering								
Elective V								
40 EC E57 Neural and Fuzzy Systems								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100
Objective(s)	• To make the students to understand Fuzzy logic and Neural Network concepts. • To equip the students with the latest application of soft computing							
Course Outcomes	**At the end of the course, the students will be able to** 1. Understand the basic concepts of feed forward neural networks 2. Analyze the various feedback networks. 3. Comprehend the various types of unsupervised networks 4. Describe the associative memories and self-organizing maps 5. Understand the concept of fuzziness involved in various systems and fuzzy set theory. 6. Comprehend the fuzzy measures, fuzzy relations and fuzzy functions. 7. Describe the fuzzy inference systems and models 8. Analyze the application of fuzzy logic control to real time systems.							

Introduction to Neural Networks
Biological neural - Neural processing - Supervised and unsupervised learning - Neural network learning rules. Single layer perception - discrete and continuous perception - multi layer feed forward network –Back propagation Networks - feedback networks

Unsupervised Networks
Unsupervised Learning – Competitive Learning Networks – Kohonen self organising networks – Learning Vector Quantization – Hebbian Learning – Hopfield Network –Content Addressable Nature – Binary Hopfield Network .

Associative memories and SOM
Bidirectional Associative Memory – Principle Component Analysis. Auto associative memories -Bidirectional Associative memory (BAM) - Self Organization Maps (SOM)

Fuzzy Logic
Fuzzy sets - Fuzzy Rules: Extension Principle, fuzzy measures - fuzzy relations - fuzzy functions.

Fuzzy Systems and Applications
Representation of fuzzy knowledge - fuzzy inference systems- Mamdani Model – Sugeno Model –Tsukamoto Model– Fuzzy decision making – Multi Objective Decision Making – Fuzzy Classification–Fuzzy Control Methods.

Text book(s):

1.	C T Jang, J S R Sun and E Mizutani**,** Neuro Fuzzy and Soft Computing**,** Pearson Education, 2009.
2.	David E Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Pearson Education India, 2006.

Reference(s):

1.	Laurene Fausett, Fundamentals of Neural Networks, PHI,1994
2.	Timothy J.Ross: Fuzzy Logic with Engineering Applications, 3rd Edition, John Wiley & sons, 2010.
3.	S.Rajasekaran and G.A.Vijayalakshmi Pai, Neural networks, Fuzzy logic and Genetic algorithms, PHI Learning Pvt. Ltd, 2003.
4.	George J.Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, PHI ,1995