K.S. Rangasamy College of Technology

(Autonomous Institution)

Curriculum & Syllabus

of

B.E. Mechatronics Engineering

(For the batch admitted in 2017 – 21)

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 pioneer in producing competent mechatronics engineers, researchers and entrepreneurs through quality education with humanistic value.

MISSION

To promote transforming teaching learning strategies in the field of mechatronics engineering through quality research facilities with adequate industrial exposure adhering to the execution of societal needs and engineering ethical practice.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I. Graduates of the programme will achieve world class technical and professional career offering sustainable solutions for the society.

II. Graduates of the programmme will be able to apply engineering knowledge to solve problems in all streams of mechatronics engineering and other relevant fields.

III. Graduates of the programmme will exhibit engineering ethical behavior through lifelong learning in diverse field of mechatronics engineering.

PROGRAM OUTCOMES (POs)

a) Apply knowledge of mathematics, science and engineering fundamentals to find solutions for complex problems in Mechatronics Engineering.

b) Identify, formulate, research literature, conduct experiments and analyze complex Mechanical, Electrical and Electronics stream problems using first principles of mathematics, natural sciences and engineering principles.

c) Design solutions for complex Mechatronics engineering problems in domains such as Engineering Analysis & Design, Electronics & Informatics and Automation & Robotics that meet the 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 machine elements, analysis and interpretations of data and synthesis of the information to provide valid conclusion related to mechatronics engineering

e) Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex mechatronics 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 consequent responsibilities relevant to the professional engineering practice

g) Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrates 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 instruction.

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 team to manage projects and in multidisciplinary environments.

l) Recognize the need for , and have the preparation and ability to engage in independent and lifelong 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	**Mechatronics Engineering**
Programme Code & Name	MC : B.E. Mechatronics Engineering

Semester I

Course Code	Course Name	Hours/ Week			Credit
		L	T	P	C
	THEORY				
40 EN 001	Technical English	3	0	0	3
40 MA 001	Ordinary and Partial Differential Equations	3	1	0	4
40 CH 002	Applied Chemistry	3	0	0	3
40 CS 001	Fundamentals of Programming	3	1	0	3
41 EE 002	Elements of Electrical Engineering	3	0	0	3
40 ME 003	Engineering Drawing	2	0	3	4
	PRACTICAL				
40 CH 0P1	Chemistry Laboratory	0	0	3	2
40 CS 0P1	Fundamentals of Programming Lab	0	0	3	2
TOTAL		17	2	09	24

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 002	Laplace Transform and Complex Variables	3	1	0	4
40 PH 003	Condensed Matter Physics	3	0	0	3
41 CH 007	Environmental Science and Engineering	3	0	0	3
40 MC 201	Materials and Metallurgy	3	0	0	3
40 ME 004	Engineering Mechanics	3	1	0	4
	PRACTICAL				
40 PH 0P1	Physics Laboratory	0	0	3	2
40 ME 0P2	Engineering Practices Laboratory	0	0	3	2
40 ME 0P3	Computer Aided Drafting Laboratory	0	0	3	2
TOTAL		18	02	09	26

Semester III

	THEORY				
40 MA 004	Boundary Value Problems and Transform Methods	3	1	0	4
40 MC 301	Manufacturing Technology	3	0	0	3
40 MC 302	Analog Electronics	3	0	0	3
40 ME 006	Strength of Materials	3	1	0	4
40 ME 007	Fluid Mechanics and Machinery	3	1	0	4
40 PH 008	Applied Physics	3	0	0	3
	PRACTICAL				
40 MC 3P1	Manufacturing Technology Laboratory	0	0	3	2
40 MC 3P2	Applied Mechanics and Fluid Machinery Lab	0	0	3	2
40 MC 3P3	Analog Circuits Laboratory	0	0	3	2
40 TP 0P1	Career Competency Development I	0	0	2	0
TOTAL		18	3	11	27

Semester IV

	THEORY				
40 MA 008	Statistical and Numerical Methods	3	1	0	4
40 EE 005	Electric Drives and Controls	3	0	0	3
40 MC 401	Hydraulic and Pneumatic controls	3	0	0	3
40 MC 402	Sensors and Instrumentation	3	0	0	3
40 MC 403	Applied Thermodynamics	3	1	0	4
40 MC 404	Digital Electronics	3	1	0	4
	PRACTICAL				
40 EE 0P1	Electric Drives and Controls Laboratory	0	0	3	2
40 MC 4P1	Hydraulic and Pneumatic controls Lab	0	0	3	2
40 MC 4P2	Sensors and Instrumentation Lab	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	**Mechatronics Engineering**
Programme Code & Name	MC : B.E. Mechatronics Engineering

Semester V

Course Code	Course Name	Hours/ Week			Credit
		L	T	P	C
	THEORY				
40 MC 501	Virtual Instrumentation and Applications	3	0	0	3
40 MC 502	Microprocessors and Microcontrollers	3	0	0	3
40 MC 503	Theory of Machines	3	1	0	4
40 MC 504	Control Systems	3	1	0	4
40 MC 505	Industrial Electronics	3	0	0	3
40 MC 506	Metrology and Computer Aided Inspection	3	0	0	3
	PRACTICAL				
40 MC 5P1	Electronics and Virtual Instrumentation Laboratory	0	0	3	2
40 MC 5P2	Microprocessors and Microcontrollers Laboratory	0	0	3	2
40 MC 5P3	Computer Aided Machine Drawing Laboratory	0	0	3	2
40 TP 0P3	Career Competency Development III	0	0	2	0
TOTAL		18	2	11	26

Semester VI

Course Code	Course Name	Hours / Week			Credit
		L	T	P	C
	THEORY				
40 MC 601	Computer Aided Design and Manufacturing	3	0	0	3
40 MC 602	Design of Mechatronics Systems	3	0	0	3
40 MC 603	Programmable Logic Controller	3	0	0	3
40 MC 604	Machine Design	3	1	0	4
40 MC 605	Automobile Technology	3	0	0	3
40 MC E1*	Elective I	3	0	0	3
	PRACTICAL				
40 MC 6P1	Control Systems Laboratory	0	0	3	2
40 MC 6P2	Computer Aided Manufacturing Laboratory	0	0	3	2
40 MC 6P3	Programmable Logic Controller Laboratory	0	0	3	2
40 TP 0P4	Career Competency Development IV	0	0	2	0
TOTAL		18	1	11	25

Semester VII

	THEORY				
40 HS 002	Engineering Economics and Financial Accounting	2	0	0	2
40 MC 702	Embedded System	3	0	0	3
40 MC 703	Robotics and Machine Vision Systems	3	0	0	3
40 MC 704	Automotive Electronics	3	0	0	3
40 MC E2*	Elective II	3	0	0	3
40 MC E3*	Elective III	3	0	0	3
	PRACTICAL				
40 MC 7P1	Robotics and Machine Vision Laboratory	0	0	3	2
40 MC 7P2	Embedded System Laboratory	0	0	3	2
40 MC 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

	THEORY				
40 HS 003	Total Quality Management	2	0	0	2
40 MC E4*	Elective IV	3	0	0	3
40 MC E5*	Elective V	3	0	0	3
	PRACTICAL				
40 MC 8P1	Project Work - Phase II	0	0	16	8
TOTAL		8	0	16	16

K.S.Rangasamy College of Technology, Tiruchengode – 637 215					
Regulation	**R 2014**				
Department	**Mechatronics Engineering**				
Programme Code & Name	**MC : B.E. Mechatronics Engineering**				
Curriculum for the Programme under Autonomous Scheme					
Elective I					
Course Code	Course Name	Hours / Week			Credit
		L	T	P	C
40MCE11	Networking of Computers	3	0	0	3
40MCE12	Advanced Microprocessors and Microcontrollers	3	0	0	3
40MCE13	Product Design and Costing	3	0	0	3
40MCE14	Artificial Intelligence and Expert Systems	3	0	0	3
40 HS 001	Professional Ethics	2	0	0	2
40MCE16	Digital Signal Processing	3	0	0	3
40MCE17	Composite Materials	3	0	0	3
40MCE18	Object Oriented Programming	3	0	0	3
Elective II					
40MCE21	Refrigeration and Air-conditioning	3	0	0	3
40MCE22	Rapid Prototyping	3	0	0	3
40MCE23	Design of Transmission Systems	3	0	0	3
40MCE24	Fuzzy Logic and Neural Networks	3	0	0	3
40MCE25	Adaptive Control in Mechatronics System	3	0	0	3
40MCE26	Nano Technology	3	0	0	3
40MCE27	IC Engines	3	0	0	3
40MCE28	E-commerce and strategic IT	3	0	0	3
Elective III					
40MCE31	Digital Image Processing	3	0	0	3
40MCE32	Statistical Quality Control	3	0	0	3
40MCE33	VLSI Design	3	0	0	3
40MCE34	Design of Material Handling Equipments	3	0	0	3
40MCE35	Finite Element Analysis	3	0	0	3
40MCE36	Medical Electronics	3	0	0	3
40MCE37	IT Essentials	3	0	0	3
40MCE38	Wireless Sensors and Networks	3	0	0	3
Elective IV					
40MCE41	Entrepreneurship Development	3	0	0	3
40MCE42	Marketing Management	3	0	0	3
40MCE43	Reliability and Quality Engineering	3	0	0	3
40MCE44	Intellectual Property Rights (IPR)	3	0	0	3
40MCE45	Industrial Safety Engineering	3	0	0	3
40MCE46	New and Renewable Energy Sources	3	0	0	3
40MCE47	MEMS and NEMS	3	0	0	3
40MCE48	Mechanical Vibration	3	0	0	3
Elective V					
40MCE51	Computer Integrated Manufacturing	3	0	0	3

40MCE52	Energy Auditing and Management	3	0	0	3
40MCE53	Enterprise Resource Planning	3	0	0	3
40MCE54	Non Destructive Testing Methods	3	0	0	3
40MCE55	Operational Research	3	0	0	3
40MCE56	Database Management System	3	0	0	3
40MCE57	Industrial Design and Applied Ergonomics	3	0	0	3
40MCE58	Wireless Communication	3	0	0	3

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

Objectives	• To help learners improve their vocabulary and to enable them to use words appropriately in academic, professional and multidisciplinary contexts.\ • To familiarize learners with different functions of English and develop work based proficiency. • To help learners understand various reading techniques to acquire skills to grasp abstract concepts, factual information and the whole range of technical data. • 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 and to extend and enhance practice on diverse contexts.
Course outcomes	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. 10. Identify the key words of concepts and learn to write definitions.

Grammar and Vocabulary

Word formation with prefixes and suffixes – synonyms and antonyms – verbal analogy- classification-alphabet test-logical sequence of words-one word substitute-verb patterns- subject-verb agreement – tenses – voices – use of conditionals – comparative adjectives (affirmative and negative) – expanding nominal compounds – articles – use of prepositions - phrasal verbs – error detection – abbreviations and acronyms.

Suggested Activities

Using prefixes and suffixes to change the grammatical functions of words – 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 in affirmative / negative sentences – '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

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

Verbal and non-verbal communication – speech sounds – syllables – word stress (structural and content words) – sentences 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

Note: closed and open ended topics related to science and technology

Reading

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

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', 1st Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.
Work books :	
2	Workbook for I year B.E / B.Tech. Department of English.Technical English., Department of English
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',3rd Edition, Pearson Education (Singapore) (p) Ltd., 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.

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

Objectives	The course is aimed at developing the basic mathematical and analytical skills in the areas of differential equations and calculus to the students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for solving engineering problems.
Course outcomes	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, evolutes and envelopes. 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 α x or cos α x ,x^n n>0, $e^{\alpha x}x^n$, $e^{\alpha x}$ sinβx, and $e^{\alpha x}$ cosβx – 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 – envelopes – properties of envelopes and evolutes – evolute as envelope of normals – 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 -Stokes' theorem(without proof)- verification of the above theorems and evaluation of integrals using them.

Text book(s):

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

Reference(s) :

1. Grewal. B.S., "Higher Engineering Mathematics", 40th Edition, Khanna Publishers, Delhi, 2011.
2. Bali. N.P, Ashok Saxena, Narayana IyengarN.CH.S, "Engineering Mathematics", Fourth Edition, Laxmi Publications (P) Ltd, New Delhi, 2001.

K.S.Rangasamy College of Technology – Autonomous								
40 CH 002 Applied Chemistry								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	50	50	100

Objectives	• To help the learners analyze the hardness of water and its removal. • To familiarize learners with the basics of electrochemistry, its applications, corrosion and its control. • To infer the relevance in engineering materials. • To highlight the significance of fuels and combustion. • To enlighten the learners on polymers.
Course outcomes	At the end of the course, the student 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. Recognize the characteristics, classification and uses of abrasives and refractories. 6. Analyze the characteristics, manufacturing and uses of cement and glass. 7. Illustrate the classification and manufacturing of fuels. 8. Appraise the combustion and calorific value. 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- hard and soft water - Estimation of hardness – EDTA method - Boiler feed water - boiler problems - Internal treatment (Carbonate, Phosphate &Calgon conditioning) - External treatments (Zeolite & deionization process)- Desalination - Reverse osmosis – Electro dialysis.

Electro Chemistry and Corrosion

Basics of electrochemistry – Nerns't equation – EMF–measurement -EMF series - applications – Types of electrodes - Reference electrodes - Reversible and irreversible cell- Conductometric titration. Corrosion – Mechanism - Galvanic corrosion - Differential aeration corrosion - Factors influencing corrosion-Corrosion control – Cathodic protection – Corrosion inhibitors. Electroplating of nickel and chromium.

Engineering Materials

Abrasives- definition-classification –grinding wheel-abrasive paper and cloth. Refractories – definition-characteristics-classification- properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide. Portland cement-manufacture and properties – setting and hardening of cement, special cement- waterproof and white cement–properties and uses. Glass – manufacture, types, properties and uses.

Fuels and Combustion

Fuels – classification- Coal- types of coal- proximate & ultimate analysis of coal- manufacture of metallurgical coke – Otto Hoffman's byproduct oven method – Liquid fuel – manufacture of synthetic petrol- Fischer – Trospch's, Bergius methods-knocking-octane number –cetane number- Gaseous fuel – CNG-LPG – water gas-producer gas- Biogas. Combustion- calorific value-GCV-NCV-flue gas analysis.

Polymers

Introduction-Types of polymerisation - mechanisms of polymerization - Free radical polymerization –Co-ordination polymerization-Properties of polymers - Tg, Tacticity, Degradation of polymers- Plastics : thermo and thermosetting plastics– Preparation, properties and uses of Poly Ethylene, PVC, Teflon, Epoxy resin, PMMA, Nylon6,6 and Bakelite- Reinforced plastics application- Basics of LCD & LED.

Text book(s):

1. S. Vairam "Engineering Chemistry", Wiley India, Delhi, 2 Nd 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., Delhi.15th Edition, 2008.

K.S.Rangasamy College of Technology – Autonomous

40 CS 001 Fundamentals Of Programming

Common to (Biotech, Civil, ECE, EEE, E&I, Tex, Mech, MCT, NST)

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

Objectives	• This Course provides comprehensive knowledge about the fundamental principles, concepts and constructs of modern computer programming and competencies for the design, coding and debugging of computer programs. • This course provides ample way to identify, formulate, and solve engineering problems.
Course outcomes	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”, Fourth 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								
41 EE 002 Elements of Electrical Engineering								
Common to (MECH & MCT)								
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)	1. To determine the voltage, current, power in resistive elements of simple DC circuits by understanding the concept of series-parallel circuit reduction technique. 2. To determine the Impedance, Power and Power factor in series RL, RC and RLC circuits by understanding the concept of instantaneous, RMS and average value of Voltage/Current in an AC source. 3. To describe the application of Faraday's, Lenz's laws and Fleming's rules, and determine the performance of transformers. 4. To measure the parameters of voltage, current, power, energy and insulation resistance using suitable measuring instruments by knowing their construction and principle of operation. 5. To impart the basic knowledge on power system and its components, simple house wiring layout, types and need for earthing, and energy conservation.
Course Outcomes	**At the end of the course, the students will be able to** 1. Identify the basic elements of electrical circuits and define important terms with their units. 2. Solve DC circuits using Ohm's & Kirchhoff's laws. 3. Characterize the single and three phase AC supply. 4. Calculate Impedance, Power and Power factor of single phase AC circuits. 5. Express the principle of electromagnetic induction and identify its usefulness in electrical engineering. 6. Explain the principle of operation of transformers and calculate its regulation and efficiency. 7. Describe the construction and principle of operation of instruments used for voltage and current measurements. 8. Explain the construction and principle of operation of instruments used for power, energy and insulation resistance measurements. 9. Outline the components of various sub-systems in a power system. 10. Sketch the layout of simple house wiring by identifying the wiring materials and express the need for energy conservation.

DC Circuits
Basic elements – resistance, inductance and capacitance – Definitions and Units: Current, Voltage, Power and Energy – Ohm's law – Kirchhoff's laws – Simple Series and Parallel circuits.

AC Circuits
Introduction to AC circuits –Single and Three phase AC supply – Advantages of Three phase AC system – Instantaneous, RMS and average value for sine wave form– Series RL,RC and RLC Circuits – Impedance, Admittance, Power and Power factor – Practical importance of power factor.

Electromagnetic Induction
Faraday's law of Electromagnetic Induction, Fleming's rules and Lenz's law - Statically and dynamically Induced emf.

Transformers
Construction, Principle of operation, types, regulation and efficiency, all day efficiency- Current and Potential transformers.

Measuring Instruments
Classification of instruments – Types of torques in an instruments – construction and working principle of moving coil and moving iron instruments – Dynamo meter type watt meter – Induction type energy meter – Multimeter – Megger – Electronic Energy Meter.

Power Systems
Structure of power system – Generation system – Transmission System – Distribution system – Power system protection.

House Wiring
Wiring material and Accessories – Simple wiring layout – Earthing – Lightning Arrestor – UPS – Energy Conservation.

Text book(s):

1.	M.Maria Louis, "Elements of Electrical Engineering", PHI, New Delhi, 2014.
2.	S. Sukhija, T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", OxfordUniversity Press, 2012.

Reference(s);

1.	V.K.Mehta, Rohit Mehta, "Principles of Electrical Engineering", S.Chand Publications, New Delhi, 2014.
2.	Edward Hughes, "Electrical and Electronic Technology", Pearson Education, 9th Edition, New Delhi, 2009.
3.	Del Tora "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007
4.	S.P.Bihari and BhuPendraSehgal, "Basic Electrical Engineering – Made Easy", Cengage Learning
5.	Alan S Moris, Principles of Measurements and Instruments, Prentice – Hall of India Pvt. Ltd, New Delhi, 1999.

K.S.Rangasamy College of Technology – Autonomous								
40 ME 003 Engineering Drawing								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	2	0	3	45	4	50	50	100
Objectives	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 student will be able to 1. Use the drafting instruments 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 shape of section 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 and Plane Curves

Use of drawing instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning – Drawing sheet layouts - Title block – Line types - Construction of ellipse, parabola, and hyperbola by eccentricity method - Construction of cycloids –Construction of involutes of square and circle.

Projection of Points and Lines

Projection of points– Projection of straight lines in the first quadrant (lines parallel to both planes – Inclined to one plane and parallel to other – Inclined to both Planes).

Projection Plane Surfaces

Projection of Planes in the first quadrant (Inclined to one plane and parallel to other – Inclined to both Planes).

Projection of Solids

Projections of simple solids: prism, pyramid, cylinder and cone (Axis parallel to one plane and perpendicular to other, axis inclined to one plane and parallel to other).

Projection of Sectioned Solids

Section of simple solids : prism, pyramid, cylinder, cone and sphere in simple positions (cutting plane is inclined to the one of the principal planes and perpendicular to the other) - True shape of sections.

Development of Surfaces

Development of lateral surfaces of simple and sectioned solids: Prism, pyramid cylinder and cone.

Orthographic Projection

Introduction to orthographic projections –Conversions of pictorial views to orthographic views.

Isometric Projection

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids : Prism, pyramid, cylinder, cone - Combination of two solid objects in simple vertical positions.

Perspective Projection

Perspective projection of prisms by visual ray method and vanishing point method.

Text book(s):

1. Venugopal K., “Engineering Graphics”, New Age International (P) Limited, 2014.
2. Natarajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2014

Reference(s) :

1. Bhatt N.D., “Engineering Drawing”, Charotar Publishing House Pvt. Ltd., 53rd Edition, Gujarat, 2014.
2. Shah M.B. and Rana B.C., “Engineering Drawing”, Pearson Education, 2005.

K.S.Rangasamy College of Technology – Autonomous								
40 CH 0P1 Chemistry Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	2	50	50	100
Objectives	• Test the knowledge of theoretical concepts. • To develop the experimental skills of thse learners. • To facilitate data interpretation • To expose the learners to various industrial and environmental applications.							
Course outcomes	At the end of the course, the student will learn about 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. Estimate ferrous ion by spectrophotometry 10. Determine the corrosion by weight loss method.							

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.

Text book(s):

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

Reference(s) :

1 J. Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Text book of Quantitative Chemical Analysis, 6th Edition, Pearson Education, 2004.

K.S.Rangasamy College of Technology – Autonomous								
40 CS 0P1 Fundamentals Of Programming Laboratory								
Common to (Biotech, Civil, ECE, EEE, E&I, TEX, Mech, MCT, 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
Objectives	To enable the students to apply the concepts of C to solve real time problems							
Course outcomes	At the end of the course, the student 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 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

Objectives	• 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 student 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', 1st Edition, Tata McGraw-Hill Publishing Company Ltd., 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. Jack. C. Richards, 'New Interchange Services (Student's Book)' – Introduction, Level – 1, Level – 2, Level – 3, Cambridge University Press India Pvt.Ltd., 2007.
3.	R.S. Aggarwal, 'A Modern Approach to Verbal & Non – Verbal Reasoning',S.Chand & Company Ltd., New Delhi, Revised Edition, 2012.
4.	NPTEL Video Courses on Communication Skills.

K.S.Rangasamy College of Technology – Autonomous

40 MA 002 Laplace Transform and Complex Variables

Common to (MECH, CIVIL, MCT, EEE, EIE, CSE, IT, TT, BT & NST)

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

Objectives

- To use multiple integration to solve problems involving volume and surface area.
- To introduce the concepts of Laplace transform, complex variables and complex integration which are imperative for effective understanding of engineering subjects.
- To identify the properties of planar and solid geometric shapes and use these properties to solve common applications.

Course Outcomes

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

1. (i) Apply double integral to find area between two curves.
   (ii) Evaluate double integral by changing the order of integration and triple integral.
2. Study the concepts of Beta and Gamma functions.
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. Know about the construction of analytic and conjugate harmonic functions and their properties.
6. Employ conformal maps to determine images of curves and find the bilinear transformation.
7. Expand the functions as Taylor's and Laurent's series and evaluate the complex integrals.
8. Evaluate real definite integrals with suitable contours using Cauchy's residue theorem.
9. Understand the notions of plane, straight line and skew lines.
10. Relate the concepts between tangent planes and spheres.

Multiple Integrals

Double integration – Cartesian and polar coordinates – Change of order of integration – Area between two curves – Area as double integral – Triple integration in Cartesian coordinates.
Beta and Gamma functions**:** Relationship between Beta and Gamma functions – Properties – Problems.

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 – Dirac's delta function – Transform of periodic functions. Inverse Laplace transform – Convolution theorem – Solution of linear ordinary differential equation with constant co-efficients – First order simultaneous equations with constant co-efficients.

Complex Variables

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

Complex Integration

Cauchy's Integral theorem (without proof) – Cauchy's integral formula – Taylor and Laurent series (without proof) – Classification of singularities – Cauchy's residue theorem – Contour integration – Circular and semi-circular contours (excluding poles on real axis).

Solid Geometry

Direction cosines – Plane – Straight lines – Coplanar – Point of intersection – Skew lines – Sphere – Tangent plane – Great circle – Orthogonal sphere.

Text book:

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

Reference(s):

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

K.S.Rangasamy College of Technology – Autonomous								
40 PH 003 Condensed Matter Physics								
Common to (MECH, MCT)								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	50	50	100

Objectives	• To impart fundamental knowledge about crystal physics, conducting, 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. Comprehend crystal symmetry and understand the characteristics of HCP. 2. Apply crystal growth techniques to prepare crystal and analyze crystal imperfect grown crystal. 3. Recognize electrical and thermal conductivity to understand the properties of a free electron in conducting materials. 4. State Fermi, distribution function to deduce density of energy state and apply conductivity theory in thermistor. 5. Classify magnetic material based on the properties. 6. Employ magnetic material to act us memory storage device. 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 prepration of nanomaterials and its impact in research and industrial applications.

Crystal Physics

Crystal symmetry elements of a simple cubic system – HCP structure: coordination number, atomic radius, c/a ratio, packing factor – Crystal imperfections –Crystal growth techniques-solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

Conducting Materials and Applications

Conductors-Classical Free electron theory of metals- -Electrical Conductivity- Expression for electrical Conductivity-Thermal Conductivity-Expression for thermal Conductivity- Widemann Franz Law (Derivation)-Lorentz number - Drawbacks of Classical free electron theory-Quantum theory-Fermi distribution function – Effect of temperature and Fermi function-density of energy states-Application: Thermistor

Magnetic Materials and Devices

Classification –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 Books

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

References

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	45	C	CA	ES	Total
II	3	0	0		3	50	50	100

Objectives	• 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”, 13th Edition Cengage Publications, Delhi, 2013.

Reference book(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” 2nd Edition, Cengage Publications, Delhi, 2013.

K.S.Rangasamy College of Technology – Autonomous

40 MC 201 Materials and Metallurgy

MCT

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

Objectives

- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials.
- To acquire overall sound knowledge in metallurgy and materials engineering.
- To identity and select suitable materials for various engineering applications.

Course Outcomes

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

1. Understand the various types of alloy structures using phase diagram
2. Explain the phase changes of various structures using iron- iron carbide equilibrium diagram
3. Identify suitable heat treatment process for engineering applications.
4. Determine hardenability using case hardening process - carburizing, nitriding and cyaniding.
5. Predict the effect of alloying additions on ferrous metals.
6. Predict the effect of alloying additions on non ferrous metals.
7. Comply the properties of ceramic materials and powder metallurgy for engineering applications.
8. Represent the powder metallurgy process for the production of different metal powders.
9. Utilize mechanism of plastic deformation process to find deformities.
10. Determine the mechanical properties using mechanical testing and metallographic procedures.

Constitution of Alloys and Phase Diagrams

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Iron – Iron carbide equilibrium diagram, eutectic, peritectic, eutectoid and peritectoid reactions.

Heat Treatment

Definition – Full annealing, stress relief and recrystallisation – normalising, hardening and Tempering of steel, austempering, martempering - Hardenability, Jominy end quench test – case hardening, carburising, nitriding, cyaniding

Ferrous and Non Ferrous Metals

Effect of alloying additions on steel (Mn, Si, Cr, Mo, V, Ti & W) - stainless and tool steels – HSLA - gray, white, malleable - alloy cast irons - Copper and Copper alloys – Aluminium and Aluminium Alloys – Bearing alloys

Non-Metallic Materials and Powder Metallurgy

Engineering Ceramics – Properties and applications of Al_2O_3, SiC - Powder metallurgy process – characteristics of metal powders – production of metal powder, applications, and limitations.

Mechanical Properties and Testing

Mechanism of plastic deformation, slip and twinning – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), Impact test (Izod and Charpy), - metallography - preparation of specimen, metallurgical microscope.

Text book (s) :

1. Khanna O.P, “A Text Book of Material Science and Metallurgy”, Dhanpat Rai Publishers, 2010.
2. Kenneth G.Budinski and Michael K.Budinski “Engineering Materials” Prentice-Hall of India Private Limited, 4th Indian Reprint 2002.

Reference(s) :

1. William D Callister “Material Science and Engineering: An Introduction”, 6th Edition, Wiley Publishers, 2002.
2. Raghavan.V, “Materials Science and Engineering: A First Course”,5th Edition, Prentice Hall of India Pvt. Ltd., 2009.
3. Sidney H.Avner “Introduction to Physical Metallurgy” Tata McGraw-Hill Companies Inc., New York, 2009.

K.S.Rangasamy College of Technology – Autonomous								
40 ME 004 Engineering Mechanics								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	50	50	100
Objectives	• To acquire knowledge about basic laws of mechanics and equilibrium of rigid bodies. • To identify the properties of surfaces and solids by using different theorem. • To impart basic concept of dynamics of particles, friction and elements of rigid body dynamics.							
Course Outcomes	At the end of the course, the student will be able to: 1. Apply the laws of engineering mechanics, vector operations. 2. Calculate the resultant force on a particle, 2D and 3D bodies. 3. Determine the moments, couples and support reactions. 4. Analyze the equilibrium conditions in 2D and 3D. 5. Calculate the centroid of areas and centre of gravity of volumes. 6. Apply the parallel and perpendicular axis theorem for calculating the mass moment of inertia. 7. Apply the kinematics to particle and rigid bodies. 8. Apply the kinetics to connected rigid bodies. 9. Explain the causes of friction applied to various mechanical components. 10. Apply the concept of general plane motion to rigid bodies.							

Basics and Statics of Particles

Introduction - Units and Dimensions - Laws of Mechanics – Principle of transmissibility- Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments.

Vector operations

Addition, subtraction, dot product, cross product - Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space - Equilibrium of a particle in space - Equivalent systems of forces –– Single equivalent force.

Equilibrium of Rigid Bodies

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Static determinacy - Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Varignon's theorem - Equilibrium of Rigid bodies in two dimensions.

Properties of Surfaces and Solids

Determination of Areas and Volumes - Centroid, Moment of Inertia of plane area (Rectangle, circle, triangle using Integration Method; T section, I section, Angle section, Hollow section using standard formula) - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia - Mass moment of inertia of thin rectangular section - Relation to area moment of inertia.

Dynamics of Particles

Displacement, Velocity, acceleration and their relationship – Relative motion – Projectile motion in horizontal plane – Newton's law – Work Energy Equation– Impulse and Momentum – Impact of elastic bodies.

Friction

Frictional force – Laws of Coloumb friction – Simple contact friction – Ladder friction - Rolling resistance – Ratio of tension in belt.

Elements of Rigid Body Dynamics

Translation and Rotation of Rigid Bodies: Velocity and acceleration – General Plane motion: Crank and Connecting rod mechanism.

Text Book(s):

1	Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., 2000.
2	Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", Statics and Dynamics, McGraw-Hill International, 8th Edition, 5th Reprint 2009.

Reference(s):

1	Jayakumar, V. and Kumar, M, Engineering Mechanics, PHI Learning Private Ltd, New Delhi, 2012.
2	Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000
3	Bansal R.K," Engineering Mechanics" Laxmi Publications (P) Ltd, 2011.
4	Irving H. Shames, Engineering Mechanics – Statics and Dynamics, IV Edition – Pearson Education Asia Pvt. Ltd., 2003.

K.S.Rangasamy College of Technology – Autonomous								
40 PH 0P1 Physics Laboratory								
Common to (ME,MC,CE,TT,BT,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
Objectives	• 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 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. Grasp the knowledge of dependency of viscosity of a liquid on its density and velocity of liquid motion 3. Imbibe the property of surface tension and capillarity action in fluid dynamics, which are due to the pressure of cohesion and adhesion that causes the liquid to work against gravity 4. 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 5. Comprehend the diffraction property of light through a spectrometer grating element which yields the wavelength of mercury spectral lines 6. Know the concept of interference of light between two reflected lights from a thin air wedge. 7. 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. 8. 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 steel bar by uniform bending method.							
2.	Determination of Young's modulus of a cantilever (Pin & Microscope method).							
3.	Determination of rigidity modulus of a wire by torsional pendulum.							
4.	Comparison of co-efficient of viscosity of two different liquids by Poiseuille's method.							
5.	Comparision of surface tension of two different liquids by capillary rise method.							
6.	Determination of radius of curvature of a plano convex lens using Newton's rings.							
7.	Determination of wavelength of mercury spectral lines using spectrometer grating element.							
8.	Determination of thickness of a fiber by air wedge.							
9.	Determination of wavelength of laser and particle size.							
10.	V-I characteristics of Solar cell.							
Lab Manual :								
"Physics Lab Manual", Department of Physics, KSRCT.								

K.S.Rangasamy College of Technology – Autonomous								
40 ME 0P2 Engineering Practices Laboratory								
Common to ME,EEE,CSE,IT,EIE,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
Objectives	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 :

"Engineering Practices Lab Manual", Department of Mechanical Engineering, KSRCT.

K.S.Rangasamy College of Technology – Autonomous								
40 ME 0P3 Computer Aided Drafting Laboratory								
Common to (MECH , CIVIL, MCT, TT)								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	3	45	2	50	50	100
Objectives	To impart the knowledge on use of drafting software to draw the conics, solids, isometric and orthographic views.							
Course outcomes	At the end of the course, the student will be able to: 1. Cons truct special curves and conic sections using drafting software. 2. Draw the projection of solids using drafting software. 3. Draw the true shape of section of solids 4. Covert the pictorial views into orthographic views using drafting software. 5. Construct the isometric projections of objects using drafting software.							

1. Study of capabilities of software for Drafting and Modeling - Coordinate systems (absolute, relative, polar, etc.) - Creation of simple figures like polygon and general multi-line figures.
2. Computer aided drafting of ellipse, parabola, involute and cycloid using B-Spline or Cubic Spline.
3. Computer aided drafting of front and top view of prism, pyramid, cylinder and cone.
4. Computer aided drafting of sectional views of prism, pyramid, cylinder and cone.
5. Computer aided drafting of front, top and side views of objects from the given pictorial views.
6. Computer aided drafting of isometric projection of an object.

Reference Book(s):

1	Bhatt N.D., “Engineering Drawing”, Charotar Publishing House Pvt. Ltd., 49th Edition, Anand, Gujarat, 2006.
2	D.M.Kulkarni,A.P.RAstogi, A.K.Sarkar, ”Engineering Graphics with Auto CAD”, PHI Private Limited, New Delhi, 2009.
3	Cencil Jenson, Jay D.Helsel, Desnnis R.Short, “Engineering Drawing & Design”, 7th Edition, Tata Mcgraw Hill Pvt. Ltd., New Delhi. 2012.

K.S.Rangasamy College of Technology – Autonomous								
40 MA 004 Boundary Value Problems and Transform Methods								
Common to CIVIL, CSE, IT, MCT, MECH and NST								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objectives	• 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. • To introduce the concepts of Z - transform and its application to various problems related to engineering and technology.
Course Outcomes	At the end of the course, the students will be able to 1. Obtain the Fourier series expansion for the periodic function. 2. Understand the notions of half – range Fourier series and harmonic analysis. 3. Know about the procedure to find the solution of one-dimensional wave equation with zero or non-zero velocity. 4. Understand the procedure to find the solution of one-dimensional heat equation with steady state or unsteady state condition. 5. Solve the solution of two dimensional heat flow equation for finite plates. 6. Solve the solution of two dimensional heat flow equation for infinite plates. 7. Apply Fourier transform technique and Parseval's identity for the continuous function. 8. Discuss the Fourier sine and cosine transforms and properties of Fourier transforms. 9. Understand the concepts of Z- transform for some elementary functions and its properties. 10. Apply the inverse Z-transform techniques to the function and solve the difference equation using Z-transform.

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.

Boundary Value Problems – I

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

Boundary Value Problems – Ii

Two dimensional heat flow equation (Insulated edges excluded): Finite plates – Square plates temperature given in horizontal edge – Square plate temperature given in horizontal and vertical edges – Rectangular plates temperature given in horizontal edge – Rectangular plates temperature given in horizontal and vertical edges – Infinite plates – Vertically infinite plates – Horizontally infinite plates.

Fourier Transform

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

Z –Transform

Z-transform – Elementary properties – Initial and final value theorem – Inverse Z – transform – Partial fraction method – Residue method – Convolution theorem – Solution of difference equations using Z - transform.

Text book(s):

1	Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
2	Kreyszig E, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons (Asia) Limited, New Delhi, Reprint 2012.

Reference(s):

1	Veerarajan T, "Engineering Mathematics-III", Tata McGraw-Hill Publishing Company Limited, New Delhi.
2	Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", 9th Edition, Lakshmi Publications Pvt Ltd, New Delhi, 2014.
3	Glyn James, "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, 2011.

K.S.Rangasamy College of Technology – Autonomous

40 MC 301 Manufacturing Technology

MCT

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

Objectives	• To introduce the students the concepts of basic manufacturing processes and fabrication techniques such as casting, metal joining, metal forming. • To understand the working of standard machine tools such as lathe, drilling , milling and allied machines, Non conventional machining
Course outcomes	1. Explain the basic concepts and principles of casting processes. 2. Understand the inspection and testing techniques of castings. 3. Explain the basic concepts and principles of welding process. 4. Describe the various welding methods. 5. Outline the various components involved in hot working and cold working processes. 6. Reproduce and summarize the sheet metal working and special forming processes. 7. Recognize and restate the components of cutting tools. 8. Describe and illustrate the construction, working principles and requirements of basic machine tools. 9. Describe the different methods of gear manufacturing. 10. Describe and illustrate the working principles of micro machining processes and need for automation manufacturing processes.

Casting Processes

Introduction to casting process - Pattern: materials, types, allowances - Moulding: green sand moulding, moulding sand and its properties - Cores: types and making - Casting: sand mould casting, shell molding, investment casting, die casting and continuous casting - Melting furnaces: Cupola and induction furnaces - Casting defects: causes and remedies - Non-destructive testing: liquid penetrate test, x-ray diffraction and ultrasonic test.

Joining Processes

Introduction to welding process - Principle of arc and gas welding - Tools and equipments - Filler and flux materials - Flame types - Weld defects - Safety in welding - Other welding processes: Resistance welding, ultrasonic welding, gas tungsten arc welding and gas metal arc welding - Electron beam welding and Laser beam welding - Brazing and soldering

Forming processes

Introduction to hot and cold working - Forging: open and close die forging, upsetting - Rolling: high roll mills and shape rolling - Extrusion: forward and backward, tube extrusion - Drawing of wires, Rods and tubes - Sheet metal work:Shearing, bending and drawing operations - Stretch forming - Special forming methods: Types - hydro forming.

Machining Processes

Cutting tool: materials, properties, wear and life - Cutting fluids - Basic machine tools: centre lathe, radial drilling machine, universal milling machine and shaping machine-Constructional features, operations, work and tool holding devices - Grinding: surface and centreless grinding. Introduction to CNC machines.

Gear Manufacturing and Micromachining

Introduction to gears - Gear tooth terminology - Methods of gear manufacturing: gear forming and gear generating- Gear finishing processes – Micromachining: Introduction to micromachining processes - Ultrosonic micromachining, Electrodischarge micromachining, Electron beam micromachining, Laser beam micromachining, Electrochemical micromachining. - Automation: Need and advantages of automation.

Text book (s) :

1	J. P. Kaushish, Manufacturing Processes, Prentice Hall of India Learning Private Limited, New Delhi, 2010.

Reference(s) :

1	V.K.Jain, Introduction to Micromachining.Narosha Publishing House, New Delhi, 2010.
2	P. N. Rao, Manufacturing Technology - Vol I and II, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2009.
3	D. K. Singh, Manufacturing Technology, Pearson Education, New Delhi, 2008.
4	Roy A. Lindberg, Processes and Materials of Manufacture, Prentice Hall of India Learning. Ltd., New Delhi, 2009.
5	P. K. Mishra, Non-Conventional Machining, Narosha Publishing House, New Delhi, 2005.
6	Phillip F. Ostwald and Jairo Munoz, Manufacturing Processes and Systems, Wiley India, Bangalore, 2008.

7	Hajra Choudhury S.K, Elemets of workshop Technology, Vol I and II, Media Promotors, Bombay Editon 2011.

K.S.Rangasamy College of Technology – Autonomous

40 MC 302 Analog Electronics

MCT

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

Objectives

- To procure the fundamental knowledge in semiconductor diodes and special purpose diodes
- To acquaint the students with construction, theory and characteristics of bipolar junction transistor and field effect transistor
- To impart the fundamental knowledge in the areas of operational amplifier, oscillator and multivibrator.

Course outcomes

1. Demonstrate the VI characteristics of pn junction diode
2. Use of diode in rectifier, clipping, clamping and voltage multiplier circuits.
3. Discuss the special diode with their VI characteristics
4. Use zener diode for voltage regulation
5. Discuss the characteristics and biasing of BJT
6. Examine the BJT amplifier
7. Sketch the characteristics of JFET
8. Categorize MOSFET with VI characteristics
9. Describe the ideal characteristics of an OP-AMP
10. Use of Op-AMP in Amplifier, Oscillator, Multivibrator and mathematical operation

Semiconductor Diodes

Intrinsic and Extrinsic semiconductors - drift and diffusion currents -formation of pn junction - biasing the diode – VI characteristics of diode – static and dynamic resistance –. Applications: - diode clipping and clamping circuits - voltage multipliers – Zener diode – photo diode – light emitting diode – laser diode – optocoupler.

Bipolar Junction Transistors

Physical structure - basic operation - Transistor characteristics - CE, CB and CC configuration - transistor as an amplifier - transistor as a switch - transistor biasing - dc load line operating point - bias stability. Applications: Current, voltage and power amplifiers.

Field Effect Transistor

Construction & operation of JFET – JFET characteristics- JFET biasing - Construction & operation of MOSFET - Enhancement and depletion mode – MOSFET characteristics- MOSFET biasing. Application: Differential amplifier using JFET - MOSFETas an analog switch.

Operational Amplifier

Ideal Op-Amp characteristics, Open loop , Closed loop configurations - Inverting & non-inverting amplifier – voltage follower - Summing amplifier- Comparators -Schmitt Trigger – Instrumentation Amplifier.

Power Supplies

Half wave and full wave rectifier – General filter consideration – capacitor filter – Discrete transistor voltage regulation – IC voltage regulators – Practical applications – SMPS.

Text book(s) :

1	David A.Bell, “Electronic Devices and Circuits”, Oxford University Press, New Delhi, 5th Edition 2013.

Reference(s) :

1	Jacob. Millman, Christos C.Halkias, “Electronic Devices and Circuits”, Tata McGraw Hill Publishing Limited, New Delhi, 3rd Edition 2010.
2	Thomas L. Floyd, “Electronic Devices” Pearson Education Limited, New Delhi, 7th Edition 2005.
3	N.P.Deshpande, “Electronic Devices and Circuits”, Tata McGraw Hill Publishing Limited, New Delhi, 1st Edition 2007.
4	Balbirkumar, shail B jain, “ Electronic Devices and Circuits” PHI Learning Private Limited, New Delhi, 2nd Edition 2014.

K.S.Rangasamy College of Technology – Autonomous								
40 ME 006 Strength of Materials								
Common to MECH & MCT								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100

Objectives	• Evaluate the engineering materials subjected to various loads. • Examine the stresses and strains developed in a material. • Analyse the bending moment and shear stress distributions in beams. • Derive and apply the bending and torsional equations in beams, shafts and springs. • Compute the stresses developed in cylindrical and spherical shells.
Course Outcomes	At the end of the course the students will be able to 1. Estimate the stress intensity and deformation in solid bodies subjected to various types of loading. 2. Evaluate the elastic properties of materials and their significant effects in engineering applications. 3. Compute the principal stresses and strains by analytical and graphical methods. 4. Apply the concepts of shear force and bending moment diagrams in design of machine elements. 5. Estimate the stresses developed due to bending and shear in the design of machine members and structures. 6. Analyze the twist and strength of torsion members. 7. Compute the deflection and stress developed in helical spring. 8. Estimate the slope and deflection in determinate beams 9. Calculate the stresses, strains and deformation of the thin cylindrical and spherical vessels. 10. Apply the Euler's theory and Rankine formula for buckling load analysis in columns.

Stress, strain and deformation of solids
Rigid bodies and deformable bodies – Tension, compression and shear stresses – Deformation of simple and compound bars –Composite bars - Thermal stresses – Elastic constants – Volumetric strains – Strain energy due to axial force. Normal and shear stresses on any oblique planes – Principal stresses and their planes by analytical and Mohr's circle method.

Transverse bending on beams
Types of beams: Supports and loads – Shear force and bending moment in beams – Cantilever, simply supported and overhanging beams.

Stresses in beams
Theory of simple bending – Bending stress distribution – Symmetrical and unsymmetrical sections. Shear stress distribution.

Torsion
Torsion of solid and hollow circular shafts – Stepped shafts – Power transmission, strength and stiffness of shafts. Leaf spring – Stresses and deflection in close coiled helical spring.

Deflection of Beams
Slope and deflection in beams - Double integration method - Moment area and Macaulay's method for statically determinate beams.

Thin cylinders, Spheres and Columns
Thin cylindrical shellssubjected to internal pressure – Circumferential and longitudinal stresses anddeformation. Thin spherical shells subjected to internal pressure – Stresses and deformation. Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula.

Text Book(s):

1	R.K.Bansal, "Strength of Materials", 5th edition, Laxmi Publications (P) Limited, New Delhi, 2013.

Reference(s):

1	Beer and Johnston, "Strength of Materials", CSB Publisher 2010.
2	E.P. Popov, "Introduction to Mechanics of solids", Prentice Hall Publication 2009.
3	Timoshenko and Young, "Strength of Materials", CSB Publisher 1998.

K.S.Rangasamy College of Technology – Autonomous								
40 ME 007 Fluid Mechanics and Machinery								
Common to MECH & MCT								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	50	50	100
Objectives	• To impart knowledge on properties of fluid, fluid statics & dynamics reactions, incompressible fluid flow. • To acquire knowledge on hydraulics machines.							
Course Outcomes	At the end of the course the students will be able to 1. Explain and evaluate the various properties of fluids. 2. Perform the measurement of fluid pressure using manometer. 3. Determine the weight of body by using buoyancy method 4. Estimate the rate of flow of fluids using continuity equation. 5. Apply the concept of Bernoulli's equation to Venturimeter and orifice meter 6. Evaluate the pressure drop using Hagen poiseulle's equation 7. Predict the major and minor losses in flow through pipes 8. Analyze the similarity of motion between model and prototype 9. Evaluate the performance of the various turbines. 10. Evaluate the performance of the various pumps.							

Fluid Properties and Fluid Statics

Units and Dimensions – Fluid Properties – Density, Specific gravity, Viscosity, Surface tension, capillarity, compressibility and bulk modulus - Fluid Statics -Pascal's law – Pressure measurements – Atmospheric, vacuum pressure and gauge pressure – simple and differential manometers - Buoyancy – Centre of buoyancy – meta center and meta center height.

Fluid Kinematics and Fluid Dynamics

Types of fluid Flow – types of flow line – control volume - velocity field and acceleration - Continuity equation-stream and potential function – energy equation - Euler's and Bernoulli's Equation – Applications **–** Venturimeter, orifice meter and pitot tube.

Flow through circular conduits

Laminar flow through circular pipes - Hagen Poiseuille equation – Turbulent flow - Boundary layer concepts – Darcy Weisbach formula -Loss of energy in pipes – major and minor losses of flow in pipes – Pipes in series and in parallel - Equivalent pipes.

Dimensional Analysis

Need for dimensional analysis **–** methods of dimensional analysis - Similitude – types of similitude – Dimensionless parameters – application of dimensionless parameters – Model analysis.

Hydraulic Pump and Turbine

Classification – construction, working principles and design of Pelton wheel and Francis turbines – head, losses, work done and efficiency – specific speed – operation characteristics – Governing of turbines – Classification of pumps – centrifugal pump and reciprocating pump - working principle – discharge, work done and efficiencies.

Text Book(s):

1	R.K Rajput, "A Textbook of Fluid Mechanics and Hydraulic Machines", S.Chand & company Ltd. 4th Edition 2011.

Reference(s):

1	Ramamrutham.S. "Hydraulics Fluid Mechanics and Fluid Machines", 8th Edition, Dhanpat Rai Publishing company (P) Ltd, New Delhi, 2014.
2	Cengel Yunus A. and Cimbala, John M., "Fluid Mechanics", Tata McGraw - Hill, New Delhi, 2nd Edition, 2010.
3	Bansal, R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) Ltd., New Delhi, 2010.
4	Modi P. N and Seth S.M "Hydraulics and mechanics, including Hydraulic machines" standard book house, Delhi 2002.

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
III	3	0	0	45	3	50	50	100
Objectives	1. To enhance students' knowledge of theoretical and modern technological aspects in physics 2. To enable the students 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 Publishers, New Delhi, 2011

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, Chennai, 2010.
3.	A.Arumugham, Engineering Physics, Anuradha Agencies, Chennai, 2005.

K.S.Rangasamy College of Technology – Autonomous								
40 MC 3P1 Manufacturing Technology Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	2	50	50	100
Objectives	Demonstration and study of the following machines. The main emphasis will be on a complete understanding of the machine capabilities and processes.							
Course outcomes	At the end of the course, the students will be able to get 1. A knowledge of plain turning (external and internal) and facing on a given work piece as per the required dimensions using lathe. 2. A knowledge of thread cutting (internal and external) in a lathe 3. A knowledge of eccentric turning. 4. A ability to perform taper turning and knurling. 5. An Ability to make drilling, tapping and reaming operations using radial drilling machine. 6. Knowledge of machining horizontal surface from cylindrical piece by using milling machine. 7. Knowledge to machine a spur gear for the given number of teeth in milling machine with indexing mechanism. 8. Ability to machine a spur/ helical gear for the given number of teeth in gear hobbing machine 9. Ability to machine a dovetail and keyway slot in the given workpiece using shaper. 10. Ability to make the surface grinding operation and centerless grinding on the given workpiece							
1. Turning and facing of shaft. 2. Machining an internal and external thread. 3. Eccentric turning. 4. Machining a taper and a gripping surface. 5. Performing drilling reaming and tapping in rectangular plate. 6. Producing a hexagonal component from cylindrical workpiece. 7. Spur gear milling. 8. Spur/helical gear hobbing. 9. Making a dove tail and key way. 10. Grinding flat and cylindrical surfaces.								
Reference(s) :								
1	H.M.T. Production Technology-Tata McGraw Hill, 2001.							
2	E.PaulDegarmo, J.T.Black, Ronald A.Kohser, “Materials and process in Manufacturing” Prentice – Hall of India (p) Ltd., New Delhi.2005.							

K.S.Rangasamy College of Technology – Autonomous								
40 MC 3P2 Applied Mechanics and Fluid Mechanics Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	2	50	50	100

Objectives	• To analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials. • To utilize appropriate materials in design considering engineering properties and sustainability. To facilitates the knowledge about the testing of springs subjected to compressive loads. • To emphasize the concept Bernoulli's principle using orificemeter. • To evaluate the frictional loss in pipes. • To analyze the performance characteristics of turbines and pumps.
Course outcomes	At the end of the course, the students will be able to get 1. Explain the basic concepts of the tensile test on mild steel using Universal Testing Machine and plot the stress strain graph. 2. Demonstrate the compression and tensile test on helical spring and plot the load Vs deflection graph. 3. Determine the impact strength by Charpy and Izod test. 4. Determine the Young's modulus of beam by deflection test. 5. Perform the torsion test and determine modulus of rigidity of the material. 6. Apply the Bernoulli's principle to find the rate of flow using orificemeter. 7. Determine the friction factor for various pipes (major and minor losses). 8. Analyze the performance characteristics of turbines. 9. Analyze the performance characteristics of pumps.

1. Tension test on ductile materials.
2. Tension and compression test on helical springs.
3. Impact test on metal specimen - Charpy and Izod.
4. Deflection test on simply supported beam.
5. Torsion test on mild steel rod.
6. Determination of the Coefficient of discharge of orificemeter.
7. Determination of friction factor for a set of pipes.
8. Performance analysis of Pelton wheel.
9. Performance analysis of Kaplan Turbine.
10. Performance analysis of centrifugal pump.

Reference(s) :

1	"Applied Mechanics and Fluid Mechanics Lab Manual", Department of Mechatronics Engineering, KSRCT.
2	Dr.R.K.Bansal,"A Textbook of Strength of Materials", Laxmi Publications (P) ltd., New Delhi.
3	Dr.R.K.Bansal,"A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications (P) ltd., New Delhi.

K.S.Rangasamy College of Technology – Autonomous								
40 MC 3P3- Analog Circuits Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	2	50	50	100

Objectives	• To inculcate the basics of semiconductor diodes and their applications • To impart the knowledge about the working principle of transistors and operational amplifier • To procure the knowledge of oscillator and multivibrator using op-amp.
Course outcomes	At the end of the course, the students will be able to get 1. Investigate the characteristics of pn junction diode and zener diode 2. Illustrate the characteristics of Bipolar Junction Transistor in Common Base configurations. 3. Understand the working principle CE Amplifier . 4. Acquire the knowledge of wave shaping circuits 5. Elucidate the principle and operation of Phase shift and wein bridge oscillator circuits. 6. Expose the principle of Astable and Monostablemultivibrator circuits using op-amp. 7. Construct and analyze IC version of voltage regulator 8. Understand the operation of half and full wave rectifier circuit using PN junction diodes. 9. Identify the characteristics of photo diode and photo transistor 10. Understand the operation and characteristics of photoelectronic devices and solid state devices.

1. Characteristics of PN junction diode and Zener diode.
2. Input and output characteristics of BJT .
3. Frequency response of BJT amplifier.
4. Wave shaping circuits (Clippers and Clampers).
5. Design of Phase shift and wein bridge Oscillator using OP-AMP**.**
6. Astable multi vibrator using OP-AMP.
7. Mono stable multi vibrator using OP-AMP.
8. Design of Voltage regulator using IC 78xx**.**
9. Half wave rectifier with and without filter.
10. Full wave Bridge rectifier with and without filter.
11. Characteristic of photo diode and photo transistors.
12. Solid state relay activation and its characteristics.

Lab Manual:

1	S.Salivahanan, N Suresh kumar, “Electronic Devices and Circuits”, Tata McGraw Hill Publishing Limited, New Delhi, 3rd Edition 2014.

K.S.Rangasamy College of Technology – Autonomous								
40 TP 0P1 Career Competency Development I								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	2	30	0	100	00	100
Objectives	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
1	Evaluation 1 Written Test	50 Questions – 30Questions from Unit 1 & 2, 20 Questions from Unit 5, (External Evaluation)
2	Evaluation 2 Oral Communication 1	Self Introduction, Role Play & Picture Talk from Unit-3 (External Evaluation by English and MBA Dept)
3	Evaluation 3 Oral Communication 2	Book Review & Prepared Speech from Unit-4 (External Evaluation by English and MBA Dept)

Reference(s) :

Aggarwal, R.S. "A Modern Approach to Verbal and Non-verbal Reasoning", Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.

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 008 Statistics and Numerical Methods								
Common to (MECH, MCT, CIVIL & NST)								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	50	50	100

Objectives	• To provide an understanding of the statistical methods and distribution concept by which real life problems are analyzed. • To apply numerical techniques for solving system of linear equations. • To understand and apply the concepts of interpolation and numerical integration. • To solve initial value problems of ordinary differential equations numerically.
Course Outcomes	At the end of the course, the students will be able to 1. Analyze and apply the concepts of some standard distributions. 2. Test the statistical hypothesis using t, F and X^2 distributions. 3. Analyze the variance of factors using CRD and RBD. 4. Analyze the design of experiment using Latin square. 5. i) Employ different techniques to approximate roots of algebraic and transcendental equations of higher degrees. ii) Solve the system of linear equations using direct methods 6. i) Solve the system of linear equations using indirect methods. ii) Find the largest Eigen value of a matrix of order 2x2 and 3x3. 7. Find the 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 initial value problem of first order ordinary differential equations using single step methods. 10. Compute point wise solutions for initial value problem of first order ordinary differential equations using multi step methods.

Standard distributions and testing of hypothesis

Binomial, Poisson, Exponential and Geometric Distributions – Problems – Small sample tests based on t, **F and** χ^2 distributions – Contingency table (Test for Independency) – Goodness of fit.

Design of experiments

One way classification – Completely randomized design – Two-way classification – Randomized block design – Latin square design.

Solution of equations and eigen value problems

Newton Raphson method – Horner's method – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Matrix inversion by Gauss Jordan method – Eigen values of a matrix by power method.

Interpolation and numerical integration

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolations – Romberg's method – Two and three point Gaussian quadratures – Single and double integrations using Trapezoidal and Simpson's 1/3 and 3/8 rules.

Numerical solution of ordinary differential equations

Single step methods: Taylor's series method – Euler's and modified Euler's 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	Johnson R.A and Gupta C.B., "Miller and Freund's Probability and statistics for Engineers'', 11th Edition, Pearson Education, Asia, 2011.
2	Grewal B.S and Grewal J.S., "Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2007.

Reference(s):

1	Kandasamy P., Thilakavathy K. and Gunavathy K., "Numerical Methods", 3rd Edition, S.Chand and Co., New Delhi, 2003.
2	Subramaniam N., "Numerical Methods", SCM Publishers, 2010.
3	Veerarajan T., "Probability, Statistics and Random process", 3rd Edition, Tata Mc-Graw Hill Publications, New Delhi, 2008.

K.S.Rangasamy College of Technology – Autonomous

40 EE 005 Electric Drives and Controls

Common to MECH & MCT

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

Objectives

1. To select appropriate electrical drive system based on their thermal factors.
2. To interpret the characteristics of DC motors and perform appropriate conventional control techniques for desired applications.
3. To interpret the characteristics of AC motors and perform appropriate conventional control techniques for desired applications.
4. To employ solid state speed control techniques for DC drives.
5. To employ solid state speed control techniques for AC drives.

Course Outcomes

At the end of this course the students are able to

1. Explain the basic requirements for developing an electrical drive system.
2. Select a suitable motor drive for particular application based on different load conditions.
3. Describe the constructional details of DC motors with their characteristics.
4. Interpret the conventional speed control methods of DC motors with starting and braking methods.
5. Describe the constructional details of AC motors with their characteristics.
6. Interpret the conventional speed control methods of AC motors with starting and braking methods.
7. Apply converters for speed control of DC drives.
8. Apply choppers for speed control of DC drives.
9. Employ static open loop speed control using inverters for AC drives.
10. Employ static closed loop speed control using converters for AC drives.

Introduction of Electrical Drives

Basic Elements of a drive system – Types of Electrical Drives – Factors influencing the choice of electrical drives – heating and cooling curves – classes of duty – selection of power rating for drive motors.

DC Drives

Constructional details of DC Motors – Principle of operation DC Motor – Back EMF and torque equations – Types of DC Motors – Characteristics of DC Motors – Starting of DC Motors – Types of Braking – Conventional Speed Control of DC Motors: Armature Voltage Control, Field Flux Control, Ward Leornard Control. Stepper motor: Permanent magnet stepper motor – Principle of operation – Applications.

AC Drives

Constructional details of Three Phase Induction Motors – Types of rotors – Principle of operation – Slip – Torque Equations – Speed-Torque Characteristics – Types of Starters – Types of Braking – Conventional Speed Control of Induction Motors: Stator Voltage Control, Stator Frequency Control, Rotor Resistance Control – Servomotor.

Single phase Induction Motor – Construction and operation – Types – Capacitor start and run, Shaded pole – Applications.

Solid State Speed Control of DC Drives

Single Phase and Three Phase Fully controlled Converter: Principle of operation and waveforms of single phase and three phase fully controlled converter fed DC drive – Choppers Fed DC Motor Drive – Applications.

Solid State Speed Control of AC Drives

Voltage/Frequency Control of induction motor, Voltage Source Inverter and Current Source Inverter – VSI fed Three Phase Induction Motors – CSI Fed Three Phase Induction Motors- Static Rotor Resistance Control – Static Scherbius and static Kramer Drives block diagram and explanation – Applications.

Text Book(s):

1. Gopal.K.Dubey,"Fundamentals of Electrical Drives" Narosa Publishing House, 2001
2. Theraja,B.L and Theraja, A.K., "A text book of Electrical Technology – Volume II (AC & DC Machines)" S.Chand & Company Ltd., New Delhi, 2005.

Reference(s):

1. Vedam Subrahmanyam, "Electric Drives Concepts and Applications" Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 1998.
2. M.D.Singh and K.B. Khanchandani, "Power Electronics", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2008.

K.S.Rangasamy College of Technology – Autonomous

40 MC 401 Hydraulic and Pneumatic Controls

MCT

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

Objectives	• To expose the students to the technology that deals with the generation, control and transmission of power using pressurized fluids. • To familiarize learners about fluid power system, applications, advantages of fluid power working principles, operation of hydraulic and pneumatic components. • To expose to various techniques of circuit building in pneumatics
Course outcomes	At the end of the course, the students will be able to 1. Explain the Fundamental properties of Fluids, Pascal's law and its applications. 2. Understand the applications, advantages of fluid power system and Losses in fluid flow. 3. Describe the different types of pumps, Actuators and its working principles 4. Understand the Valves involved in Hydraulic circuit and its working 5. Describe and illustrate the construction and working principles of different types of compressors and FRL. 6. Understand the Valves involved in Pneumatic circuit and its working. 7. Describe and illustrate the Design, working principles Hydraulic circuits. 8. Design the Pneumatic circuit for various applications using cascade method. 9. Analyze and Design the Hydraulic and pneumatic circuits using PLC and Relay diagram 10. Know the significance of Failures and trouble shooting, Fluid power circuit for machine tool applications and software used in Fluid power automation

Fluid Power System

Introduction to fluid power – properties of fluid – Types of hydraulic fluids – Advantages and drawbacks of fluid power – Applications of fluid power – Components of fluid power system – Pascal's law: Multiplication of Force – Analysis of simple hydraulic jack – Applications of Pascal's law: Hand operated hydraulic jack , Air to Hydraulic pressure Booster – Laminar and Turbulent flow – Reynold's Experiment – Darcy's equation – Frictional losses in turbulent and Laminar Flow – Losses in valves and fittings.

Hydraulic Pumps, Actuator And Valves

Pumps Pumping theory - Pump classification – working principle of Gear pump, Vane pump, Piston pump, Screw pump - Hydraulic Actuators: Hydraulic motors – gear and vane motors, Hydraulic cylinders: single acting and double acting cylinders, Special type cylinders: rodless, tandem and telescopic – Hydraulic valves: Pressure relief valve, Compound relief valve, Direction control valve, Unloading valve, Sequence valve – Flow control valve Pressure compensated and Non pressure compensated types.

Pneumatic System

Properties of air – Compressors: Rotary compressor – Screw compressor, vane compressor – Piston Compressor: Single and Multi stage Compressor – Filter, Regulator and Lubricator Unit – Valves: Direction control valves, Two way, Three way, Four way valves – Pneumatic check valves – Flow control valve, Pneumatic shuttle valve – AND type valve – Quick exhaust valve.

Design of Hydraulic And Pneumatic Circuits

Construction of Hydraulic circuits - Counter balance circuit - Fail safe circuit - Regenerative circuit - pressure intensifier circuits - Accumulator circuits. Construction of Pneumatic circuits: Cascade method - sequence circuit. Electro – pneumatic circuit.-Basics of Fluidics.

Industrial Automation

Fluid power circuit by using Relay diagram. Fluid power circuit for machine tool applications: Grinding, milling, drilling, Robot arm. Failure and trouble shooting of Fluid power system –Software used in Fluid power automation.

Text book (s) :

1	Anthony Esposito, "Fluid Power with Application", Prentice – hall of India Pvt. Ltd.Sixth Edition, 2011
2	Srinivasan R, "Hydraulic and Pneumatic controls" , McGraw-Hill Education Pvt.Ltd.,2007

Reference(s) :

1	Andrew Parr, "Hydraulics and Pneumatics" , Jaico Publishing House, Seventh Edition, 2005
2	Majumdar S R , " Pneumatic Systems – Principle and Maintenance " , Tata McGraw Hill , 2006
3	Majumdar S R "Oil Hydraulic Systems – Principle and Maintenance ", Tata McGraw Hill 2006

K.S.Rangasamy College of Technology – Autonomous								
40 MC 402 Sensors and Instrumentation								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	50	50	100
Objectives	• To make the students to gain a clear knowledge of the basic measurements in mechanical and electrical instruments • Emphasis is laid on the mechanical instruments used for temperature, pressure, force and flow. • Detailed study of resistance, inductance, capacitance, photo emissive, photo conductive and photo voltaic sensors. • Detailed study of proximity, smart sensors, MEMS and NEMS sensors. • To get adequate knowledge about the recent trends and applications of sensors.							
Course outcomes	At the end of the course, the students will be able to 1. Use the units, standards and calibration techniques for generalized measuring systems. 2. Determine the various responses of transducers for zero, first and second order systems. 3. Demonstrate the working of mechanical transducers which can measure the temperature, pressure, force, torque and flow. 4. Examine the suitable specification of mechanical transducers for different measurement applications. 5. Demonstrate the working of electrical transducers which can measure the temperature, displacement, load, light intensity and angle. 6. Examine the suitable specification of electrical transducers for different measurement applications. 7. Illustrate the working and characteristics of smart sensors. 8. Use the different smart sensors for particular applications. 9. Demonstrate the working of recent sensors in the field of biometric, particle measurement and networking. 10. Choose the appropriate sensors for machine tools, manufacturing process, machine vision and environmental applications.							

Standards of Measurements

Introduction-Classification of Transducers-Performance Characteristics-Static & Dynamic Characteristics-Errors in Measurement-Gross Errors, Systematic Errors, Statistical Analysis of Random Errors-Calibration and Standards-Process of Calibration, Classification of Standards, Standards for calibration.

Mechanical Transducer

Introduction-Temperature Measurement-Pressure Measurement-Force Measurement-Torque Measurement-Liquid Level Measurement-Flow Measurement-Displacement to pressure transducers.

Passive Electrical Transducer

Resistive Transducers resistance thermometers, hot wire resistance transducer, resistive displacement transducers, resistive strain transducers-Inductive Transducer, inductive thickness transducer, displacement transducer, moveable core type inductive transducer, eddy current type inductive transducer-Capacitive Transducers-thickness, displacement, moisture.

Active Electric Transducer

Thermo electric transducers-Piezo Electric Transducers-Magnetostrictive Transducers-Hall-Effect Transducers-Photoelectric Transducers-Ionization Transducers-Digital transducers-electrochemical transducers.

Sensor Technology

Introduction – Semi Conductor Sensor-Smart Sensor-Microsensors-IR Radiation Sensors-Ultrasonic Sensors-Fibre Optic Sensors-Chemical Sensors-Bio Sensosrs.

Text book(s) :

1	D.V.S.Murty, Transducers and Instrumentation, 2nd Edition, PHI Learning Private Limited, New Delhi, 2010.
2	K. Sawhney and P. Sawhney, A Course on Mechanical Measurement Instrumentation and Control, Dhanpat Rai and Co, New Delhi, 2011.

Reference(s) :

1	J. P. Bentley, Principles of Measurement Systems, Addison Wesley Longman Ltd., UK, 2010
2	K.Krishnaswamy and S.Vijayachitra, Industrial Instrumentation, New age International Private limited, 2005.
3	William David Cooper, Electronic Instrumentation and Measurement Techniques , Prentice-Hall of India, 2001
4	C.S.Rangan, G.R. Sarma and V.S.Mani , Instrumentation Devices and Systems, Tata McGraw-Hill Education,2008

K.S.Rangasamy College of Technology – Autonomous

40 MC 403 Applied Thermodynamics

MCT

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

Objectives

- To acquire knowledge about the fundamentals of thermodynamics, laws of thermodynamics, air standard cycles, properties of steam, refrigeration and air conditioning.
- To study and understand the concepts and working of IC Engines, steam boilers and air conditioner.
- To understand and analyze about the various modes of heat transfer i.e., conduction, convection, and radiation.

Course outcomes

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

1. Estimate the thermodynamic characteristics for closed and open systems using first law of thermodynamics in steady state and transient conditions.
2. Calculate the thermal efficiency and coefficient of performance of heat engine, heat pump and refrigerator using second law of thermodynamics.
3. Determine the cycle efficiency and mead effective pressure for air standards cycles.
4. Evaluate the engine performance terminologies by understanding the different IC engine working principles.
5. Calculate the properties of steam using steam table.
6. Demonstrate the working of different types boilers, boiler mountings and boiler accessories.
7. Estimate the co-efficient of performance for various refrigeration cycle.
8. Find the psychrometric terms for different psychrometic processes used in air-conditioning system.
9. Explain the various modes of heat transfer principles.
10. Estimate the heat transfer for walls, cylinders, spheres, plates, cylinders, black and gray bodies.

Basic concepts and Laws of Thermodynamics

Systems, boundary, surroundings, properties, state, process, path, cycle, equilibrium, work and heat transfer, point and path function. – Zeroth law of thermodynamics - First law of thermodynamics for closed and open system – First law applied to control volume – Steady flow energy equation – Second law of thermodynamics, Equivalents of Kelvin Planck and Clausius statement, Heat engine, Refrigerators and Heat pumps – Corollaries of Second law.

Air standard cycles and IC Engines

Air standard cycles: Carnot, Otto, Diesel and Dual cycle, cycle efficiency and mean effect pressure – IC Engines: Comparison and working principles of two stroke, four stroke petrol and diesel engines, valve timing and port timing diagram – Total fuel consumption, specific fuel consumption, mechanical efficiency, BHP, IHP, FP – Applications of SI and CI engines.

Steam boilers

Properties of steam: use of steam table and mollier diagram – Boilers: Classification and applications: Simple vertical, la mont, Benson boiler. – Boiler mountings and Boiler accessories: – Application of steam boilers.

Refrigeration and Air-conditioning

Refrigeration: Principle of refrigeration. Refrigerant properties - vapour compression and vapour absorption refrigeration cycle, Calculation of COP. Air-conditioning: Psychrometric terms, relations – Use of psychrometric chart – Psychrometric processes, Sensible heating, sensible cooling, humidification and dehumidification - Summer and winter air-conditioning systems.

Heat Transfer

Fourier law of one dimensional heat conduction through plain and composite walls, cylinders and spheres. Free and forced convection – Empirical relations – Problems in flow over vertical plates, flow across cylinders. Laws of Radiations– Concept of black and gray body – Absorptivity, Reflectivity, transmissivity – Radiation exchange between two gray bodies.

Text book(s):

1. R.S.Khurmi & J.K.Guptha, 'Thermal Engineering', S.Chand, publisher – 2007.
2. B.K. Sachdeva, 'Fundamentals of Engineering Heat and Mass Transfer (SI Units)', New Age International (P) Limited, Chennai, 2003.
3. P.K. Nag, 'Basic and Applied Engineering Thermodynamics', Tata McGraw Hill, New Delhi, 2006.

Reference(s) :

1. Mahesh M Rathore, 'Thermal Engineering', Tata McGraw Hill, New Delhi, 2010.
2. Rogers and Mayhew, 'Engineering Thermodynamics -Work and Heat Transfer', Addision Wesley, New Delhi, 1999
3. Eastop and McConkey, 'Applied Thermodynamics', Addison Wesley, New Delhi. 1999.
4. M.L. Mathur and F.S. Metha, 'Thermal Engineering', Jain Brothers, New Delhi, 1997.
5. C.P.Kothandaraman & S. Subramanyan – Heat and Mass Transfer Data Book, Wiley Eastern Limited , 2008

(Approved stream table, HMT Data Book and Psychrometric Chart are permitted for examination).

K.S.Rangasamy College of Technology – Autonomous								
40 MC 404 Digital Electronics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	50	50	100
Objectives	• To procure the fundamental knowledge in digital logic principles. • To equip learners with the design of combinational logic circuits • To acquaint learners with fundamentals and design of sequential circuits • To impart learners in analyzing synchronous and asynchronous sequential circuits. • To educate learners with the basics of memory devices and implement combinational circuits using the same.							
Course outcomes	At the end of the course, the students will be able to 1. Practice the Boolean techniques and minimization of Boolean function. 2. Use logic gates to implement logic function. 3. Design arithmetic circuits using combinational logic gates 4. Design secured data transmission and reception circuits using combinational logic gates. 5. Discuss latches &flipblops in sequential circuits 6. Apply flipflops in counters & shift registers. 7. Analyxe synchronous and asynchronous sequential circuits. 8. Design synchronous and asynchronous sequential circuits 9. Describe the various types of semiconductor memory devices. 10. Construct combinational logic functions using programmable logic devices							

Boolean Algebra and Logic Gates

Review of Number Systems-Boolean postulates and laws – De-Morgan's Theorem –Principle of Duality – Boolean expression – Minimization of Boolean expressions —Minterm – Maxterm – Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine-McCluskey method of minimization.Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR -Implementations of Logic Functions using gates, NAND–NOR implementations – Multilevel gate implementations- Multi output gate implementations.

Combinational Circuits

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – BCD adder – Binary Multiplier – Binary Divider – Multiplexer – Demultiplexer – decoder – encoder – parity checker – parity generators – code converters – Magnitude Comparator.

Sequential Circuits

Latches, Flip-flops – SR, JK, D, T, and Master-Slave – Characteristic table and equation – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous counter – Asynchronous Up/Down counter – Synchronous counters – Synchronous Up/Down counters – Design of Synchronous counters: state diagram – State table –State minimization –State assignment – Excitation table and maps-Circuit implementation – Modulo–n counter, Registers – shift registers – Universal shift registers.

Analysis and Design of Sequential Circuits

Synchronous Sequential Circuits: Moore model – Mealy model – Design of clocked sequential circuits – Algorithmic State Machine – Analysis of Synchronous Sequential Circuits. Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Analysis of Asynchronous sequential Circuits – Hazards - Design of Hazard Free Switching circuits.

Memory and Programmable Logic Devices

Classification of memories: ROM – PROM – EPROM – EEPROM – RAM – Write operation – Read operation – Memory cycle – Timing wave forms – Static 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, Digital Design, 4th Edition, Prentice Hall of India Pvt. Ltd.,/ Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2012.
2	S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 4th Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2013.

Reference(s) :

1	Charles H.Roth, 'Fundamentals Logic Design', Cengage learning, VI edition, 2013.
2	Floyd, 'Digital Fundamentals', 10th edition, Pearson Education, 2013.

K.S.Rangasamy College of Technology – Autonomous

40 EE 0P1 Electric Drives and Controls Laboratory

Common to MECH & MCT

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

Objectives	1. To determine the performance characteristics of the given DC and AC motors from the test data. 2. To control the speed of DC shunt motor and AC motor by applying different techniques. 3. To determine 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 motors under different load conditions. 2. Test and analyze the performance of induction motors under different load conditions. 3. Analyze the performance of conventional speed control systems for DC shunt motors. 4. Design the power electronic based speed control systems for DC drives. 5. Design the power electronic based speed control systems for induction motor drives. 6. Test and analyze the performance of single phase transformer.

1. Load characteristics of DC shunt motor and compound motor
2. Load characteristics of DC series motor
3. Load test on three-phase squirrel cage induction motor
4. Load test on three-phase slip ring induction motor
5. Load test on single phase induction motor
6. Speed control of DC shunt motor
7. Speed control of DC shunt motor using controlled rectifier
8. Speed control of DC shunt motor using chopper
9. Speed control of three –phase induction motor by V/F method
10. Load test on single phase transformer and calculation of efficiency and regulation

Lab Manual:

1. “Electrical Machines Lab Manual” by EEE staff members

K.S.Rangasamy College of Technology – Autonomous								
40 MC 4P1 Hydraulic and Pneumatic Controls Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	3	45	2	50	50	100

Objectives	• To expose the students to the technology that deals with the generation, control and transmission of power using pressurized fluids • To provide hands on experience on circuit building in Hydraulics & Pneumatics • To understand the concepts and applications of electro pneumatic/PLC based automation for industries.
Course outcomes	At the end of the course, the students will be able to 1. Test the simulated output by constructing the fluid power circuits using suitable actuators and valves. 2. Acquire the knowledge of meter in and meter out hydraulic and pneumatic circuits to extend and retract the double acting cylinders. 3. knowledge of basic hydraulic pneumatic circuit to extend and retract double acting cylinder using pneumatic kit. 4. To develop the Capability of design and implementation of electro - pneumatic circuits for industrial automation. 5. To understand the concepts and applications of Synchronizing circuit based automation system. 6. Identify the various methods to actuate Automatic Reciprocation of double acting cylinders. 7. Designing simple circuits systems for sequential control systems involving valves and cylinders. 8. Design and simulate the fluid power circuits using PLC. 9. To learn the Automation studio software and its applications for automation system for industries.

Study and experiment the following circuits.

1. Basic Hydraulic circuit
2. Meter in & Meter out hydraulic circuit
3. Basic pneumatic circuit
4. Meter in & Meter out pneumatic circuit
5. Regenerative circuit.
6. Electro pneumatic circuit
7. Synchronizing circuit
8. Automatic Reciprocation circuit
9. Sequential circuit
10. Automatic Reciprocation of Double acting cylinder using PLC
11. Fluid power circuits using Automation studio software.

Reference(s) :

1	Anthony Esposito, “Fluid Power with Application”, Prentice – hall of India Pvt. Ltd., 2011
2	Srinivasan R, “Hydraulic and Pneumatic controls” , McGraw-Hill Education Pvt.Ltd.,2007

K.S.Rangasamy College of Technology – Autonomous								
40 MC 4P2 Sensors and Instrumentation Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	3	45	2	50	50	100

Objectives	• To reinforce the concepts studied in the study in the sensors & instrumentation course for the practical/real world applications. • To understand the concept of controlling the parameters based on measurement • To provide hands on experience on measuring instruments. • To understand the concepts and applications PID a controller.
Course outcomes	At the end of the course, the students will be able to 1. Investigate the characteristics of resistance thermometer, thermocouple. 2. Analyze the characteristics of speed measurement using tacho meter, stroboscope 3. Understand measuring characteristics load cell and proving ring 4. Investigate the characteristics of peizo electric sensor 5. Acquire the knowledge of torque measuring devices 6. Acquire knowledge and studying characteristics of strain gauge indicator 7. Acquire knowledge and characteristics of position measurement , LVRT 8. Analyze the characteristics of LVDT 9. Acquire measuring techniques of angular measurements sing encoders 10. Obtain knowledge on speed measurement using tacho generator 11. Obtain knowledge on speed measurement using PID controller

Study and experiment the following circuits.

1. Temperature Measurement And Control
   Temperature measuring devices like platinum resistance thermometer, thermocouple, etc
2. Speed Measurement And Control
   Studying the devices and characters and measuring the speed using tachometer, stroboscope, etc.
3. Force Measurement
   Force measuring devices, load cells and proving rings
4. Pressure Measurement
   Pressure measuring device, piezo electric sensor
5. Torque Measurement
   Torque measurement –using torque measuring devices
6. Strain Measurement
   Study and use of strain – strain gauge indicator
7. Position Measurement Using Linear Scale
   Position measurement, LVRT
8. Displacement Measurement
   LVDT-Displacement and velocity measurement using encoders
9. Angular Velocity Measurement Using Encoders
   Measure the angular velocity of the PMDC motor using encoder
10. Speed Measurement Using Tachogenerator
    Measure the speed of DC motor using tachogenerator then plot speed Vs voltage characteristic
11. Speed Measurement and Control Using PID Controller
    Study the action of PID controller using a speed control system

Text book(s) :

1	K. Sawhney and P. Sawhney, A Course on Mechanical Measurement Instrumentation and Control, Dhanpat Rai and Co, New Delhi, 2011.

Reference(s) :

1	J.P.Bentley, Principles of Measurement Systems, Longman Inc., 2010.

K.S.Rangasamy College of Technology – Autonomous

40 TP 0P2 Career Competency Development II

MCT

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

Objectives	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
1	Evaluation 1 Written Test	15 Questions Each from Unit 1, 3, 4 & 5 (External Evaluation)
2	Evaluation 2 Oral Communication	Extempore & Miming – Unit 2 (External Evaluation by English, MBA Dept.)
3	Evaluation 3 Technical Paper Presentation	Internal Evaluation by the Dept.

Reference Book(s):

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 MC 501 – Virtual Instrumentation and Applications								
MCT								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P	45 Hours	C	CA	ES	Total
V	3	0	0		3	50	50	100
Objective(s)	• To provide basic concepts in virtual instruments • To know about the programming methods in software used in virtual instrumentation • To familiarize the students with the applications of virtual instrumentation.							
Course Outcome(s)	At the end of the course, the students will be able to : 1. Understand the Architecture of Virtual Instrument and its features 2. Learn the concepts of data flow techniques and Graphical programming 3. Practice loops, Charts ,Arrays, Structures, String and File I/O in GUI 4. Practice Formula nodes, Instrument Drivers, Local and Global Variables in GUI 5. Learn the basic principles of Data Acquisition on PC 6. Learn the different components used for data acquisition 7. Recall Principles and Pin configuration of RS232/485,GPIB,USB,PCMCIAfor interfacing with PC 8. Learn the principles and Pin configuration of VXI,SCSI,PCI and PXI controllers PCMCIA for interfacing with PC 9. Develop Database management System ,Control system, Industrial communication and Instrument control using VI 10. Simulate system Using Virtual Instrument for Motion control,Image acquisition and processing							

Introduction

Virtual Instrumentation: Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems.

VI Programming Techniques

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers.

Data Acquisition Basics

Introduction to data acquisition on PC, Sampling fundamentals, Input / Output techniques and buses. ADC, DAC, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

Interface Standards and PC Buses

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI.

Applications

Instrument Control, Development of process database management system, Simulation of systems using VI, Development of Control system, Image acquisition and processing, Motion control, Robotics.

Text Book(s) :

1	Garry M. Johnson, “Lab VIEW Graphical Programming”, TATA McGraw Hill, Edition, 2006.
2	Lisa K. wells & Jeffrey Travis, “LabVIEW for everyone”, Prentice Hall, New Jersey, 1997.

Reference(s) :

1.	Jovitha Jerome, “Virtual Instrumentation using LabVIEW”, PHI Learning Pvt. Ltd, New Delhi, 2010.
2.	Steve Mackay, Edwin Wright, John Park, and Deon Reynders, “Industrial Data Networks”, Elsevier, 2004.
3.	Kevin James, “PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control”, Newnes, 2000.
4.	Sanjay Gupta and Joseph John, “Virtual Instrumentation using LabVIEW”, Tata McGraw Hill Inc., 2005.
5.	http://www.nptel.ac.in/syllabus/112106152/
6.	http://www.nptel.ac.in/courses/112104039/lecture13/13_8
7.	http://www.nptel.ac.in/courses/112106139/pdf/5_1.pdf

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 502 Microprocessors and Microcontrollers								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objectives	• To study the architecture of 8085 microprocessor, 8051 & PIC microcontrollers. • To study the addressing modes & instruction sets of 8085, 8051 & PIC. • To introduce the need & use of Interrupt structure. • To develop the skill in simple program writing. • To introduce the commonly used peripheral / interfacing ICs and study its simple applications.
Course outcomes	1. Understand the basic element and functions of microprocessor. 2. Computation of assembly language programs. 3. Analyze the operation of various interfacing devices to microprocessor and microcontroller applications. 4. Various important peripheral architecture and its functions**.** 5. Understand functional and architectural characteristics of a 8051 microcontroller. 6. Ability to develop program microcontroller using arithmetic and logic instructions. 7. Capability to develop simple microcontroller design concepts. 8. Acquaintance with basic concept to develop simple case study. 9. Interfacing with microprocessor and microcontroller. 10. Apply the concepts of microprocessor and microcontroller to mechatronics systems

8085 Microprocessor

Architecture – Functional block diagram - Instruction set – Addressing modes – Timing diagrams – Assembly language programming – Interrupts, memory interfacing.

Peripheral Interfacing

Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter.

8051 Microcontroller

Microcontroller Hardware – I/O Pins, Ports – External memory – Counters and Timers – Serial data I/O – Interrupts – 8051 Assembly Language Programming: Instruction set of 8051, Addressing modes, Data transfer instructions, Arithmetic and Logical Instructions, Jump and Call Instructions, interrupts and returns interrupts and returns interrupt handling.

8051 Microcontroller Design

8051 Microcontroller Specification – Microcontroller System Design – Testing the Design, Timing Subroutines, Look up Tables – Multiple interrupts – Serial Data Communication – Network Configuration - Case study 1: water level monitoring system using 8051 microcontroller, Case study 2: ticket vending machine design using 8051 microcontrller.

Applications

Interfacing of ADC, DAC and stepper motor, speed control of DC motor interfacing, traffic light control and washing machine control interfacing.

Text book

1	Krishna Kant, “Microprocessors and Microcontrollers Architecture, Programming and system Design 8085, 8086, 8051, 8096”, Prentice Hall of India, New Delhi, 8th Edition , 2011.
2	Ajay V. Deshmukh, “Microcontrollers Theory and Applications, “Tata McGraw Hill Publishing company Ltd, New Delhi 2011.

Reference(s) :

1	R.S. Goankar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Prentice Hall, 2010.
2	John E Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Prentice Hall of India, 2007.
3	A.K. Ray and K.M. Bhurchandi, “Advanced Microprocessors and peripherals”, 2nd Edition, Tata McGraw-Hill Publishing company Ltd, 2010.
4	Muhammad Ali Mazidi, Janice Gillispie Mazidi & Rolin McKinlay, ‘The 8051 Micro Controller and Embedded Systems’, Prentice Hall of India, 2008.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 503 – Theory of Machines								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100
Objectives	The student able to understand mechanism of machine, motion transmission, velocity and acceleration analysis.							
Course outcomes	1. Acquaintance with basic mechanism and the layout of linkages in the assembly of the system. 2. To understand how the rigid bodies are connected in order to accomplish a desire motion transmission. 3. Ability to design and analyze the velocity and acceleration of different mechanisms. 4. Ability to design the cam profile and analyze the design using displacement, velocity, acceleration diagrams. 5. To understand the basic concept of toothed gearing. 6. Acquaintance with kinematics of gear trains. 7. To plot the turning moment diagram of crank rotation at various strokes. 8. An understanding the process of providing continuous energy to the system when the energy source is discontinuous. 9. Ability to analyze different types of vibrations (free, forced and damped vibration) 10. An understanding of balancing of single and several masses in same or different planes.							

Simple Mechanism

Introduction- Kinematic links, structure- comparison between machine and structure, joints, Kinematic pairs- classification- types of constrained motion. Kinematic chain-classification- degrees of freedom – Kutzbach criterion, Gruebler's criterion – Grashof's law - Mechanism - Inversions of four bar and slider crank chain – Mechanical advantage – Description of some common mechanism - Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms.

Kinematic Analysis of Linkages and CAM

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method of velocity and acceleration diagram for four bar and slider crank chain - Introduction to kinematic analysis software packages. CAM – Classification of cams and follower – radial cam nomenclature – analysis of follower motion - uniform velocity, simple harmonic motion and uniform acceleration and retardation – Construction of cam profile for a radial cam.

Gears and Gear Trains

Gear tooth profiles - gear tooth action - Interference and undercutting - requirement of minimum number of teeth in gears - Gear trains - Simple and compound gear trains -Determination of speed and torque in epicyclic gear trains.

Turning Moments and Flywheels

Introduction, turning moment diagram for a single cylinder double acting steam engine-Turning moment diagram for a four stroke internal combustion engine- Fluctuation of energy- determination of maximum fluctuation energy- co-efficient of fluctuation of energy-Flywheel: co-efficient of fluctuation of speed-energy stored in a flywheel- Dimensions of the flywheel rim- Introduction to governors and gyroscope.

Vibration and Balancing

Free, forced and damped vibrations of single degree of freedom systems, Critical speed of shaft - logarithmic decrement – Force transmitted to supports. Static and dynamic balancing - balancing of revolving masses, single and multi-cylinder engines. Reciprocating masses - single cylinder engines.

Text book

1	R.S Khurmi and JK Gupta , "Theory of Machines", S.Chand and Company Ltd., New Delhi.2010

Reference(s) :

1	Rattan S.S, "Theory of Machines, Tata McGraw-Hill Education Pvt. Ltd., 2009
2	Ballaney P L, "Theory of Machines", Khanna Publishers, New Delhi, 2005.
3	Rao J.S. and Dukkipati R.V., "Mechanism and Machine Theory", Bohem press, 2007
4	Sadhu Singh "Theory of Machines", Pearson Education, 2012.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 504 - Control Systems								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	50	50	100

Objectives	• To describe feedback control and basic components of control systems • To understand the various time domain and frequency domain tools for analysis and design of linear control systems. • To study the methods to analyze the stability of systems from transfer function forms • To describe the methods of designing compensators
Course outcomes	1. Understanding of open loop and closed loop control system 2. Ability to design Mathematical, Translations, Rotational systems transfer function 3. Learn about time domain specification 4. Acquire the knowledge about types of test input 5. Acquaintance with frequency performance 6. Ability to design and develop the Bode plot. 7. Understanding the concept of stability control system 8. Acquire the knowledge about routh Hurwitz criterion 9. Ability to design Lag, Lead, Lag-lead network. 10. Acquire the knowledge about State space Analysis

Systems and Their Representation

Introduction to Control System: Open and Closed loop Systems Examples –Residential Heating System, Automobile Drive System, and Temperature Control System. Transfer function: Mathematical Model- Mechanical Model- Translational & Rotational Systems, Electrical Model, Block Diagram Reduction Techniques, Signal flow Graph using Manson's Gain Rule –Related problems.

Time Response Analysis

Introduction – The Performance Specifications: Transient Response-Rise time, Peak time, Peak Overshoot, Settling time, Measure of performance of the Standard Second Order System -Steady State Response-Steady State Error Constants and System Type Numbers. Types of Test Inputs: Step, Ramp, Parabolic, Impulse -First and Second Order System Response. Feed Back Control System Characteristics: - Proportional, Integral, Derivative, PID Modes of Feedback Control.

Frequency Response Analysis

Introduction –The Performance Specifications in Frequency Domain- The Bode Plots – The Polar Plots–Nichols Chart-determination of closed loop response from open loop response

Stability of Control Systems

Introduction-Characteristic Equation, Location of Roots in S-plane for Stability. Stability Criterion: Bounded input Bounded output Stability, Zero input Stability, Routh Hurwitz Criterion. Root locus construction: Root locus Concept, Guidelines for Sketching Root Loci, Selected illustrative Root Loci-Gain Margin and Phase Margin. Nyquist Stability Criterion Selected illustrative Nyquist Plots.

Compensator Design and Statespace Analysis

Performance criteria - Lag ,Lead and Lag-lead networks-Compensator design using bode –plot, Introduction to state space analysis-physical variable, phase variable and canonical variable forms.

Text book

1	I.J Nagrath and M.Gopal "Control System Engineering", New Age international publisher, new Delhi,2011
2	Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, Pearson Education, New delhi, 2009

Reference(s) :

1	M.N. Bandyopadhyay, "Control Engineering Theory and Practice", Prentice Hall of India, 2006.
2	Chesmond C.J. "Basic Control System Technology", Viva Low Priced Student Edition, 1998
3	Leonard N.E. and William Levine, "Using MATLAB to Analyze and Design Control Systems",..
4	Gopal M. "Control System Principles and Design", 3rd Edition ,Tata McGraw-Hill, New delhi,2008

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 505 - Industrial Electronics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100

Objectives	• To impart the knowledge on power semiconductor devices & protection circuits. • To give exposure for the operation, characteristics & performance of inverters & Choppers. • To introduce the concepts of AC Voltage controller & Cycloconverters. • To expose the learners to various working components of power electronics in industries.
Course outcomes	At the end of the semester student will able to 1. Understand the working principles of power switching devices. 2. Apply auxiliary circuits in real time power electronic applications. 3. Identify the proper gating sequence & control circuit in operating the single phase & three phase inverters**.** 4. Describe the principles of choppers & classify their types. 5. Analyze & understand the performance parameters of AC voltage controllers. 6. Explain the working principles of Cyclo Converters. 7. Understand and apply the concept of oscillators. 8. Design the multivibrator circuits using IC 555. 9. Apply the electronics technology in switching circuits, relays & contactor control circuits. 10. Use power electronics in electric heating & Welding.

Power Semiconductor Devices & Operation

Basic structure & operation of: Power diode, power transistor, SCR, TRIAC, GTO, MOSFET&1GBT, serial parallel operation of SCR, Turn On & Turn Off Methods of Thyristors - di/dt & dv/dt Protection Circuits.

Inverters and Choppers

Classification of inverters, Thyristor inverters, voltage and current commutated inverters, PWM inverters, principle of chopper, chopper classifications.

A.C. Voltage Controllers and Cyclo-Converters

Single phase AC Voltage controller – principle of phase control – sequence control – Principle of Cycloconverters operation and its types.

Oscillators and Multivibrators

Oscillators: Definition, Hartley, Colpitts, Wein- bridge and RC phase shift oscillator. Multivibrators; Introduction – IC 555 timer –Astable, Monostable and Bistable multivibrators.

Industrial Applications

Solid-state switching circuits – Static circuit breakers and relays – Design of control circuit – Contactor control circuit –Electronic regulators – Battery charger – Emergency lightning system – Electric heating – Electric welding.

Text book

1	Bimbhra.P.S,"Power Electronics" 4th Edition, Khanna publishers – New Delhi, 2006.
2	Mithal G.K and Maneesha Gupta, "Industrial and Power Electronics", 19th Edition, Khanna publishers – New Delhi, 2006.
3	Salivahanan.S. "Electronic Devices and Circuits" Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2011.

Reference(s) :

1	Dubey, G.K., Doradia, S.R.,Joshi, A. and Sinha, R.M., "Thyristorised Power Controllers",Wiley Eastern Limited, 1992.
2	Singh.M.D and Kanchandani "Power Electronics" - Second edition Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2002.
3	Bhattacharya, "Industrial Electronics and Control" Tata McGraw-Hill Publishing Company Ltd, New Delhi, 1998.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 506 – Metrology and Computer Aided Inspection								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	50	50	100
Objectives	To provide knowledge on metrological instruments and correct procedure adopted to measure the dimensions of components.							
Course outcomes	At the end of the course, the students will be able to 1. Understand the basic concepts of Metrology. 2. Acquaintance with mechanical measurement and errors in measurements. 3. Choose the appropriate linear measuring instrument and examine the dimensions of mechanical components with comparators. 4. Choose the appropriate angular measuring instrument for measurement of various components. 5. Discriminate between various screws by measuring their dimensions. 6. Examine the various dimensions of gears and measurement of surface finish, straightness, flatness and roundness. 7. Describe the methods of measurement for various quantities like force, torque and power. 8. Understanding the concept of temperature measurements using thermometers, thermocouple and thermistor. 9. Understand the principles and application of laser in metrology. 10. Acquire knowledge about Coordinate measuring machine and computer aided inspection.							

Basics of Metrology

Introduction to metrology - Standards of measurements - Measuring instruments - sensitivity, readability, range of accuracy, precision - Static and dynamic response - repeatability. Errors – Errors in measurements – types – controls – correction, calibration, Interchangeability.

Linear and Angular Measurement

Linear measuring instruments: Vernier, Micrometers, Slip gauges and surface plates. Introduction to Interferometry. Comparators: Mechanical, pneumatic, electrical and optical types and its applications. Angular measurements: Sine bar, optical bevel protractor, Angle Decker, Sprit level, Autocollimators and Clinometer.

Form Measurement

Measurement of screw threads - Thread gauges, floating carriage micrometer - measurement of gears - tooth thickness - constant chord and base tangent method - Parkinson Gear Tester - surface finish, straightness, flatness and roundness measurements.

Measurement of Power and Temperature

Force, torque, power: mechanical, pneumatic, hydraulic and electrical type. Temperature: Bimetallic strip thermometer, Pressure thermometer, Thermocouples, Electrical resistance thermistor.

Laser and Advances in Metrology

Precision instruments based on laser-Principles- laser interferometer-application in linear, angular measurements and machine tool metrology. Coordinate measuring machine (CMM) - Constructional features – types, applications – digital devices- computer aided inspection using robots.

Text book

1	Jain .R.K, “Engineering Metrology”, Khanna Publishers, 2005.

Reference(s) :

1	Gupta .S.C, “Engineering Metrology”, Dhanpat rai Publications, 2005
2	Beckwith, Lienhard, and Marangoni, “Mechanical measurements”, Pearson education, 2006.
3	Jayal A.K, Instrumentation and Mechanical Measurements, Galgotia Publications 2000

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 5P1 - Electronics and Virtual Instrumentation Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	3	45	2	50	50	100
Objectives	To impart the knowledge of modeling and simulation in instrumentation to fulfil the industrial requirements.							
Course outcomes	After successful completion of the course, the students should be able to 1. Design and implementation of adders and subtractors using logic gates. 2. Analyze the 4 bit binary adder/subtractor and BCD adder using IC 7483. 3. Identify the logic gates and to design multiplexer and demultiplexer. 4. Design and analyze the 4 bit ripple counter and Mod-10 / Mod-12 ripple counters. 5. Acquire the knowledge of graphical programming. 6. Use the different types of variables. 7. Comprehend the digital control of components. 8. Use the data acquisition card in instrumentation.. 9. Evaluate and analyze the performance of mass-spring damper system. 10. Design and simulate rectifiers and converters using MATLAB.							

1. (a) Design and implementation of Adders and Subtractors using logic gates.
   (b) Design and implementation of 4 bit binary Adder / Subtractor and BCD adder using IC 7483.
2. Design and Implementation of Multiplexer and Demultiplexer using logic gates
3. Construction and verification of 4 bit ripple counter and Mod 10 / Mod 12 ripple counters.
4. Debugging a VI, sub VI's using LabVIEW.
5. Programming structure, arrays, clusters, and File I/O using LabVIEW.
6. Usage of local and global variable in LabVIEW.
7. Control of temperature using data acquisition card.
8. Model and simulate a LED interface unit using DAQ.
9. Digital control of DC/stepper motors.
10. Design and simulation of mass-spring damper system using LabVIEW.
11. Simulate universal power converter with selectable topologies using MATLAB.
12. Design a bridge rectifier circuit using MATLAB.
13. Modeling and Simulation of diode rectifiers using MATLAB.

Text book

1	Garry M. Johnson, "LabVIEW Graphical Programming", Tata McGraw Hill Edition, 1996.
2	Amos Gilot, "MATLAB – An ntroduction with application", Wiley India Pvt Ltd.

Reference(s) :

1	Barry Paton, " Sensors, Transducers and LabVIEW", Prentice Hall, 2000.
2	Amos Gilat, MATLAB – An introduction with application", John Wiley India, 2004.
3	"LabVIEW Basics I and II Manual", National Instruments, 2003.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 5P2 – Microprocessors and Microcontrollers Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	3	45	2	50	50	100

Objectives	To learn programming and interfacing concepts of microprocessors and microcontrollers
Course outcomes	1. Perform the basic arithmetic operations using 8085 microprocessors by developing assembly language programs. 2. Able to develop assembly language program to perform addition of two 16 bit numbers using 8085. 3. Perform sorting using 8085 by developing assembly language programs. 4. Develop an assembly language program to perform multiplication of two 8 bit numbers using 8085. 5. Develop an assembly language program to convert hexadecimal to decimal and decimal to hexadecimal using 8085. 6. Perform the basic arithmetic operations using 8051 microcontrollers by developing assembly language programs 7. Demonstrate the interfacing of Stepper Motor using 8051. 8. Demonstrate the interfacing of DC motor using 8051. 9. Demonstrate the interfacing of traffic light controller with 8051. 10. Demonstrate the interfacing of Timer/Counter and Sensor with 8051.

1. Addition and subtraction of two 8-bit numbers.
2. Decimal addition of two 8-bit numbers.
3. Addition of two 16-bit numbers.
4. Sorting numbers in ascending and descending order
5. 8-bit multiplication and division..
6. 8-bit decimal to hexadecimal conversion.
7. Hexadecimal number to decimal number conversion.
8. Stepper motor interface.
9. Traffic light controller.
10. D.C. motor controller interface.
11. Timer/Counter Interfacing Techniques.
12. Sensor Interfacing Techniques

Text book

1	R.S. Goankar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Prentice Hall, 2010.
2	Ajay V. Deshmukh, “Microcontrollers Theory and Applications, “Tata McGraw Hill Publishing company Ltd, New Delhi 2005.

Reference(s) :

1	“Douglas V.Hall “Microprocessors and Interfacing, Programming and Hardware”,Tata McGraw Hill Publishing Company Ltd., New Delhi, 2000.
2	Kenneth J Ayala, “The 8051 Micro controller”, Thomson Delmer Learning, 2010.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 5P3 - Computer Aided Machine Drawing Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	3	45	2	50	50	100

Objectives	To make the students understand and interpret drawings of mechanical and electronic components so as to prepare assembly drawings using standard CAD packages, familiarize the students with Indian standards on drawing practices and standard mechatronics components.
Course outcomes	1. Learn to knowing the specifications and symbols of standard mechanical components used in machine drawing 2. An ability to interpret various tolerances and fits used for component design and to practice the drawings 3. Hands on experience to understand the importance and simplicity of CAD tools 4. Learn to create the sketch and drawing of a mechanical parts using 3D CAD modelling software 5. Learn to create the drawing of a mechanical part using mini drafter 6. Practice to generate the part and assemble the mechanical components manually 7. Practice to generate the part and assemble the electronics components manually 8. Hands on experience to generate the part and assemble the mechanical components using 3D CAD modelling software 9. Hands on experience to generate the part and assemble the electronics components using 3D CAD modelling software 10. Learn to create new products using CAD packages by understand the industrial drawings

Standards and Representations

ISO standard - Indian standard code of practice for engineering drawing –Conventional representations of threaded parts, Springs, gear and Common features. Abbreviations and symbols for use on technical drawings. Conventions for sectioning, dimensioning. Tolerances - Allowance - Limits and fits, types, selection of fits – Surface finish -Symbols and methods of indicating on drawing – Geometric Dimensioning and Tolerance.

2-D Drafting

Introduction to 3-D modelling CAD package : solid and wire frame modelling and drafting – Creation of simple geometric bodies using primitives (line, arc, circle etc.,) and editing for the drawing, Dimensional and text writing, concept of layer creation and setting, line types. Preparation of 2-D drawings using CAD package for orthographic views of standard machine components: Brackets, V Blocks, Stop Block, Screw components.

Assembly Drawing (Manual Drafting & CAD Package) and Introduction to Industrial drawing

Assemblies of Mechanical components - Plummer block, Screw jack, Tool head of the shaper Assembly of Electronic components - Direction control valves: 3/2 and 4/2 way valves, Robot manipulator. Reading and understanding an industrial drawing: Car door

Text book

1	K.R.Gopalakrishnan, “Machine Drawing”, Subhas Publication, XII edition, 2015.

Reference(s) :

1	N.D. Bhatt and V.M. Panchal, *Machine Drawing*, Charotar Publishing House, New Delhi, 2011.
2	Narayanan .K.L, Kannaiah .P and Venkata reddy .K, “Production Drawing”, New Age International Ltd, New Delhi,1st edition, 2012.
3	Gill .P.S. “A Text book of Machine Drawing”, S.K.Kataria & Sons, New Delhi, 7th Edition reprint, 2014.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 601 – Computer Aided Design and Manufacturing								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100
Objectives	The course aims to provide a detailed appreciation of the concepts of computer aided designing, in the context of computer interfacing and softwares. It is undertaken with particular on CNC machines and part programming.							
Course outcomes	1. Acquire knowledge about the various steps involved in product cycle and fundamentals of CAD/CAM. 2. Recite the role of computers in automation and CAD/CAM software packages. 3. Recognize the graphics display techniques in 2D/3D view of various mechanical components. 4. Study the various types of data structure, data storage and search methods 5. Learn about the various geometric modeling techniques such as CSG and B-rep. 6. Understand the concepts of finite element analysis. 7. Understand the basic concepts in numerical control and CNC machine tools and its classifications. 8. Understand the basic concepts of CNC programming and learn about the CNC codes. 9. Understand the concepts and principles involved in Group Technology 10. To describe the traditional and computer aided Process Planning techniques.							

Introduction to CAD/CAM

Fundamentals of CAD / CAM, product cycle and CAD/CAM, Computer Aided Engineering- Computer Aided Design - Computer Aided Manufacturing, Role of computer in CAD/CAM, Benefits of CAD/CAM. Concurrent Engineering, Types of Automation, Design for Manufacturability, Introduction to CAD / CAM software packages.

Computer Graphics

Introduction to Computer Graphics – Input and Output devices - Output primitives – Graphical input techniques - Two dimensional display control facilities – 2D and 3D transformations – Viewing transformation - Hidden line elimination – Model storage and data structure - Data structure organization, Hierarchical data structure, Network data structure, Relational data structure. Data storage and search methods.

Geometric Modeling

Geometric Modeling - Wireframe, Surface and Solid models –CSG and B-REP techniques – Wireframe versus Surface modeling - Introduction to finite element methods –Procedure of finite element analysis – Interfaces to CAD.

Machine Tool Control and Part Programming for CNC Machines

Introduction to Numerical Control (NC), Computer Numerical Control (CNC) & Direct Numerical Control (DNC) machines – Classifications of CNC machine. Fundamentals of part programming – G and M codes - Manual Part Programming. Computer Aided Part Programming, CAD / CAM integration – Advantages of CAD/CAM in NC programming.

Group Technology and Process Planning

Current trends in Manufacturing Engineering - Group Technology – Part family – Coding and classification – DCLASS , MCLASS and OPTIZ coding systems - Design for Manufacturing and Assembly – Process planning – CAPP - Variant and generative approaches- Flexible manufacturing systems.

Text book

1	Sadhu Singh, “Computer Aided Design and Manufacturing ", Khanna Publishers, New Delhi, 2010.
2	P.Radhakrishnan, “Computer Numerical Control (CNC) Machines ", New Central Book Agency (P) Ltd , Kolkatta, 2001.

Reference(s) :

1	Ibrahim Zeid, Sivasubramanian “CAD CAM Theory and Practice ", Tata McGraw-Hill, Special Indian Edition, Second Edition, New Delhi 2008.
2	P.Radhakrishnan and C.P.Kothandaraman, “Computer Graphics and Design ", Dhanpat Rai and Sons, New Delhi, Fifth edition 2010.
3	P.Radhakrishnan and S.Subramanyan, "CAD / CAM / CIM ", Wiley Eastern Ltd., New Age International Ltd., 1994.
4	Groover and Zimmers, " CAD / CAM: Computer Aided Design and Manufacturing ", Prentice Hall of India, New Delhi, 1994.
5	Yoram Koren, “Computer Control of Manufacturing Systems ", McGraw-Hill Book Company, 1986.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 602 - Design of Mechatronics Systems								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VI		3	0	0	45	3	50	50	100
Objectives	• To design a system with the aid of mechanical and electronic components • To study about Mechatronics Design process. • To study the data acquisition and control case studies • To study about the application of Mechatronics system							
Course Outcomes	At the end of the course, the students will be able to 1. Identify various mechatronics elements 2. Differentiate mechatronic design process from conventional design. 3. Categorize the different system models. 4. Select appropriate communication module for system design. 5. Obtain knowledge about of real time interface 6. Identify the applications software of real time interface. 7. Apply Mechatronics design process for new product development. 8. Identify, describe the principles and use correct methodology for mechatronics system 9. Outline the importance of micro mechatronics system. 10. Summarize working of advanced controllers and Microsystems							

Introduction

Key elements – Mechatronics Design process –Design Parameters – Traditional and Mechatronics designs – Advanced approaches in Mechatronics - Industrial design and ergonomics, safety.

System Modelling

Introduction - model categories - fields of application - model development - model verification - model validation - model simulation - design of mixed systems - electro mechanics design - model transformation domain - independent description forms - simulator coupling.

Real Time Interfacing

Real time interface - Introduction, Elements of a data acquisition and Control system, overview of I/O process, installation of I/O card and software – Installation of the application software - over framing.

Case Studies on Mechatronic System

Introduction –Fuzzy based Washing machine – pH control system – Autofocus Camera, exposure control – Motion control using D.C. Motor & Solenoids – Engine management systems.– Controlling temperature of a hot/cold reservoir using PID- Control of pick and place robot – Part identification and tracking using RFID – Online surface measurement using image processing.

Micro Mechatronic System

Introduction- System principle - Component design – System design – Scaling laws – Micro actuation – Micro robot – Micro pump – Applications of micro mechatronic components.

Text book

1	Devdas shetty, Richard A. Kolk, “Mechatronics System Design”, 2nd Edition ,Cengage Learning 2011.
2	Georg pelz, "Mechatronic Systems: Modeling and simulation" with HDL’s, John wiley and sons Ltd, 2003.

Reference(s) :

1	Bishop, Robert H, "Mechatronics Hand book", CRC Press, 2002.
2	Bolton, “*Mechatronics - Electronic Control Systems in Mechanical and Electrical Engineering”*, 2nd Edition, Addison Wesly Longman Ltd., 1999.
3	Bradley, D.Dawson, N.C. Burd and A.J. Loader, "Mechatronics: Electronics in Products and Processes", CRC Press 1991 , First Indian print 2010.
4	De Silva, "Mechatronics: A Foundation Course", Taylor & Francis, Indian Reprint, 2013
5	HMT “Mechatronics”, Tata McGraw Hill, 1998.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 603 - Programmable Logic Controller								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objectives	• To provide knowledge on PLC architecture and its components. • To give exposure for PLC Programming using ladder diagram. • To impart the knowledge on advanced functions of PLC. • To enable the students to Troubleshoot and Maintain the Equipment Operation in industries. • To study the need of SCADA in remote monitoring and their communication networks.
Course outcomes	At the end of the semester student will able to 1. Understand the basic concepts of programmable logic controller. 2. Recognize the functions of various components of PLC. 3. Realize the usage of relays, pushbuttons, limit switches, and other basic control devices for automation. 4. Develop program using the basic instructions of PLC. 5. Design the closed loop controllers for continuous process control. 6. Connect a power devices using an interposing relays. 7. Know about the maintenance and troubleshooting procedures in industry for PLC based control systems. 8. Develop a PLC program for an automatic control system for different applications. 9. Interpret the functionality of various elements of SCADA. 10. Gain knowledge on SCADA Communication protocols.

Introduction to PLC

Need for PLC – Definition & History of PLC – Overall PLC system, PLC sizes – PLC Input & Output modules – Central processing unit – Power supplies – Programming devices – Selection criteria – PLCs versus computers.

Programming of PLC

Basic components – symbols in ladder diagram, Boolean logic & relay logic – Programming ON/OFF Inputs to produce ON/OFF outputs – input and output field devices – Latching relays – control instructions – Data handling instructions – arithmetic instructions – data manipulation – program subroutines – Timer instructions – counter instructions creating ladder diagram from process control descriptions.

Functions of PLC

Analog PLC operation, PID control of continuous process, simple closed loop systems, problems with simple closed loop systems, closed loop system using Proportional, Integral & Derivative (PID), PLC interface, and Industrial process example.

Motors Controls: AC Motor starter, AC motor overload protection, DC motor controller, Variable speed (Variable frequency) AC motor Drive.

PLC Maintenance

PLC maintenance – internal & external PLC faults – programmed error – watch dogs – hardware safety circuits – troubleshooting. Case Studies**;** Robot controller – FMS – Factory automation – Process control – Simple materials handling applications – Automatic control of power plant.

SCADA Systems

Introduction and definitions, SCADA system evolution, principles of modern SCADA systems. Basic SCADA system architecture**;** Human Machine Interface, Master Terminal Unit, Remote Terminal Unit – SCADA data transfer through PLC – Communication Technologies & its components, Real Time System, SCADA server.

Text book

1	Frank D. Petruzella, “Programmable Logic Controllers”, McGraw-Hill Companies, 3rdEdition, March 2013.
2	John W. Webb and Ronald A.Reis, “Programmable Logic Controllers – Principles and Applications”, Prentice Hall Inc., New Jersey, 5th Edition, 2011.

Reference(s) :

1	Ian G.Warnock, “Programmable Controllers Operation and Application”, Prentice Hall International, UK, 1998.
2	Gary Dunning, “Introduction to Programmable Logic Controllers”, Thomson Learning, 2010.
3	Krishna Kant, “Computer Based Industrial Control”, Prentice Hall of India, 2004.
4	W. Bolton, "Programmable Logic Controllers” 5th Edition Newnes, 2015.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 604 – Machine Design								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	50	50	100

Objectives	To familiarize the various steps involved in the Design Process To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements. To learn to use standard practices and standard data To learn to use catalogues and standard machine components
Course outcomes	1. Know how to use the engineering design process while designing products/projects. 2. Able to analyze stresses and dimensions in machine elements at various loads. 3. Understand of the design of solid shaft based on strength and key. 4. Ability to design couplings and knuckle joint. 5. Knowledge on different terminologies and design of threaded fasteners 6. Ability to design welded joints. 7. Ability to design and analyze helical and leaf, springs under various loads. 8. Ability to design and analyze the spur and helical gear. 9. Exhibit the basic concepts of bearings, types and design of bearings 10. An understanding of connecting rod mechanism and design of connecting rod.

Various Stresses in Machine Members

Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact loading – calculation of principle stresses for various load combinations – Design of curved beams – crane hook - Factor of safety - theories of failure – Introduction of stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations.

Shafts and Couplings

Design of solid shaft based on strength and rigidity – Design of keys and key ways - Design of rigid and flexible couplings - design of knuckle joints.

Springs and Gears

Design of helical, and leaf, disc under constant loads and varying loads – Concentric springs – Gears, types, terminologies-Design of spur and helical gears.

Bearings and Connecting Rod

Design of bearings – sliding contact and rolling contact types. – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions – Design of connecting rod.

Screw Fasteners and Welded Joints

Threaded fasteners - Design of bolted joints including eccentric loading – Design of welded joints and structures - theory of bonded joints.

Text book

1	Juvinall R.C, and Marshek K.M, “Fundamentals of Machine Component Design”, John Wiley & Sons, Fifth Edition, 2011

Reference(s) :

1	Bhandari V.B, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 2008.
2	Norton R.L, “Design of Machinery”, Tata McGraw-Hill Book Co, 2004.
3	Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.
4	Spotts M.F., Shoup T.E “Design and Machine Elements” Pearson Education, 2004.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 605 – Automobile Technology								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	‘3	0	0	45	3	50	50	100

Objectives	To create an awareness on Vehicle Construction and Components of Engines, Auxiliary systems and Alternative Fuel Sources in Students.
Course outcomes	1. Explain about selection of suitable types of automobiles, vehicle construction, chassis, frame,body and aerodynamics principle. 2. Identify the components of engine and their functions and materials 3. Exhibit the carburetor and its working principle for petrol engine and exhibit the fuel injection system and fuel injector for diesel engine. 4. Explain basic concepts construction, operation and maintenance of lead acid battery and electrical systems in an automobile 5. Describe the need of clutch, gear boxes, manual and automatic for transmission system. 6. Demonstrate the working of simple floor mounted shift mechanism, over drives ,transfer box fluid flywheel and torque convertors. 7. Discuss about wheels and tyres and wheel alignment parameters 8. Describe about steering geometry and types of steering gear box and power steering. 9. Explain about an ethanol, methanol production, fuel properties, methods of using alcohols in diesel engine, emulsion, fumigation, dual fuel injection, spark ignition and use of ethanol in petrol engine. 10. Describe about the use of hydrogen in SI engine, manifold injection, cylinder injection, safety precaution using hydrogen in SI engine.

Vehicle Structure and Engines

Classification of Automobiles - Vehicle Construction – Chassis – Frame and Body – aerodynamics. Components of Engine – Their forms, Functions and Materials - Review of Cooling and Lubrication systems in Engine – Introduction to Turbo Charging – Engine Emissions – 3 – Way Catalytic Converter.

Engine Auxiliary Systems

Carburettor – working principle - Fuel injection system – Disel Fuel Injector – Construction, Operation and Maintenance of Lead Acid Battery - Electrical systems – Battery, Alternator – Starting Motor and Drives – Lighting and Ignition systems (Battery, Magneto Coil) – Regulators - cut outs.

Transmission Systems

Clutch – Types and Construction – Gear Boxes, Manual and Automatic – Simple Floor Mounted Shift Mechanism – Over Drives – Transfer Box Fluid flywheel - Torque convertors – Propeller shaft – Slip Joint – Universal Joints – Differential and Rear Axle – Hotchkiss Drive and Torque Tube Drive.

Wheel, Steering, Brakes and Suspension

Wheels and Tyres – Wheel Alignment Parameters - Steering Geometry and Types of steering gear box – Power Steering – Types of Front Axle – Suspension systems – Braking Systems – Types and Construction.

Alternative Fuel Sources

Alcohol: Ethanol, Methanol, Production, fuel properties, methods of using alcohols in diesel engine, emulsion, fumigation, dual fuel injection. Spark ignition, surface ignition – Use of ethanol in petrol engine. Hydrogen: Use of hydrogen in SI engine, manifold injection, cylinder injection, safety methods.LPG / CNG: Usage in petrol engine, diesel engine modifications. . Biodiesel: Problems of vegetable oils as fuel for C.I engine, transesterification process, fuel properties, advantages and disadvantages.

Text book

1	Sethi H.M, “Automobile Technology”, Tata McGraw – Hill - 2003
2	Kirpal Singh “Automobile Engineering,12th edition, Vol. 1& 2, Standard Publishers, New Delhi, 2011

Reference(s) :

1	Crouse and Anglin “Automotive Mechanism ”, 9th Edition. Tata McGraw - Hill, 2003.
2	Newton, Steeds and Garet, “Motor vehicles”, Butterworth Publishers, 1989.
3	Srinivasan.S , “ Automotive Mechanics” 2nd edition, 2003, Tata McGraw – Hill.
4	Joseph Heitner, “Automotive Mechanics”, 2nd edition, East - West Press, 1999.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 6P1 - Control Systems Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	2	50	50	100

Objectives	To learn the practical experiments on DC, AC servo motor, Digital simulation
Course outcomes	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 system in time domain with different test inputs. 4. Construct the root locus and Routh-Hurwitz array to analyse the stability. 5. Analyse the performance of the system in frequency domain. 6. Determine the closed loop response of a system from its open loop response. 7. Design the suitable compensator for the given performance criteria. 8. Designthe controller for the given performance criteria and verify the performance of the controlled systems 9. Formulate the state space model of a system and obtain its solution. 10. Examine the controllability and observability of a syste

List of Experiments using LabVIEW

1. Determination of transfer function of DC Servomotor
2. Determination of transfer function of AC Servomotor.
3. Analog simulation of Type - 0 and Type – 1 systems
4. Determination of transfer function of DC Generator
5. Determination of transfer function of DC Motor
6. Stability analysis of linear systems
7. DC and AC position control systems
8. Stepper motor control system
9. Digital simulation of first order systems
10. Digital simulation of second order systems

1."Control System Laboratory", Faculty of MCT, KSRCT, Tiruchengode

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 6P2 – Computer Aided Manufacturing Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	2	50	50	100
Objectives	To gain practical experience in manual and computer assisted part programming, tool path generation, operation and control of CNC machines tools and CAM software							
Course outcomes	1. Apply G and M codes and be able to write new programs for various parts. 2. Understand standard control systems and tool path simulations 3. Generate CL data using CAM software 4. Machine components using machining and turning center.							

Study of specification of CNC milling machine and lathe.

Study of G and M codes.

Study of CNC control systems.

CNC Lathe

Programming and simulation for the following features - Straight turning, step turning and taper turning.

CNC Milling

Programming and simulation for the following features - Linear interpolation, circular interpolation, Pocket milling, slotting and other fixed cycles.

Computer Aided Part Programming

CL Data Generation by Using CAM Software, Post Process Generation for Different Control System, Machining of Computer Generated Part Program by Using Machining Center and Turning Center.

Text book

1	NIIT., Fundamentals of Computer Numerical Control, PHI learning private limited, New Delhi, 2009
2	David Kelley., Pro Engineer Wildfire 5.0, Published by McGraw-Hill Professional, 2010.

Reference(s) :

1	Radhakrishnan. P., Computer Numerical Control Machines, New Central Book Agency, 2001.
2	GROOVER, M.P., Automation, Production Systems and Computer Integrated Manufacturing, Prentice

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 6P3 - Programmable Logic Controller Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	2	50	50	100

Objectives	To facilitate knowledge on PLC Control Principles and Applications with Field Devices To train the students to create ladder diagrams for process control descriptions. To impart knowledge on Configure communication between the PLC and PC.
Course outcomes	At the end of the course, the students will be able to 1. Design the ladder logic for Mathematical and Boolean operations. 2. Design the Gray painting system. 3. Use the timers and counters in conveyors. 4. Design the controller for elevator. 5. Implement Traffic control using PLC. 6. Acquire the knowledge about automatic bottle filling and stamping process. 7. Control the speed of AC motors using VFD. 8. Interface the sensors for flow, pressure and level monitoring and control in process industries. 9. Design the of closed loop temperature controller. 10. Explore the concept of real-time monitoring and control using HMI.

Programming the PLC using ladder logic for:

1. Basic operations (Mathematical and Boolean).
2. Gray painting system.
3. Control the lamp by timer.
4. Material handling system.
5. Lift elevator control.
6. Traffic light control

Program and Interface the PLC using ladder logic for:

7. Bottle filling and stamping system
8. Water level control.
9. Speed control of AC motor.
10. Flow measurement.
11. Pressure measurement.
12. Temperature control.
13. Human machine interface

K.S.RangasamyCollegeofTechnology–Autonomous								R 2014
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	3	0	0	45	3	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 student 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”,
4. V.L.Mote, Samuel and G.S.Gupta, “Managerial Economics – Concepts and Cases”, Tata Mcgraw Hill

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 702 Embedded System								
MCT								
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 impart knowledge on Embedded Processors architecture and Programming design and apply to solve real-world problems.
Course outcomes	At the end of the course, the students will be able to 1. Understand the basic structural units of embedded system 2. Describe the function and operation of software and hardware components of embedded systems 3. Study the general architecture of ARM processor 4. Compare and contrast various types of memory technologies. 5. Gain knowledge on various communication networks and their interfaces 6. Explain the interrupt service routines used to address and service the device IOs 7. Describe the basic architecture of an operating system and its fundamental operations 8. Describe the inter-process communication functions and their inter-relationships. 9. Appraise an embedded based system. 10. Use the hardware and software tools to debug and configure the RTOS for embedded applications

Introduction to Embedded Systems

The build process for embedded systems- Structural units in Embedded processor, selection of processor & memory devices - Timer and Counting devices, Watchdog Timer, Real Time Clock- Software Development tools-IDE, assembler, compiler, linker, simulator, debugger, In circuit emulator, Target Hardware Debugging need for Hardware-Software Partitioning, Co-Design.

ARM Architecture and Memory Organization

ARM architecture – ARM programming's model- Registers – 3 Stage Pipeline architecture – 5 Stage pipeline architecture- Interrupts and Exceptions handlings – ARM Instruction sets – THUMB instruction sets. ARM Programming - DMA – Memory management - Cache mapping techniques, dynamic allocation – Fragmentation.

Embedded networking and communication

Synchronous, Iso-synchronous and Asynchronous serial communication mode - Serial communication Network protocol using I^2C, CAN, USB – Parallel Communication network using ISA, PCI, PCI-X, ARM and Advanced High Speed Buses. Types of Interrupt - Programmed I/O Busy wait approach without ISM – ISR Concept – Interrupt Handling Mechanism – Context Switching - Interrupt latency – Interrupt Service Deadline - preventing Interrupt overrun, disability interrupts - interrupt driven I/O - writing interrupt service routine in C & assembly languages.

Real Time Operating System (RTOS)

Basic principles of OS – Kernel and its function - Process Management – Device Management – File and I/O Subsystem Management – Task scheduling model – Shared Data Problem – Semaphores – Queues – Mailboxes - OS Security Issues.

Case Studies

Embedded System in Automobile – Adaptive Cruise Control Systems in a car – Smart card - Elevator control - Automatic Washing machine - Mobile phone - ATM machine.

Text book

1. P.Rajkamal, "Embedded System – Architecture, Programming and Design", 3rd Edition, Tata McGraw Hill Publishing Co. Ltd, 2015.
2. Steve Furber, "ARM System on chip Architecture", 2nd Edition, Addision Wesley, 2013.

Reference(s) :

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", 2nd Edition, Morgan Kaufman Publishers, 2013.
2. David E. Simon, "An Embedded Software Primer", 3rd Edition, Pearson Education, 2014.
3. Dr K.V.K.K..Prasad, "Embedded /Real-Time systems: Concepts, Design & Programming", New Edition, Dream Tech Press, 2013.
4. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield, "ARM System Developer's Guide Designing and Optimizing System Software", Elsevier Publications, 2013.
5. Frank Vahid and Tony Givargi, "Embedded System Design: A Unified Hardware/Software Introduction", 3rd Edition, John Wiley & Sons, 2012.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 703 – Robotics and Machine Vision systems								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	Familiarize the students with the fundamentals of robotics, robotic kinematic, robot sensors image processing techniques.
Course outcomes	At the end of the course, the students will be able to 1. Understand the different types of robots and its various components. 2. Exhibits the basic characteristics of robots. 3. knowledge of basic robot kinematic. 4. Acquaintance of homogeneous transformation matrix for different types of robots. 5. Knowledge about position, velocity, acceleration principles for different environmental condition. 6. Ability to analyze different types of range and sniff sensors for robotic systems. 7. Classify the types and description of grippers. 8. Exhibit the principle, need and techniques of image processing techniques. 9. Exposure of feature extraction of the images. 10. Exhibits the concepts of object recognition by features by texture, depth, volume and color

Introduction and Robot Components

Introduction-basic structure-classification of robot and robotic systems-laws of robotics-robot motions work space-precision of movement –power transmission systems-gear transmission, belt drives, cables, roller chains, link, rotary to linear motion conversion, rack and pinion drives, ball bearing screws, speed reducers-hydraulic systems-servo motors-stepper motors.

Kinematics Of Robot

Introduction-matrix representation -homogeneous transformation matrices-representation of transformations–Inverse of transformation matrices-forward and inverse kinematics of robots-degeneracy-dexterity.

Sensors and End Effectors

Position sensors–potentiometers, encoders–Linear Variable Differential Transducer, velocity sensors, acceleration sensors, force, pressure and torque sensors, touch and tactile sensors ,proximity, range and sniff sensors. Mechanical grippers-types of gripper mechanisms-grippers force analysis-other types of grippers-vacuum cups-magnetic grippers-adhesive grippers

Image Processing Techniques

Machine vision introduction–image processing and image analysis, image acquisition-sampling and quantization-levels of computation. Image processing techniques–segmentation-thresholding–connectivity-noise reduction-edge detection-region growing and region splitting-binary morphology and gray morphology Operations.

Feature Extraction

Geometry of curves-texture and texture analysis-image resolution–depth and volume, color processing-object recognition by features-depth measurement, specialised lighting techniques-image data compression-Real time image processing-application of vision system-medical robotics-painting robotics.

Text book

1.	Saeed B. Niku, “Introduction to Robotics:Analysis, Systems, Applications”, 2nd edition, Pearson Education India, 2013.
2	Ramesh Jain, Rangachari Kasturi, Brain G. Schunck, “Machine Vision”, Tata McGraw Hill, 3rd edition 2012.

Reference(s) :

1	M.P.Groover, “Industrial Robotics-Technology, Programming and Applications”, Tata Mcgraw Hill, USA., 2012 second edition special indain edition
2	Yorem Koren, “Robotics for Engineers”, McGraw Hill, USA 2013
3	P.A. Janaki Raman,” Robotics and Image Processing”, Tata McGraw Hill, 2011

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 704 Automotive Electronics								
MCT								
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 impart knowledge on vehicle sensors, ignition and injection systems in the field of Automobiles. To understand the principles of comfort, safety systems and advanced vehicle technologies of automobiles
Course outcomes	At the end of the course, the students will be able to 1. Acquire knowledge about different types of speed and pressure sensors. 2. Acquire knowledge about different types of temperature and position sensors. 3. Exposure the different types of ignition systems and its operations. 4. Describe the construction of different types fuel injection. 5. Study about the automotive engine management and its construction details. 6. Study the construction details of new developments in engine management. 7. Knowledge about TCS & CCS. 8. Exposure of different automotive safety systems. 9. Acquire knowledge about advanced vehicle technology. 10. Exposure of navigation systems.

Vehicle Sensors

Working principle of sensors-speed and pressure sensors, vehicle speed sensors(VSS), manifold absolute pressure sensor(MAP), knock sensor, mass air flow sensor (MAF)-Temperature sensors, coolant and exhaust gas temperature sensor, exhaust oxygen level sensor-position sensors, throttle position sensor, accelerator pedal position sensor and crank shaft position sensor-Air mass flow sensor.

Ignition and Injection

Ignition Systems: Ignition fundamental, types of electronic ignition Systems. Programmed ignition, Distribution less ignition, Direct ignition, IGBTs automotive ignition- Spark plugs – Injection Systems – Throttle body injection – Multipoint fuel injection – Sequential fuel injection – GDI –CRDI- Supercharger.

Engine Management

Introduction: Input, output and control strategies, Combined electronic Ignition and Fuel Management Systems – Exhaust Emission Control – Advanced vehicle control systems – New developments in engine management system, fuel injection timing control.

Safety and Comfort

Antilock Braking System (ABS) – Traction Control System (TCS) —Electric Seats-Power steering, mirrors and sun-roofs – Central locking and electric windows - Cruise Control System (CCS) - Electric power steering - electronic clutch – Electronic suspension system – airbags, seat belt tensioners, collision avoidance Radar warning system and low tire pressure warning system

Advanced Vehicle Technology

Gasoline Direct Injection.- Electronic Control of Automatic Transmission (ECAT) – Keyless entry – Noise control – Reverse sensing / parking aid – Car navigation system – Telematics - Global Positioning System, e-mobility

Text book

1. Tom Denton, Automobile Electrical and Electronic systems, BH Publication, 4th edition 2012.

Reference(s) :

1. Allan Bonnick, Automotive computer controlled systems, Kindle Edition, 2012.
2. William B. Ribbens, “Understanding Automotive Electronics”, Butterworth-Heinemann, Burlington, 2003.
3. Bosch Automotive Hand Book, 8 th Edition, 2011.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 7P1 – Robotics and Machine Vision Laboratory								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	0	0	3	45	2	50	50	100

Objectives	The students will learn to design, build, program, control robotic devices and think of ways in machine vision system.
Course outcomes	At the end of the semester student will able to 1. Explain the different types of robots and its applications.- 2. Describe the different types of links, drives, joints and end effectors used in robots. 3. Verify transformation with respect to gripper. 4. Practice Point to point and continuous path on robot programming. 5. Analyze the Signal conversion of sensing and digitizing the images using sampling and quantization 6. Asses the concepts related with data reduction process 7. Analyze the Threshold, connectivity, noise reduction and edge detection of the image. 8. Analyze Depth and volume using feature extraction technique 9. Inspect the colour to differentiate the components while doing the pick and place operation of the desired components 10. Develop the various methods of inspection and maintenance.

1. Study of different types of links and joints used in robots, components of robots with drive system and end effectors, classification of robots based on configuration and application.
2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system.
3. Robot programming exercises (Point-to-point and continuous path programming)
4. Signal conversion of sensing and digitising the images using sampling and quantization analysis.
5. Windowing and digital conversion techniques of the captured component image for data reduction process.
6. Threshold, connectivity, noise reduction and edge detection of the component image for further segmentation analysis of the component.
7. Texture analysis of the captured image for feature extraction process.
8. Depth and volume analysis of the component in feature extraction techniques to pick the component.
9. Analysis of colour inspection to differentiate the components while doing the pick and place operation of the desired component.
10. Template matching such as pattern matching and geometric matching exercises for the component recognition to pick the component using grippers

Text book

1	Saeed B. Niku, “Introduction to Robotics: Analysis, Systems, Applications”, 2nd edition, Pearson Education India, PHI 2013 (ISBN 81-7808-677-8)
2	Ramesh Jain, Rangachari Kasturi, Brain G. Schunck, “Machine Vision”, Tata McGraw Hill, 2012

Reference(s) :

5	M.P.Groover, “Industrial Robotics-Technology, Programming and Applications”, McGraw Hill, USA. 2012.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC 7P2 Embedded System Laboratory								
MCT								
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 impart knowledge on AT89X51ED2 Development board/equivalent using Embedded C / Assembly Language using Keil IDE or Equivalent.
Course outcomes	At the end of the course, the student will be able to, 1. Acquire the knowledge of basics of embedded system and develop the skill on programming. 2. Perform arithmetic operations in an embedded system with a combination of C and assembly language 3. Test the serial data communication of internal UART using Atmel processor 4. Demonstrate the 8 channel 12 bit analog to digital conversion using Atmel processor 5. Demonstrate the dual slope analog to digital conversion using Atmel processor 6. Demonstrate the concept of 4 digit 7 segment display using Atmel processor 7. Acquire the analog signal from temperature sensor and display the temperature using Atmel processor 8. Operate and control the traffic signal using Atmel processor 9. Develop an embedded C program to control the speed of stepper motor using ARM processor 10. Develop an embedded C program to control the speed and position control of DC motor using ARM processor

LIST OF EXPERIMENTS

1. Real time operating system solutions with KEIL tools – Introduction
2. Program to perform 8bit and 16bit Arithmetic operation using KEIL IDE.
3. Program to perform search and replacement a number using KEIL IDE.
4. Program to transmit a message from Microcontroller to PC serially using UART communication
5. Program to check the status of PORT1 (8051) signal using LEDs.
6. Interfacing and programming of 8 Channel 12 Bit ADC
7. Interfacing and programming of Dual Slope ADC
8. Interfacing and Programming of Seven Segment Display
9. Program to get analog input from Temperature sensor and display the temperature value on PC Monitor.
10. Program to Perform Traffic Lights Interface
11. Program to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions
12. DC motor speed and position control using ARM Processor

<table>
<tr><td colspan="9">K.S.Rangasamy College of Technology – Autonomous R 2014</td></tr>
<tr><td colspan="9">40 MC 7P3 – Project Work Phase – I</td></tr>
<tr><td colspan="9">MCT</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="3">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>50</td><td>50</td><td>100</td></tr>
<tr><td>Objectives</td><td colspan="8">The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Three periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project

Each student shall finally produce a comprehensive report covering back round information, literature survey, problem statement, project work details and conclusion. This final report be typewritten form as specified in the guideline</td></tr>
</table>

K.S.Rangasamy College of Technology - Autonomous R 2014								
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
VIII	3	0	0	45	3	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 student 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.Besterfiled, 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	Suburaj, Ramasamy “Total Quality Management”, Tata McGraw Hill, 2005.

<table>
<tr><td colspan="9">K.S.Rangasamy College of Technology – Autonomous R 2014</td></tr>
<tr><td colspan="9">40 MC 8P1 – Project Work Phase – II</td></tr>
<tr><td colspan="9">MCT</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="3">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>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>Objectives</td><td colspan="8">The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. Sixteen periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project

Each student shall finally produce a comprehensive report covering back ground information, literature survey, problem statement, project work details and conclusion. This final report will be in typewritten form as specified in the guidelines.</td></tr>
</table>

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E11 - Networking of Computers								
MCT								
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 Data Communications • To Analyze the functions of different layers, and introduce IEEE standards employed in Computer Networking • To Analyze different Protocols and its applications.							
Course Outcomes	At the end of the course, the students will be able to 1. Understand the basic components of a network model and its types 2. Analyze the different types of transmission medium and line coding techniques 3. Apply the different error detection and correction techniques 4. Analyze the flow control, data control and LAN 5. Analyze the circuit and packet switching networks, IP addressing and subnetting 6. Extrapolate the different routing algorithms 7. Understand the different communication protocols(TCP and UDP) 8. Explore congestion control 9. Obtain the knowledge of WWW, HTTP, FTP protocols 10. Explore the concept of SMTP, DNS and security							

Data Communications

Networks – Components – Data Flow – networks criteria – Physical Structure– Topologies – Network Types – ISO / OSI model. Line Coding – Line Coding Schemes – Line Coding – Polar– Unipolar–Transmission Media – Coaxial Cable – Fiber Optics.

Data Link Layer

Error – types of errors – Detection Vs Correction –CRC – Hamming code – Check sum. Flow Control and Error Control - Stop and Wait – go back-N ARQ – Selective Repeat ARQ- Sliding Window – HDLC. LAN - Ethernet IEEE 802.3 – IEEE 802.4 - IEEE 802.5 -. IEEE 802.11.

Network Layer

Internetworks – Circuit Switching – Packet Switching– IP addressing methods – Subnetting – Routers- Routing Algorithms – Distance Vector Routing – Link State Routing.

Transport Layer

Transport Layer Services – Multiplexing – Demultiplexing –Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control.

Application Layer

WWW – HTTP – FTP – SMTP – Domain Name Space (DNS) – Security – Security Goals – Attacks.

Text book (s):

1. Behrouz A. Forouzan, “Data communications and Networking 5E”, McGraw-Hill, Fifth Edition , 2013.

Reference(s) :

1. James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach”, Pearson Education, Fifth Edition 2009.
2. Larry L.Peterson and Bruce S. Davie, “Computer Networks, A Systems Approach”, The Morgan Kaufman Series in Networking, Fourth Edition, 2007.
3. Andrew S. Tanenbaum, “Computer Networks”, PHI, Fourth Edition, 2003.
4. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E12 – Advanced Microprocessors and Microcontrollers								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objectives	• To introduce various advanced microprocessors and microcontrollers. • Discuss about their architecture, programming concepts, and its application.
Course outcomes	1. Understand the basic element and functions of 8086 microprocessor. 2. Articulate the salient features of 8086 processors 3. Understand the basic concepts of 80386, 80486 microprocessor, M68040 and MC88100 Architecture. 4. Express the features of Pentium processors and identify their applications 5. Understand functional and architectural characteristics of ARM processor. 6. Ability to do ARM instructions executions with coprocessors. 7. Ability to do assembly language program using ARM conditional and loop instructions. 8. Understand the basic concepts of run time environment and thump instructions. 9. Understand the concepts ARM processor memery organization techniques. 10. Acquaintance with basic concept to of ARM processor chips.

8086 Microprocessor

Introduction - architecture, addressing modes, Instruction Format, Data transfer, Arithmetic, Bit and Logical manipulation, string, program transfer and processor control instructions, dependent instructions, Pseudo instructions - Use of assembler and assembler directives, simple math programme, moving block of data , arrange a block of data in ascending / descending order.

Other Microprocessor

Intel 80386, 80486, Pentium microprocessor - SUN's SPARC microprocessor – AMD microprocessor - MOTOROLA 68040, MC88100.

Arm Architecture

RISC machine-ARM programmer's model-Development tools-ARM assembly language programming- ARM organization-ARM instruction execution-ARM implementation-ARM coprocessor interface

Arm Instruction Set

ARM instruction set. Floating point architecture-Expressions-Conditional statements- loops-Functions and procedures-Use of memory- Run time environment - Thumb instruction set.

A**rm Processor Core**

Memory hierarchy-Architectural support for operating systems-Memory size and speed-Cache memory management-Operating systems-ARM processor chips.ARM7TDMI-ARM8-ARM9TDMI-ARM10TDMI

Text book

1	Krishna Kant, "Microprocessors and Microcontrollers Architecture, Programming and system Design 8085, 8086, 8051, 8096", Prentice Hall of India, New Delhi, 8th Edition , 2011.
2	Ajay V. Deshmukh, "Microcontrollers Theory and Applications, "Tata McGraw Hill Publishing company Ltd, New Delhi 2005.

Reference(s) :

1	R.S. Goankar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Prentice Hall, 2010.
2	John E Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Prentice Hall of India, 2001.
3	A.K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and peripherals", 2nd Edition, Tata McGraw-Hill Publishing company Ltd, 2010.
4	Muhammad Ali Mazidi, Janice Gillispie Mazidi & Rolin McKinlay, 'The 8051 Micro Controller and Embedded Systems', Prentice Hall of India, 2005.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E13 – Product Design and Costing								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objectives	• To enable the student to understand the various aspects of the design process and to apply them in practice. • To train the student in the concept of product costing, cost estimation and other product development economics in product design.
Course outcomes	1. Understand the fundamentals of product design, planning and development. 2. Gain knowledge about market research and product life cycle. 3. Understand the significance of customer satisfaction and issues associated with it. 4. Learn the various types of product architecture. 5. Know the elements and types of economic analysis. 6. Learn the economic analysis process, factors affecting it and trade offs. 7. Gain knowledge of various types of costs associated with production of components 8. Able to estimate various types of costs for producing components by turning, drilling, shaping, planning, milling, grinding, welding and forging. 9. Learn the process of work study, method study, tools and techniques used for it and able to calculate the standard time. 10. Understand the ergonomics and its influence in production.

Product Design and Development

Principles of creativity in design- product development planning-planning process– Product analysis – Criteria for product design – Market research – Design for customer and design for manufacture – Product life cycle.

Customer Needs and Product Architecture

Customer satisfaction-voice of customer, types of customer needs, customer need model- organizing and prioritizing customer needs. Product architecture- architecture types-implication- establishing. Product modularity- types.

Product Development Economics

Elements of economic analysis- quantitative analysis- qualitative analysis. Economic Analysis Process- building of a base case financial model - sensitivity analysis - project trade-offs - influence of the qualitative factors on project success.

Cost Estimation

Estimation of labour and total costs for simple machining works such as turning, drilling, shaping, planning, milling, grinding. Estimation of cost for cast welded and forged components.

Work Study and Ergonomics

Method study-definition-objectives-motion economy principles-tools and techniques-applications work measurement – purpose - use - procedure techniques - standard time - Ergonomics-tools Principles – applications.

Text book

1	Karl T. Ulrich, Steven D. Eppinger, “Product design and development”, Tata Mc Graw-Hill edition, third edition, 2003.
2	Narang G.B.S, Kumar.V,” Production an Costing”, Khanna Publishers, Tenth edition, 2014

Reference(s) :

1	Kevin otto, Kristin wood, “Product design techniques in reverse engineering and new product development”, Pearson education, second edition, 2004.
2	Jones S.W., “Product Design and Process Selection”, Butterworth Publications, 1973
3	George E. Dieter, “Engineering Design – Materials and process approach”, Tata McGraw- Hill, 1991

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E14 - Artificial Intelligence and Expert Systems								
MCT								
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	To present the concepts of intelligent agents, searching, knowledge, reasoning, planning, Learning and expert systems. To learn the applications of AI in Robot Vision and to make the students familiarize with different AI techniques.							
Course outcomes	1. To learn about the level of the model in design an AI system. 2. To know about the criteria for success and problem defining. 3. Acquire the knowledge about Representations and mappings. 4. Understanding of simple facts in logic and ISA relationships. 5. Study about planning and components of planning. 6. Acquire the knowledge about goal stack, nonlinear and hierarchical planning. 7. To know the various stages of robot vision. 8. Create the general idea on image processing. 9. To learn about the features of expert system. 10. To describe the expert system shells.							

Introduction to AI and Production Systems

Introduction to AI: Criteria for success – problem defining–production systems characteristics- Specialized system characteristics – Problem solving methods — Problem graphs, Matching and Indexing - Heuristic search techniques; Generate and Test, Hill Climbing, Best-First Search –Problem Reduction.

Knowledge Representation

Representations and mappings, approaches, issues, representing simple facts in logic, instance and ISA relationships, computable functions and predicates, resolution , natural deduction, procedural versus declarative knowledge, logic programming- Knowledge-based agents- The Wumpus World

Planning And Learning

Planning; components of planning system, goal stack planning, nonlinear planning, hierarchical planning, and Conditional Planning- Reactive systems. Learning- Rote learning, learning by taking advice, Explanation based learning, Formal learning theory, Genetic learning- Logical formulation of learning- Inductive learning.

AI In ROBOT VISION

Introduction – steering an automobile– two stages of robot vision– image processing; averaging, edge enhancement, combining edge enhancement with averaging, region finding- Scene analysis; interpreting lines and curves in the image, model- Based vision. Stereo vision and depth analysis.

Expert Systems

Definition – Features of an expert system – Organization – Characteristics – representing and using domain knowledge – Expert system – Architecture – Typical ES- MYCIN, PIP, INTERNIST, DART, XOON- Shells – Knowledge acquisition. Perception and action; real-time search, perception, action.

Text book

1	Elaine Rich, “Artificial Intelligence”, McGraw-Hill, Third edition, 2009.
2	Nils J. Nilsson, “Artificial Intelligence”, Morgan Kaufman publishers, 2007.

Reference(s) :

1	Charniac.E and M.C.Dermott., “Introduction to Artificial Intelligence”, Addison Wesley Publishing Company, 2002.
2	M. W. Richaugh, “Artificial Intelligence, A. Knowledge Based Approach”, PWS Rent Publishing Boston, 1998.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 HS 001 - Professional Ethics								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	‘3	0	0	45	3	50	50	100

Objectives	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 students 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

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, 2007.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E16 – Digital Signal Processing								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objectives	• Understand and analyze the characteristics of discrete signals and systems • Apply mathematical tools for signal / system analysis • Study concept, Design and implementation of digital filters • Learn the architecture and features of Programmable Digital Signal Processors.
Course outcomes	1. Learn the characteristics of discrete-time signals and systems 2. Analyze signal / system properties using mathematical tools 3. Analyze frequency of discrete and continuous time signals. 4. Learn the characteristics of LTI systems 5. Understand the concept of Discrete Fourier transform. 6. Apply FFT for computation of DFT, linear filtering and correlation 7. Design IIR filters 8. Design linear phase FIR filters 9. Learn the concepts of multi-rate signal processing 10. Discuss advanced features and architecture of generic P-DSP

Discrete Time Signals and Systems

Basic elements of digital signal Processing – Representation of a CT signal by samples – Sampling theorem - Concept of frequency in continuous time and discrete time signals - Discrete time signals - Discrete time systems - Analysis of Linear time invariant systems - Direct and Inverse Z transforms - Convolution and correlation – Properties of DT signals – Transformation of independent variable – Shifting, Scaling, folding.

Frequency Analysis of Signals and Systems

Frequency analysis of continuous time signals (Periodic and Aperiodic) - Frequency analysis of discrete time signals (Periodic and Aperiodic) - Frequency domain characteristics of LTI systems – Linear time Invariant systems as frequency selective filters.

Transforms and Computation

Discrete Fourier Transform - Properties of DFT - use of the DFT in linear filtering - Frequency analysis of signals using DFT. Computation: FFT Algorithms - radix 2 - Application of FFT Algorithms - Quantization error in FFT algorithm.

Design of Digital filters

Structures for the realization of Discrete Time Systems - Structure for FIR systems - Structure for IIR Systems - Representation of Numbers - Quantization of Filter Coefficients - Round Off Effects in Digital Filters. - Design of linear phase FIR filter using windows - Frequency sampling method - Design of Hilbert transformers - IIR filter design by approximation of derivatives - Impulse invariance - bilinear transformation - frequency transformations.

Programmable DSP

Concepts of multi-rate signal processing – Decimation and interpolation by integer factor – Sampling rate conversion – Introduction to DSP architecture - Von Neumann, Harvard, Modified Harvard architectures – MAC unit–Multiple ALUs Modified Bus structures and memory access schemes in P-DSP – Multiple access memory – Multi-ported memory – VLIW architecture –Pipelining – Special addressing modes

Text book

1	John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education, 2009, 4th Edition.
2	B.Venkataramani and M.Bhaskar, “Digital Signal Processors Architecture, Programming and Applications”,Tata McGraw Hill Publishing Company Limited, New Delhi, 2003,Second edition.

Reference(s) :

1	Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education, 2007, 2nd Edition.
2	Johny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education, 2013.
3	Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGrawHill, 2006, Third Edition.
4	Rabiner .L.R and Gold.C.B, “Theory and Applications of Digital Signal Processing”, Prentice Hall India, 2009.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E17 – Composite Materials								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	50	50	100

Objectives	To learn limitations of conventional materials, provide knowledge in various types of fiber and polymers; study the various manufacturing methods, mechanics and design of composite materials.
Course outcomes	The students can able to 1. Learn the characteristics & properties of composites. 2. Understand the limitations and advantages of composites 3. Study the different types of fibers and matrices. 4. Know the polymer matrix composites (PMC). 5. Understand the properties and applications of metal matrix composites (MMC). 6. Knowledge about properties & applications of ceramic matrix composites (CMC). 7. Study the different types of manufacturing methods. 8. Study about the manufacturing of ceramic matrix & metal matrix composites. 9. Learn about the types and properties of lamina. 10. Understand the different mechanical properties of composites.

Introduction

Definition of composite material – need for composites – general characteristics of composites – classification of composites – advantages and limitations.

Materials

Fibers – Types of fibers, Glass, Carbon, Aramid, Kevlar and natural fibers – Matrices: polymer, metal ceramic matrices – polymer matrix composites – thermoset polymers – coupling agents, fillers and additives.

Metal Matrix Composites (MMC) & Ceramic Matrix Composites (CMC)

Metals – inter metalics and alloys used for MMC and their properties – properties of metal matrix composites (MMC) – characteristics and applications of MMC – Classification of ceramics and their potential role as matrices – properties and application of CMC using fine ceramics, carbon, glass, cement and gypsum as matrices.

Manufacturing Methods

Fundamentals – hand layup & spray layup – bag moulding – compression moulding – injection moulding – resin injection – pultrusion – filament winding – other manufacturing processes for CMC & MMC – quality inspection and non-destructive testing.

Mechanics and Performance

Introduction to micro-mechanics – unidirectional lamina – bi directional lamina – laminates – types of laminates, symmetric laminate, anti symmetric laminate, balanced laminate, quasi-isotropic laminates, cross ply laminates, angle ply laminate – inter-laminar stresses – static mechanical properties – fatigue properties – impact properties – environmental effects – fracture mechanics and toughening mechanisms, damage prediction, failure modes.

Text book

1	P.K.Mallick, “Fiber-reinforced composite: Materials, Manufacturing and Design”, 3rd Edition, CRC press, Nov 2007, ISBN : 0849342058
2	Ronald F Gibson, “Principles of Composite Material Mechanics”, second edition, CRC press, Taylor & Francis group, 2007

Reference(s) :

1	Michael W Hyer, “Stress Analysis of Fiber – Reinforced Composite Materials”, DEStech Publications, Inc. 2008, ISBN: 193207886X
2	Bhagwan.D. Agarwal, Lawrence.J.Broutman and K.Chandrasekara , “Analysis and Performance of Fiber Composites”, John Wiley and Sons,3rd Edition, 2006, ISBN: 0471268917
3	F.Matthews & R.Rawlings, “Composite Materials, Engineering and Science”, Woodhead Publishing, New edition, 1999, ISBN:1855734737

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E18 – 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
VI	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, Second Edition, 2013.

Reference(s) :

1. Herbert Schildt, “ The Complete Reference C++”, Fourth Edition, McGraw-Hill Education, 2013.
2. BjarneStroustrup, “The C++ programming language”, Addison Wesley, 2013.
3. Venugopal K.R., Rajkumar Buyya, "Mastering C++", Second Edition,McGraw-Hill Education, 2013.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E21 – Refrigeration and Air-conditioning								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100
Objectives	The course imparts knowledge in thermodynamics concepts in the analysis of refrigeration cycles and the course also create awareness on psychrometry process and parameters to be considered for designing Refrigeration & Air-conditioning systems.							
Course outcomes	At the end of the semester student will able to 1. Interpret the thermodynamics concepts pertaining to refrigeration cycles. 2. Relate multistage and multiple evaporator systems in refrigeration cycles. 3. Identify refrigeration components and refrigerants. 4. Associate selection, testing, charging and application of refrigeration units. 5. Analyze the psychrometric processes and charts. 6. Determines comfort charts and factors governing design conditions. 7. Compare and classify air conditioning equipments. 8. Summarize the application of air conditioning system. 9. Identify the type of load design and calculates the load for cooling space. 10. Determines the external and internal parameters to estimate total cooling load.							

Refrigeration Cycle

Thermodynamic principles of refrigeration. Concept of Air refrigeration system. Vapour compression refrigeration cycle - use of P-H charts - multistage and multiple evaporator systems –cascade system - COP comparison. Vapour absorption refrigeration system. Ammonia water and Lithium Bromide water systems. Steam jet refrigeration system.

Refrigerants and System Components

Compressors - reciprocating & rotary (elementary treatment.) - Condensers - evaporators - Refrigerants - properties - selection of refrigerants, Alternate Refrigerants, Refrigeration plant controls – testing and charging of refrigeration units. Applications to refrigeration systems – ice plant – food storage plants - milk -chilling plants – refrigerated cargo ships.

Psychrometry

Psychrometric processes- use of psychrometric charts - Grand and Room Sensible Heat Factors – bypass factor - requirements of comfort air conditioning - comfort charts - factors governing optimum effective temperature, recommended design conditions and ventilation standards.

Air Conditioning

Air conditioning equipments – air cleaning and air filters - humidifiers - dehumidifiers - air washers – condenser– cooling tower and spray ponds - elementary treatment of duct design – air distribution system. Thermal insulation of air conditioning systems. - Applications: car, industry, stores, and public buildings, food processing and intelligent air conditioner .

Cooling Load Calculations

Types of load - design of space cooling load - heat transmission through building. Solar radiation - infiltration - internal heat sources (sensible and latent) - outside air and fresh air load – estimation of total load - Domestic, commercial and industrial systems - central air conditioning systems.

Text book

1	Arora. C.P., "Refrigeration and Air Conditioning", Tata McGraw-Hill, New Delhi, Third Edition, 2010.
2	R.S.Khurmi & J.K.Gupta, “A textbook of Refrigeration and Air-conditioning”, S.Chand &Company, New Delhi, 2003.

Reference(s) :

1	Jordon and Prister, “Refrigeration and Air Conditioning”, Prentice Hall of India PVT Ltd., New Delhi, 1985.
2	Stoecker N.F and Jones, "Refrigeration and Air Conditioning", TMH, New Delhi, 1981.
3	Roy.J Dossat, “Principles of Refrigeration”, Pearson Education 1997.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E22 Rapid Prototyping								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VII		3	0	0	45	3	50	50	100
Objectives	To understand the various rapid prototyping and tooling principles, process, applications and its software's.							
Course outcomes	At the end of the semester student will able to 1. Understand the need, history, growth and classification of RP system. 2. Understand the Principle, process parameters, applications of SLA and SLS. 3. Ability to learn the path generation of FDM. 4. Ability to learn the SGC process and applications. 5. Understand the different LOM materials, Concept modelers, 3 D Printers. 6. Understand the LENS principle and applications. 7. Ability to use the direct metals for rapid tooling. 8. Ability to sand casting tooling and laminate tooling. 9. Understand the RP software's, rapid manufacturing optimization. 10. Understand the allied process of rapid prototyping.							

Introduction and Stereolithography Systems

Need for the compression in product development - History of RP systems - Survey of applications - Growth of RP industry and classification of RP systems.Laser- Stereolithography (SLA) Systems - Principle - Process parameters - Process details - Data preparation - Data files and Machine details - Applications. Selective Laser Sintering (SLS)- Types of machines - Principle of operation – Process parameters - Data preparation for SLS – Applications- Metal injection moulding.

Fusion Deposition Modeling (FDM)

FDM and Solid Ground Curing (SGC) - Principle of operation - Machine details - Process parameters - Path generation- applications.

Laminated Object Manufacturing (LOM)

Principle and applications of LOM, Concept Modelers, Thermo jet printer - Sander's model market - 3D printer - Genisys Xs printer – JP system 5 - Object Quadra System-Laser Engineered Net Shaping (LENS)**,**4D printer using shape memory alloy

Rapid Tooling

Indirect Rapid Tooling - Silicone rubber tooling - Aluminum filled epoxy tooling - Spray metal tooling-Direct Rapid Tooling - Direct AIM - Quick cast process - Copper polyamide – Rapid Tool – DMILS – ProMetal - Sand casting tooling - Laminate tooling - Soft tooling versus hard tooling.

Software for Rapid Prototyping

STL files - Overview of Solid view - Magics, mimics, Magics communicator, Internet based soft wares - Collaboration tools - Rapid Manufacturing Process Optimization - Factors influencing accuracy - Data preparation errors - Part building errors - Errors in finishing - Influence of part build orientation. Allied Processes - Vacuum Casting - Surface Digitizing - Surface Generation from point cloud –Surface modification and data transfer to solid models- Applications: medical and automotive fields.

Text book

1	C.K.Chua, K.F. Leong and C.S.Lim "Rapid prototyping: Principles and Applications", 3rd Edition, World Scientific Publishinf Co. Pvt. Ltd. 2010.
2	Duc Pham, S.S. Dimov, "Rapid Manufacturing: The Technologies and Applications of Rapid Prototyping and Rapid Tooling", London Springer, 2012.

Reference(s) :

1.	Terry Wohlers, "Wohlers Report ", Wohlers Associates, 2006.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E23 – Design of Transmission Systems								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	• To gain knowledge on the principles and procedure for the design of power Transmission components. • To understand the standard procedure available for Design of Transmission systems. • To learn to use standard data and catalogues.
Course outcomes	At the end of the semester student will able to 1. Select, design and analyze the belt drives. 2. Design and analyze chain drive systems. 3. Design of spur gears based on Lewis and Buckingham equation and gear life. 4. Design of helical gears based on Lewis and Buckingham equation and gear life. 5. Design of bevel gears based on Lewis and Buckingham equation and gear life. 6. Design of worm gears based on Lewis and Buckingham equation and gear life. 7. Design and analyze the multispeed gear box. 8. Design of cam drives. 9. Design and analyze different types of clutches. 10. Design and analyze different types of brakes

Design Of Flexible Elements

Design of Flat belts and pulleys – Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprocket- recirculating ball design.

Spur Gears and Parallel Axis Helical Gears

Speed ratios and number of teeth-Force analysis -Tooth stresses – Dynamic effects – Fatigue strength – Factor of safety – Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears- herringbone gears.

Bevel, Worm and Cross Helical Gears

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Worm Gear: Merits and demerits- terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

Gear Boxes

Geometric progression – Standard step ratio – Ray diagram, kinematics layout -Design of sliding mesh gear box – Design of multi speed gear box for machine tool applications – Constant mesh gear box – Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications.

CAMS, Clutches and Brakes

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches- Electromagnetic clutches. Band and Block brakes – external shoe brakes – Internal expanding shoe brake- disc brake.

Text book

1	Bhandari V, “Design of Machine Elements”, 3rd Edition, Tata McGraw-Hill Book Co, 2010.
2	Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill, 2008.

Reference(s) :

1	Sundararajamoorthy T. V, Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2003
2	Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000.
3	C.S.Sharma, Kamlesh Purohit, “Design of Machine Elements”, Prentice Hall of India, Pvt. Ltd., 2003
4	Gitin Maitra, L. Prasad “Hand book of Mechanical Design”, 2nd Edition, Tata McGraw-Hill, 2001
5	Alfred Hall, Halowenko, A and Laughlin, H., “Machine Design”, Tata McGraw-Hill BookCo.(Schaum"s Outline), 2010

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E24 -Fuzzy Logic and Neural Networks								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	The main objective of this course is to provide students with an understanding of the fundamental theory of neural networks and fuzzy systems. The objective is intended for students to apply neural networks and fuzzy systems to model and solve complicated practical problems such as recognition.
Course outcomes	At the end of the semester, the student will be able to 1. Learn the concept of artificial neural networks and its topologies 2. Practice the different neural networks and its learning methods 3. Illustrate the concepts of feed forward neural networks 4. Learn concepts about Recurrent neural networks. 5. Train the machines using unsupervised learning. 6. Practice the learning strategies of Self Organizing Networks 7. Learn knowledge about fuzzy set theory. 8. Apply the rules of fuzzy logic for fuzzy control 9. Develop the neuro fuzzy controller for direct drive motor and flexible robots 10. Implement neural networks and fuzzy systems to solve practical problems

Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate and Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments.

Feed forward and Recurrent Neural Networks

Feed forward networks: Multilayer Perceptron – Back Propagation learning algorithm – Universal function approximation – Associative memory: auto association, heteroassociation, recall and cross talk recurrent neural networks: Linear auto associator – Bi-directional associative memory – Hopfield neural network –BPN Traveling Salesman Problem.

Unsupervised Learning and Self Organizing Networks

Competitive learning neural networks – Max net – Mexican hat – Hamming net – Kohenen Self organizing Feature Map – Counter propagation – Learning Vector Quantization – Adaptive Resonance Theory–Learning strategies of neural networks in image processing, signal processing, modeling and control in robotics.

Fuzzy Logic System Components

Basic concepts of Fuzzy logic–Fuzzy vs Crisp set– Linguistic variables–membership functions–operations of Fuzzy sets–Fuzzy if-then rules– Variables inference techniques– Defuzzification techniques–basic Fuzzy interference algorithm– Fuzzy system design implementation–useful tools supporting design.

Applications

Genetic algorithm: Introduction, Basic operators, Simple GA–Hybrid System-Neuro fuzzy system Application: Control of direct drive motor-Genetic Fuzzy Systems: Concept, Application: Control of flexible Robots–Introduction to MATLAB Tool boxes for Fuzzy logic and Neural Network- Bio fuzzy.

Text book

1.	Simon Haykins, Neural Networks, 2nd edition, Prentice Hall of India Private Ltd, 2013.
2.	James A Freeman and David M. Skapura, 'Neural Networks: Algorithms, Applications, and Programming Techniques', Pearson Education, 2013.
3.	S. N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", Wiley India(p) Ltd, First Edition, 2008.

Reference(s) :

1	Melanie Mitchell, An Introduction to Genetic Algorithms', 2nd edition, MIT, 2012.
2	David E.Goldberg, 'Genetic Algorithms in Search, Optimization and Machine Learning', Pearson Education, 2013.
3	Bart Kosko, "Neural networks and Fuzzy systems", Tata Mcgraw Hill, 2007.
4	Timothy J.Ross, "Fuzzy logic with Engineering Applications", Mc Graw Hill, Newyork, 2006

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E25 – Adaptive Control in Mechatronics System								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To study the definition of adaptive control and Mechatronics system and methods of adaptation.
Course outcomes	At the end of the course, the students will be able to 1. Understand about the basic concept of adaptive control system 2. Design gradient and normalized algorithm 3. Learn about convergence propertites 4. Acquire the knowledge of direct adaptive control 5. Acquaintance with popov lemma , passivity theory 6. Design and develop direct model reference adaptive control system. 7. Understand the concept of pole placement, model reference , predictive controls 8. Acquire the knowledge about singularity regions. 9. Acquire the knowledge about persistency of excitation conditions 10. Acquire the knowledge about robustness and disturbance rejection

INTRODUCTION

Adaptive control - Basic approach and applications - Error analysis: linear systems - Gradient and normalised gradient algorithms - Convergence properties

DIRECT ADAPTIVE CONTROL

Linear error equations with dynamics. Gradient and pseudo-gradient algorithms. Positive real transfer functions. Kalman-Yacubovitch-Popov lemma. Passivity theory. Direct model reference adaptive control. Stability proofs.

INDIRECT ADAPTIVE CONTROL

Pole placement control. Model reference control. Predictive control. Indirect adaptation. Singularity regions.

PARAMETER CONVERGENCE

Persistency of excitation conditions. Generalised harmonic analysis and sufficient richness conditions. Averaging methods of approximation and analysis

ROBUSTNESS AND DISTURBANCE REJECTION

Mechanisms of instability. Methods to improve robustness. Averaging analysis and tuned values, Adaptive internal model principle. Integral control and adaptive bias cancellation. Periodic disturbances

Text book

1	S. Sastry and M. Bodson, Adaptive Control: Stability, Convergence, and Robustness, Prentice-Hall, 2011..

Reference(s) :

1	K.J. Astrom and B. Wittenmark, Adaptive Control, Addison-Wesley, 2nd edition, 2008..
2	G.C. Goodwin and K.S. Sin, Adaptive Filtering, Prediction, and Control, Prentice-Hall, 2002
3	P.A. Ioannou & J. Sun, Robust Adaptive Control, Prentice Hall, Upper Saddle River, NJ, 2010.
4	Gopal M. “Control System Principles and Design”, 3rd Edition ,Tata McGraw-Hill, New delhi,2008
5	P.E. Wellstead & M.B. Zarrop, Self-Tuning Systems: Control and Signal Processing, J. Wiley & Sons, Chichester, England, 2010.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40MCE26 – Nano Technology								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To understand the fundamentals of Nanotechnology, types of nanomaterials, various synthesis, characterization techniques and its applications.
Course outcomes	At the end of the semester student will able to 1. Understand the scientific revolutions and trends in nano technology. 2. Familiarize the fundamentals and basic concepts. 3. Know the various classes of advanced materials. 4. Interpret new classes nano materials for industrial applications. 5. Know about the synthesis of nano materials with different chemical methods. 6. Know about the synthesis of nano materials with different physical methods 7. Recognize the microscopic techniques in nanomaterial characterization. 8. Identify the types of spectroscopic characterization techniques. 9. Acquire knowledge on nano materials in energy storage devices. 10. Understand the properties and applications of nano bio-materials.

Over View of Nanotechnology

Introduction – Scientific revolutions –Time and length scale in structures – Definition of a nanosystem – Dimensionality and size dependent phenomena – Surface to volume ratio -Fraction of surface atoms – Surface energy and surface stress- surface defects-Properties at nanoscale (optical, mechanical, electronic and magnetic).

Different Classes of Nanomaterials

Classification based on dimensionality-Quantum Dots, Wells and Wires- Carbon based nanomaterials bucky balls, nanotubes, graphene) – Metal based nanomaterials (nanogold, nanosilver and metal oxides) – Nanocomposites- Nanopolymers – Nanoglasses –Nano ceramics – Biological nanomaterials.

Synthesis of Nanomaterials

Chemical Methods: Metal nanocrystals by Reduction – Solvo thermal Synthesis – Photochemical Synthesis – Sono chemical Routes- Chemical Vapor Deposition (CVD) – Metal Oxide – Chemical Vapor Deposition (MOCVD). Physical Methods: Ball Milling – Electro deposition – Spray Pyrolysis – Flame Pyrolysis – DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).

Characterization of Nano Materials

Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, confocal LASER scanning microscopy - transmission electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

Applications

Solar energy conversion and catalysis – Molecular electronics and printed electronics – Nanoelectronics – Polymers with a special architecture – Liquid crystalline systems – Linear and nonlinear optical and electro – optical properties, Applications in displays and other devices – Nanomaterials for data storage – Photonics, Plasmonics – Chemical and biosensors -Nanomedicine and Nanobiotechnology – Nanotoxicology challenges.

Text book

1	Pradeep T., “A Textbook of Nanoscience and Nanotechnology”, Tata McGraw Hill Education Pvt. Ltd., 2012.
2	Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press, 2002.

Reference(s) :

1	Nabok A., “Organic and Inorganic Nanostructures”, Artech House, 2005.
2	Dupas C., Houdy P., Lahmani M., “Nanoscience: Nanotechnologies and Nanophysics”, Springer-Verlag Berlin Heidelberg, 2007.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E27 IC Engines								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To impart the knowledge on working process of spark ignition and compression ignition engines, Automobile pollution and its control, Pollution norms, Recent trends in I.C engines like lean burn engines, stratified charge engines, homogeneous charge ignition, plasma ignition and engine combustion.
Course outcomes	At the end of the course, the student will be able to 1. Understand the engine function, performance, and design methodology. 2. Identify the advantages and disadvantages of the operation and efficiency of internal combustion engines. 3. Knowledge of spark ignition engines and its combustion. 4. Identifying the flame propagation, flame speed, pressure rise and types of combustion chamber 5. Discuss about the compression ignition engines. 6. Acquaintance of combustion stages in compression ignition engines. 7. Knowledge of in-depth analysis of the combustion process, predict concentrations of primary exhaust pollutants 8. Identify the different emissions and its controlling methods 9. Knowledge of recent trends in engines and vehicles. 10. Understand the working principle of lean burn engines and stratified engines

Fuel Air Cycle and Their Analysis

Significance –Composition of cylinder gases - Variables of specific heat – Dissociation. Effect of operating variables: Compression ratio, fuel air ratio. Comparison of fuel air cycle and actual cycles - Time loss factor - Heat loss factor - Exhaust blow down - Valve timing diagram – Port timing diagram - Losses due to rubbing friction. (Qualitative treatment only)- Bio fuel.

Combustion in SI Engines

Homogeneous mixture - Stages of combustion, Flame propagation, factors influencing the flame speed, rate of pressure rise, abnormal combustion. Phenomena of knock. Engine variable affecting knocks, Combustion chambers types.

Combustion in CI Engines

Heterogeneous mixture – Stages of combustion – Factors affecting delay period – Phenomena of diesel knock – Comparison of knock in SI and CI engines –Combustion chamber: Direct and Indirect injection engines .

Pollution and Driving Cycle

Air pollution – Major exhaust emissions and its effect —Formation of NOx, HC, CO,PM &smoke and method of controlling – Particulate trap. EGR technology, Driving cycles: Japanese driving cycles, European driving cycle ,US driving cycle Indian driving cycle, Euro I & VI norms, BS norms.

Recent Trends

Lean burn engines – Stratified charge engines – Homogeneous charge compression ignition engines –Concept of Plasma Ignition , Hybrid Electrical vehicle . Engine systems, Flexible fuel vehicle, Variable compression ratio engine, Variable valve timing engine ,Multiple spark engine .

Text book

1.	V.Ganesan, “Internal Combustion Engines”, Fourth Edition, Tata McGraw Hill, 2012.
2	K.K.Ramalingam “Internal Combustion Engines Theory and Practice”, Scitech Publications (India) Pvt. Ltd., Chennai, 2004.

Reference(s) :

1	Rowland S.Benson and N.D.Whitehouse,"Internal combustion Engines", Vol.I and II, Pergamon Press, 1999.
2	Duffy Smith, “Auto fuel Systems", The Good Heart Willox Company, Inc., 2000
3	John B. Heywood, “Internal Combustion Engine Fundamentals", McGraw Hill, 1988.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40MCE28 E-commerce and strategic IT								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To enable learners to understand the Electronic commerce in business, payments and in security.
Course outcomes	At the end of the course, the students will be able to, 1. Study the basic concepts of E-commerce, physical commerce and its advantages. 2. Obtain the knowledge of different business models in E-commerce. 3. Acquire the knowledge of world wide web, internet and its protocols. 4. Study the basic concepts of FTP, intranet and extranet. 5. Gain the knowledge of E-payments in E-commerce. 6. Understand the characteristics of payment systems and its advantages. 7. Study the basic concepts of consumer and business oriented ecommerce. 8. Acquire the knowledge of web auctions and portals. 9. Understand the legal, ethical and privacy issues. 10. Acquire the knowledge of taxation and encryption policies.

E- Commerce

Introduction - objectives - importance, E-trade - process - E-business and its activities - E-business models - role of Internet in E- commerce, advantages and disadvantages of E-commerce network.

Technology Infrastructure

Internet and world wide web - common gateway interface - internet protocols - FTP - intranet and extranet - web server hardware and software - TCP/IP reference model - domain name server and internet industry structure.

E-Payment Systems

Introduction - types - E-payment process - participants of E-payment system - components of an effective E-payment system - economic implications - advantages - issues.

Business Applications

Consumer oriented E-commerce - E-tailing and models - marketing on web advertising - e-mail marketing - business oriented E-commerce - E-government - EDI on the internet - web auctions - virtual communities and web portals.

Legal and Privacy Issues

Legal framework for E-commerce - net threats - E-security protection - cyber laws - aims - salient features - taxation issues - cyber crimes - categories - ethical and intellectual property issues in E-commerce Technologies.

Text book

1	Paul May, “Business of E-commerce”, Cambridge university, New York, 2014.
2	Gary P. Schneider, “Electronic commerce, Thomson course technology”, Fourth annual edition, 2015.

Reference(s) :

1	Bharat Bhasker, “Electronic Commerce – Frame work technologies and Applications”, 3rd Edition. Tata McGrawHill Publications, 2014.
2	Kamlesh K.Bajaj and Debjani Nag, “E-commerce- the cutting edge of Business”, Tata McGraw Hill Publications, 2015.
3	Efraim Turban et al,” Electronic Commerce - A managerial perspective”, Pearson Education Asia, 2015.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E31 - Digital Image Processing								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To learn and understand the fundamentals of digital image processing and various image transforms, image enhancement techniques, image restoration techniques and methods, image compression and image segmentation used in digital image processing.
Course outcomes	At the end of the course, the students will be able to 1. Explain the basic concept of digital image processing and fundamental techniques. 2. Explain the basic concepts of two dimensional signal acquisition, sampling, and quantization. 3. Demonstrate understanding of spatial filtering techniques, including linear and nonlinear methods. 4. Demonstrate understanding of 2D Fourier transform concepts, including the 2D DFT and FFT, and their use in frequency domain filtering. 5. Demonstrate understanding of the Human Visual System (HVS) and its applications. 6. Demonstrate understanding of the fundamental image enhancement algorithms. 7. Describe and illustrate the basics of image segmentation and segmentation techniques. 8. Explain the concept of image compression and need for image compression coding and their types. 9. Demonstrate programming skills in digital image processing and its related problems 10. Gain experience in applying image processing algorithms to real problems.

Fundamentals of Digital Image and Transforms

Elements of digital image processing systems - Visual perception - Brightness, Contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD - properties of transforms.

Image Enhancement

Spatial domain enhancement - gray level transformations - Histogram equalization and specification techniques - Image averaging - Spatial filtering - Median, Geometric mean, Harmonic mean, Contra-harmonic mean filters, Homomorphic filtering - Color image enhancement.

Image Restoration

Image Restoration - Degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration - Inverse filtering - Wiener filtering - Geometric transformations - Spatial transformations.

Image Segmentation

Edge detection: Point-line edge detection - Edge linking via Hough transform - Thresholding - Region based segmentation - Region growing - Region splitting and Merging - Segmentation by morphological watersheds - regional descriptors - simple descriptors - texture.

Image Compression

Need for data compression, Huffman coding - Error-free compression - block coding, constant area coding, variable length coding - run length encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Text book

1	Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Second Edition, 2012.
2	Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice hall publication, 2013.

Reference(s) :

1	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 3rd edition 2010.
2	William K. Pratt, 'Digital Image Processing', John Wiley, New York, 2010.
3	Milan Sonka et al, 'Image Processing, Analysis and Machine Vision', Brookes/Cole, Vikas Publishing House, 4th edition, 2014.
4	D.E.Dudgeon and RM. Mersereau, 'Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 2007.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E32 – Statistical Quality Control								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To solve quality-related problems using various statistical quality control tools and techniques, as well as sampling plans.
Course outcomes	At the end of the semester student will able to 1. Describe the concepts of quality, quality assurance and quality planning. 2. Understand mean, variance and ratios of variances. 3. Understand the sampling and size, 4. Understand the testing of hypothesis and distribution. 5. Construct the control charts for variables X bar and R charts. 6. Construct the control charts for attributes variables P chart, R chart and u chart. 7. To understand about process capability and its analysis. 8. To understand about process capability performance. 9. Acceptance Sampling Operating Characteristic (OC) Curves 10. Producer's risk and consumer's risk – AQL, LTPD, AOQL concepts.

Introduction

Quality definitions - Quality Dimensions – Quality control – Quality Assurance – Quality planning - Quality costs – Economics of quality – Quality loss function – Mean, variance, differences of means, ratio of variances.

Statistical Inferences on Quality

Sampling theory and testing of Hypothesis – Population and Sample – influence of sample size – Random sampling – Confidence intervals – choice of sample size for estimation – Testing of hypothesis for large and small samples, testing of hypothesis for mean, difference between means – F distribution – C-distribution.

Control charts

Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables X bar and R chart and attributes P, nP, C, and u charts. Demerit chart – State of control and process out of control identification in charts.

Statistical analysis of Process Capability

Introduction -Process capability analysis using probability plot – Normality and process capability ratio –– process capability towards process improvement- performance of process capability – steps for analysis of process capability- Pareto analysis – Cause and effect diagram.

Acceptance Sampling

Acceptance Sampling fundamental – need, types– sampling plans for attributes, simple, double, multiple and sequential, sampling plans for variables, – OC curves - Producer's risk and consumer's risk – AQL, LTPD, AOQL concepts.

Text book

1	Douglas C. Montgomery "Introduction to Statistical Quality Control",6th Edition John Wiley and Sons, 2009.

Reference(s) :

1	Eugene L.Grant and Richard S. leavwnworth " Statistical Quality Control", 7th Edition. McGraw hill,2006.
2	Gupta R.C., "Statistical Quality Control", Khanna Publishers, 8th Edition, 2008
3	Amata Mitra "Fundamentals of Quality Control and improvement" Pearson Education, 2002.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E33 VLSI Design								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To learn the CMOS process technology, CMOS circuits, chip level testing and HDL.
Course outcomes	At the end of the semester student will able to 1. Understand the rapid advances in CMOS Technology. 2. Analyse the performance issues in circuit layout. 3. Draw the equivalent circuits of MOS based Analog VLSI and analyze their performance. 4. Analyse the merits of circuits according to the technology and applications change. 5. Understand Full Custom Design Flow and Tool used 6. Understand the concepts of Physical Design Process such as partitioning, Floorplanning, Placement and Routing. 7. Apply the concepts in testing which can help them design a better yield in IC design. 8. Analyse the various test generation methods for CMOS circuits. 9. Develop the skills to design analog VLSI circuits for a given specification. 10. Understand the basic concepts of verilog HDL

CMOS Processing Technology

An overview of Silicon semiconductor technology - Basic CMOS technology: n well, p well, Twin-Tub and SOI - CMOS Process Enhancements: Interconnects - Circuit Elements: Resistors, capacitors, Electrically alterable ROMs and Bipolar transistors - Layout Design Rules and Latch up prevention.

MOS Transistor

nMOS, pMOS Enhancement transistor, Threshold voltage, Body effect - MOS device design equations: channel length modulation, Mobility variation - MOS models: small signal AC characteristics - Complementary CMOS inverter DC characteristics, Noise Margin, Rise time, fall time, power dissipation - Transmission gate and tri-state inverter

CMOS Design Methods

Design strategies: structural design strategies, hierarchy, regularity, modularity, locality - CMOS Chip Design Options: programmable logic, programmable logic structures, reprogrammable gate arrays, XILINX programmable gate array, sea-of-gate and gate array design, standard-cell design, full-custom design, symbolic layout, sticks layout - Placement routing, floor planning and design economics.

CMOS Testing

Need for testing - Manufacturing test principles: fault models, observability, controllability, fault coverage, automatic test pattern generation - Design strategies for test: Design for Testability and scan-based test techniques.

Specification Using Verilog HDL

Basic Concepts: Typical Design flow, design methodologies, modules and ports, instances, operators, strings, identifiers and key words, data types, arrays memories parameters - Gate level modeling, Data flow modeling, and Behavior modeling - Procedural assignments, timing controls, conditional statements, multiway branching, loops, sequential and parallel block - tasks and function, examples: multiplexer and 4-bit counter.

Text book (s)

1.	Neil Weste and Kamran Eshrachian, CMOS VLSI Design: A Circuits and Systems Perspective, fourth edition, Addison Wesley, 2010
2.	Samir Palnitkar; Verilog HDL - Guide to Digital design and synthesis, third edition, Pearson Education, 2008.

Reference(s) :

1.	M.J.S.Smith : Application Specific integrated circuits, Pearson Education, 2004.
2.	Wayne Wolf, Modern VLSI Design, Pearson Education 2006.
3.	Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2008.
4.	J . Bhasker : Verilog HDL Primer, BSP, 2010.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E34 Design of Material Handling Equipments								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To impart students on the need, use, application and design of different material handling techniques, equipments and machines used in common use and in industrial sector.
Course outcomes	At the end of the course, the students will be able to 1. Describe importance and operational features of material handling equipment. 2. Compare and select proper material handling equipment for specific applications. 3. Able to design flexible hoisting appliances, pulleys, sprockets and drums. 4. Able to design various load handling attachments, arresting gear and brakes. 5. Knowledge on designing different types drives used in hoisting equipment. 6. Select the motor rating and determination of torque during transient motion in hoisting gears. 7. Understand specific requirements of conveyors systems and their applications. 8. Able to design various types of conveyors system. 9. Acquire the familiarity on designing the bucket elevators. 10. Knowledge on designing cage elevators, fork lift truck and escalators.

Materials Handling Equipment

Introduction - Intraplant transporting facilities - Types - Principle groups of material handling equipment - Choice of material handling equipment – types of material handling equipment – General characteristics of Hoisting machines, surface and overhead equipment- application- AGVs- ASRs.

Design of Hoist

Designing of hoisting elements: Welded and roller chains - Hemp and steel wire ropes - pulleys, pulley systems, sprockets and drums - Load handling attachments - Forged hooks and eye hooks - Crane grabs – Electric lifting magnets - Grabbing attachments – Ladles - Arresting gear and Brakes.

Hoisting Gear

Drives of Hoisting gear - Hand and power drives – Traveling gear - Rail traveling mechanism - Cantilever and monorail cranes – Trackless travelling mechanisms - Slewing, jib and luffing gear - Selecting the motor ratings - Cogwheel drive.

Conveyors

Conveyor types - Belt conveyor - Pneumatic conveyor - Screw conveyor - Apron conveyor - Vibratory conveyor – Design and applications.

Elevators

Bucket elevators - design - Loading and bucket arrangements - Cage elevators - Shaft way, guides, counter weights, hoisting machine, safety devices – Fork lift truck – Escalators.

Text book

1	Rudenko, N., “Materials handling equipment”, Peace publications, Mascow, 1964.
2	Spivakovsy, A.O and Dyachkov, V.K., “Conveying Machines”, Volumes I and II, MIR Publishers, 1985.

Reference(s) :

1	Alexandrov, M., “Materials Handling Equipments”, MIR Publishers, 1981.
2	Siddhartha Ray., “Introduction to material handling”, New age International, 2007.
3	Arora,.K.C and Vikas V. Shinde., “Aspects of Material handling”, First edition, Laxmi publications (P). Ltd, 2007.
4	Fayed,.M.E and Thomas S.Skoair, “Mechanical conveyors", Selection and operation”, First edition, CRC press,1996.
5	P.S.G. Tech, “Design Data Book”, Kalaikathir Achchagam, Coimbatore, 2011.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MCE 35 - Finite Element Analysis								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	To understand the principles involved in discretization and finite element approach and learn to form stiffness matrices and force vectors for simple elements.
Course outcomes	At the end of the course, the students will be able to 1. Explain the concept of finite element method and its applications. 2. Outline the various classical approaches to solve engineering problems. 3. Convert the continuous system into discredited FE model with elements and nodes. 4. Construct and solve the element equation for one dimensional structural and thermal problems. 5. Describe the concept of two dimensional meshing with the 2D triangular elements. 6. Derive the shape functions, global stiffness matrix for triangular element. 7. Solve the 2D problems with plane stress, plane strain and axisymmetric conditions. 8. Explain the concept of isoparametric element formulation and its applications. 9. Solve 2D problems using isoparametric quadrilateral element. 10. Implement the Gaussion quadrature expression for numerical integration.

Fundamental Concepts

Introduction to numerical method–Applications and advantages of FEM- The role of FEM in numerical simulation-Principle of minimum potential energy-Principle of virtual work– The variational method –Weighted Residual method – Solution of algebraic equations – Gaussian elimination method.

One – Dimensional Problems

Procedure of FEM- Finite element modeling –Element design- Discretisation – Coordinate system and shape functions – Strain - displacement relations and Stress - strain relations – Element stiffness matrices and force vectors – Assembly to global element equation – Boundary conditions – solution of primary and secondary variables- Applications to axial loadings of rods – Extension to plane trusses. Higher order elements- Shapes functions.

One Dimensional Beam and Scalar Variable Problems

One Dimensional beam element –Hermite shape function - Element stiffness matrices and force vectors - Problems. Applications to scalar variable problems - Element stiffness matrices and force vectors - Assembly to Global equations –boundary conditions – Solutions - heat transfer problems.

Two Dimensional Problems – Vector Variable Problems

CST and LST elements -Shapes functions – Strain Displacement matrix - Element stiffness matrices and force vectors for CST element - Plane Stress, Plane Strain and Axisymmetric problems.

Isoparametric Element Formulations

ISO parametric elements – four noded quadrilateral element – Serendipity element -Element shapes Functions – Jacobian matrix - Strain -Displacement matrix – Numerical Integration -Gaussian quadrature method.

Text book

1	Chandrupatla T.R. & Belegundu A.D., “Introduction to Finite Elements in Engineering”, Pearson Education 2002, 3rd Edition.
2	Chennakesava R.Alavala, “Finite element methods Basic concepts and applications”, PHI Pvt., Ltd., 2013.

Reference(s) :

1	Reddy J.N., “An Introduction to Finite Element Method”, Tata McGraw-Hill Publishing company Ltd., 2005
2	Daryl L.Logan ., “A First course in the Finite Element Method”, Fourth Edition, Cengage Learning, 2007
3	David V.Hutton, “Fundamentals of finite element analysis”, Tata McGraw-Hill Publishing company Ltd, 2012
4	Robert D.Cook., David.S, Malkucs Michael E Plesha, “Concepts and Applications of Finite Element Analysis” 4th Edition. Wiley, 2003.
5	Asghar Bhatti, “Fundamental Finite Element Analysis and Applications”, John Wiley & Sons Inc, 2005

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E36 - Medical Electronics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	50	50	100

Objectives	This course will cover various systems of the human physiology, signals of biological origin obtained from these systems, bio transducers, bio electrodes used to acquire such signals, and amplifiers for measuring biopotentials. Human assist devices and electrical safety of medical devices; measurements of the blood pressure, blood flow, respiratory system, clinical laboratory equipment and medical imaging techniques will also be discussed.
Course outcomes	At the end of the course, the students will be able to 1. Classify the different types of bio- potential electrodes, biological amplifiers and their functions. 2. Illustrate the different types of bio-potential recording methods and analyze the wave form characteristics. 3. Identify the function of bio-chemical electrodes and measure the different blood amalgamation. 4. Describe the non electrical parameter and measurements like blood flow, pressure, cardiac output, respiratory, temperature, pulse, blood cell counters. 5. Discuss the different types of pacemakers, defibrillators, heart lung machine and their functions. 6. Express the functions and importance of dialyser, ventilators and anesthetic machine. 7. Discuss the different techniques in electro surgery and safety methods. 8. Develop the knowledge about bio-telemetry principle and its importance. 9. Explain the recording methodologies of thermal images and different scanning techniques of human body. 10. Describe the different types of endoscopes, laser usage and cryogenic applications.

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, pO_2, pCO_2, $pHCO_3$, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

Human Assist Devices

Cardiac pacemakers, DC Debrillators, Dialyser, Heart Lung Machine, Artificial ventilators, Anesthetic Machine.

Physical Medicine and Bio-Telemetry

Diathermies- Short-wave, ultrasonic and microwave type and their applications, Medical stimulator, Telemetry principles, frequency selection, Bio-telemetry, tele-stimulation and tele-medicine, Electrical Safety.

Recent Trends in Medical Instrumentation

Thermography, endoscopy unit, Laser in medicine, cryogenic application, Basic ideas of CT scanner, MRI and ultrasonic scanner, Centralized patent monitoring system.

Text book(s)

1	Arumugam .M, “Bio Medical Instrumentation”, Anuradha agencies Pub., 2013.
2	Khandpur R.S., “Handbook of Bio-Medical instrumentation”, Tata McGraw-Hill Publishing Co Ltd., New Delhi, 2014.

Reference(s) :

1	Cromwell, Leslie, Weibell. Fred J. and Pfeiffer. Erich A., “Bio-Medical Instrumentation and Measurements”, Second Edition, Pearson Education, New Delhi, 2012.
2	Webster J., “Medical Instrumentation”, John Wiley & Sons, New York, 2012.
3	Anandanatarajan.R., “Biomedical Instrumentation and Measurements”, PHI Learning Private Limited, New Delhi ,2011.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E37 - IT Essentials								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VII		3	0	0	45	3	50	50	100
Objectives	• Understand the essential concepts of IT • Introduce the analysis of algorithms and object oriented concepts. • Infer web technologies and client server concepts								
Course outcomes	At the end of the course, the students will be able to 1. Outline the fundamental concepts of analysis of algorithms. 2. Apply the knowledge of various algorithmic techniques. 3. Appraise the basic and advanced object oriented concepts. 4. Demonstrate the concepts of object oriented design methodology. 5. Employ the knowledge of software development methodology and models. 6. Express the knowledge of software testing and software quality. 7. Identify the basic concepts of client server technologies. 8. Enumerate the knowledge of middleware technology and web technology. 9. Design the basic web applications. 10. .Interpret the basic concepts of User Interface Design.								

Analysis of Algorithms

Introduction of ADA – Code Tuning Techniques – Analysis of Algorithms – Analysis of Some Known Algorithms – Algorithmic Techniques – Linear search – Binary search – Bubble sort – Quick sort – Merge sort – Selection sort – Insertion sort – Intractable Problems.

Object Oriented Concepts

Introduction to Object oriented concepts – Advanced concepts in Object oriented technology – Relationship – Inheritance – Abstract classes – Polymorphism – Object oriented design methodology – Recent trends in OO Technology.

System Development Methodology

System Development Methodology – Evolution of Software – Software Development Models – Requirement Analysis and Design – Software Construction – Software Testing – Software Quality.

Client Server Concepts

Client server computing – Back Ground – Client Server Technologies – Middle ware technologies – Introduction to Web Technology.

Web Technologies & User Interface Design

The world wide web – Web Application – Security in Applications – Issues in web based application – Introduction to User interface Design (UID) – The elements of UID – UID Tips and techniques – Good Vs Bad - User Interface – Reports.

Text book (s) :

1.	Foundation Program Books Vol-2 and Vol-3, Infosys.

Reference(s) :

1.	Brad J.Cox, Andrew J.Novobilski, Object Oriented Programming – An evolutionary approach, Addison Wesley, 2009.
2.	Alfred V.Aho, John E.Hopcroft, Jeffrey D.Ullman, Design and Analysis of Computer Algorithms, Addison Wesley Publishing Co.,2005.
3.	Roger Pressman, Software Engineering-A Practitioner's approach, McGraw Hill, 7th Edition, 2009.
4.	Wilbert O.Galitz, Essential Guide to User Interface Design, John Wiley, 3rd Edition 2007.
5.	Alex Berson, Client Server Architecture, McGraw Hill International, 1996.
6.	Dromey R.G., How to solve it by Computers, PHI, 1994.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E38 – Wireless Sensors and Networks								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VII		3	0	0	45	3	50	50	100
Objectives	To familiarize the wireless communication principles and fundamentals, to understand Ad Hoc Wireless Networks, WWAN and the Universal Mobile Telecommunication System (UMTS) and sensors in networking.							
Course outcomes	At the end of the semester student will able to 1. Discuss the evolution of wireless communication 2. Study the Fundamentals of wireless communication 3. Describe the concept of topologies of wireless LAN 4. Understand the architecture of wireless LAN 5. Learn the concept of networking sensors 6. Develop the Routing concept for networking sensors 7. Implement Ad Hoc networks to solve the problems 8. Design routing protocol for adhoc networks 9. Learn the WPAN, Bluetooth and Radio Frequency Technology for wireless network 10. Learn the wireless geolocation technologies for wireless network							

Wireless Communication Principles and Fundamentals

Wireless propagation characteristics and modeling- Voice coding-Multiple access for wireless system-FDMA,TDMA,CDMA,CSMA-Performance increasing techniques- Ad Hoc and semi Ad Hoc concept-wireless services: circuit and packet mode

Wireless LAN

Wireless LAN application-concerns- Topologies-Physical layer-MAC layer- HYPER LAN 1 MAC sub layer, IEEE 802.11 MAC sub layer-IEEE 802.11a/ 802.11 b / 802.11g-.wireless ATM architecture. HYPER LAN 2 : ATM compatible WLAN

Networking Sensors

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

Ad Hoc Wireless Networks

Cellular and Ad Hoc Wireless networks – Applications- issues in Ad Hoc wireless networks-medium access sheme, Routing, multicasting, QoS, security, Energy management-Challenges in designing routing protocol for Ad Hoc networks

WPAN and Geolocation Systems

IEEE 802.15 WPAN, Home RF, Bluetooth, interface between Bluetooth and 802.11, wireless geolocation technologies for location detection

Text book:

1	P. Nicopolitidis, M.S.Obaidat, G.I.Papadimitriou, A.S. Pomportsis, Wireless Networks, Wiley & Sons, 2009.
2	Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley, 2012.

Reference(s) :

1	Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2014
2	Jochen Schiller, Mobile Communications, Person Education – 2008, 2nd Edn
3	X.Wang and H.V.Poor, Wireless Communication Systems, Pearson education, 2011
4	M.Mallick, Mobile and Wireless design essentials, Wiley Publishing Inc. 2012
5	Kaveh Pahlavan, Prashant Krishnamoorthy, Principles of Wireless Networks, - A united approach - Pearson Education, 2012.
6	Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2009.
7	Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2010

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E41- Entrepreneurship Development								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VIII		3	0	0	45	3	50	50	100
Objectives	This course provides an ample amount of understanding and scope of an entrepreneur, key areas of development, financial assistance provided by the institutions, methods of taxation and tax benefits, etc.							
Course outcomes	At the end of the semester student will able to 1. Identify the concept of entrepreneurship in economic growth. 2. Characterize the Factors Affecting Entrepreneurical Growth 3. Describe the Entrepreneurship Training types and its importance. 4. Identify and select a good business opportunity. 5. Explain the preparation of preliminary project reports. 6. Determine the sources of finance. 7. Describe the break even and network analysis of PERT/CPM. 8. Outline the concepts of growth strategies in small industries. 9. List out the causes and consequences, corrective measures related to entrepreneurship development. 10. Explain about the expansion, diversification, joint venture, merger and sub contracting.							

Introduction

Entrepreneur –Types of Entrepreneurs–Difference between Entrepreneur and Intrapreneur–Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurical Growth.

Entrepreneurship Training and Development

Major Motives Influencing an Entrepreneur–Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test–Stress management, Entrepreneurship Development Programs–Need, Objectives

Business Planning

Small Enterprises–Definition, Classification–Characteristics, Ownership Structures–Project Formulation–Steps involved in setting up a Business–identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment –Preparationof Preliminary Project Reports–Project Appraisal–Sources of Information–Classification of Needs and Agencies

Financing and Accounting

Need–Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM –Taxation–Income Tax, Excise Duty–Sales Tax.

Support to Entrepreneurs

Sickness in small Business–Concept, Magnitude, causes and consequences, Corrective Measures–Government Policy for Small Scale Enterprises–Growth Strategies in small industry –Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Text book :

1.	S.S.Khanka “Entrepreneurial Development” S.Chand & Co. Ltd. Ram Nagar New Delhi,2010.
2.	Hisrich R D and Peters M P, “Entrepreneurship” 5thEdition Tata McGraw-Hill, 2011.

Reference(s) :

1	Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi,2010.
2.	EDII Faulty and External Experts–A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development” Institute of India, Ahmadabad, 2010

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E42 Marketing Management								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	To understand the various processes involved in Marketing, Philosophy, Psychology of consumers, formulate the strategies for advertising, pricing and selling.
Course outcomes	At the end of the course, the student will be able to 1. Understand the process of marketing process. 2. Explain the various philosophies used in marketing. 3. Describe the buying behavior of consumers. 4. Enumerate the various segmentation of a market. 5. Discuss the various steps in pricing a product. 6. List the various pricing methods. 7. List the various components of marketing plan. 8. Discuss the importance of strategy formulation. 9. Explain the various sales promotion methods. 10. Describe the unique selling proposition in marketing management

Marketing Process

Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy

Buying Behaviour and Market Segmentation

Cultural, demographic factors, motives, types, buying decisions, segmentation factors- demographic –Psycho graphic and geographic segmentation, process, patterns.

Product Pricing and Marketing Research

Objectives, pricing, decisions and pricing methods, pricing management, Marketing Research: uses-process.

Marketing Planning and Strategy Formulation

Components of marketing plan-strategy formulations-marketing process, implementations, portfolio analysis, BCG, GEC grids.

Sales Promotion and Distribution

Introduction: characteristics, impact, goals, and sales promotions- point of purchase- unique selling proposition., wholesaling, retailing, channel design, logistics, and modern trends in retailing- E marketing.

Text book

1. Philip Kotler, “Marketing Management”, Pearson Education, New Delhi, 2011.

Reference(s) :

1. Govindarajan.M. “Industrial marketing management”, Vikas Publishing Pvt., Ltd., 2012
2. Green Paul.E.and Donald Tull, “Research for marketing decisions”, Prentice Hall of India, New Delhi , 2000.
3. Donald S. Tull and Hawkins, “Marketing Research”, Prentice Hall of Inida-1996.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E43 - Reliability and Quality Engineering								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	The course deals with quality concepts, principles, tools and statistical approach to achieve quality. The course also stresses importance of reliability and its significance at present industrial scenario.
Course outcomes	At the end of the course, The students will be able to 1. Summarize the concept and approaches of quality Engineering. 2. Understand the applications of various failures distributions. 3. Adopt suitable quality control techniques and important methods. 4. Apply quality control tools and charts like X bar and R charts, standard deviation charts, run up and run down ,process capability studies ,control charts for attributes etc. 5. Interpret the fundamentals of sampling. 6. Determine the attributes and variables pertaining to sampling procedure. 7. Synthesis data from reliability matrix. 8. Predict hazards rate using distribution function and system reliability. 9. Recognize reliability improvement, redundancy and allocation concepts in a system. 10. Formulate system effectiveness using maintainability, availability and reliability.

Introduction

Definition of Quality- Method of control, chance, causes, assignable causes, SQC benefits and limitations. Quality assurance, Quality management, quality control, quality circles, normal curve, measure of dispersion, Distributions: Binomial, Poisson, Geometric, Hyper geometric, Gamma distribution. Poisson as an approximation to the binomial, normal, approximation to the Binomial. Review of Probability theorems – Six sigma.

Theory Of Control Charts

Sample as an estimate of universal process control, control charts for variables – X bar and R charts, standard deviation charts, run up and run down ,process capability studies ,control charts for attributes ,fraction defective and number of defective charts, chart sensitivity, control charts for non conformities-C and U charts.

Acceptance Sampliing

Fundamental concepts and terms, OC curves, AQL, LTPD, AOQL sampling plans, Simple, double, multiple and sequential sampling plans, stratified sampling for variables, Dodge –Roming sampling plans, bulk sampling problem using Dodge –Roming and BIS code books – Case studies.

Reliability

Definition, mean fracture rate, mean time to failure, meantime between failure, hard rate, hazard models. Constant hazard, linearly increasing hazard, weibull model, system reliability, series, parallel, and mixed configuration, simple problems.

Reliability Improvement

Reliability improvement, redundancy, element, unit and stand by redundancy, reliability allocation for a series system, maintainability and availability, system down time, reliability and maintainability trade - off, simple problems.

Text book :

1.	Grantt, “Statistical Quality Control”, Mc Graw Hill, ISE.,1998
2.	Srinath L.S., “Concepts in Reliability Engineering”, East west Press Ltd., New Delhi, 1991.

Reference(s) :

1.	Jerry Banks, “Principles of Quality Control”, John Wiley, 1990
2.	Montgomery D.C., “Introduction to Statistical Quality Control”, John Wiley, 1994
3.	Gupta R.C., “Statistical Quality Control”, Khanna Publishers, 1998

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MCE44 – Intellectual Property Rights (IPR)								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	To understand the importance of IPR. To provide knowledge of different types of intellectual property. To learn various levels of policy. To get idea to file the patent applications.
Course outcomes	At the end of the course, the students will be able to 1. Acquire knowledge about the basic concepts of Invention and Creativity 2. Understand the theories related to Intellectual Property (IP) 3. Ability to predict the base factor for patents. 4. Gain the knowledge about Copyrights and related right 5. Demonstrate the usefulness of the International convention relating to Intellectual Property 6. Designing the steps for the Establishment of WIPO 7. Understand the consequences of Indian position with world trade organization and Strategies 8. Knowledge about types of Indian IPR legislations 9. Discuss about the patents and Intellectual Property audits 10. Know about the international development in trade secrets law.

Introduction to IPR

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – types of intellectual property rights -Movable Property - Immovable Property and - Intellectual Property.

Procedures

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

International IPR Conversion

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT) – TRIPS Agreement.

Act of India

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

New Development of Intellectual Property

New developments in trade mark law - copy right law - patent law - intellectual property audits. International overview on intellectual property - international trade mark law - copy right law - international patent law and international development in trade secrets law.

Text book (s) :

1.	Subbaram N.R. “Handbook of Indian Patent Law and Practice “,S.Viswanathan Printers and Publishers Pvt. Ltd., 2009.
2.	Intellectual property right, Deborah, E. Bouchoux, cengage learning.

Reference(s) :

1.	Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2.	Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000.
3.	www.ipmatters.net/features/000707_gibbs.html.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E45 Industrial Safety Engineering								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	The syllabus framed is to impart knowledge on safety engineering fundamentals, safety management, principles, and legislations. This course strives to foster the progress of safe operating practices within the industry.
Course outcomes	At the end of the course the student will be able to 1. Summarize the history, legal norms and regulation pertaining to safety. 2. Analyze the roles and responsibilities of safety organization. 3. Outline the theories of accident prevention. 4. Investigate Accidents, file document and report. 5. Follow safety norms adhering to engineering industry. 6. Practice essential Fire fighting and first aid services 7. Identify work exposure level and hazards at industries. 8. Scrutinize Occupational health and hygiene issues. 9. Review the factories act and rules. 10. Summarize the standards pertaining to occupational safety, health and environment

Safety Management

History and development of industrial safety-Formation of factories act and safety council-safety and productivity-safety policy-safety organization, safety committee, safety budget- safety training. Role of management and government in industrial safety.

Accident Prevention

Definition and theories-accident-injury- -near miss-theories and principles of accident causation-principle of accident prevention- unsafe act and conditions -cost of accidents-accident reporting and investigation – reportable and non reportable accidents.

Safety In Engineering Industries

Hazard, risk, general safety rules, Housekeeping – standard operating procedures - machine guarding - types and its application- benefits of good guarding systems. safety in welding and gas cutting - general safety consideration in material handling - manual handling - mechanical handling - Ergonomic consideration in material handling. Safety in use of electricity- Fire triangle - Classes of fire - Fire fighting equipments – First aid.

Occupational Health And Industrial Hygiene

Toxicity, TLV, REL, PEL, types of hazards- exposure, acute effect, chronic effect- occupational diseases, -control measures - Industrial hygiene -functional units and activities of occupational health services, pre-employment and post-employment medical examinations –exposure monitoring - stress, fatigue.

Safety Regulation And Certifications

Overview of Factories Act 1948 and Tamil Nadu Factories Rules 1950 – ISO 9001, ISO 14001, OHSAS 18001 and Integrated Management System- Different power plant safety.

Text book

1.	John V.Grimaldi and Rollin H.Simonds,Safety Management", All India Travelers Book Seller, Fifth Edition, New Delhi – 2001
2.	Heinrich, H.W., Industrial Accident Prevention, 5th edition,McGraw-Hill,California, 1980.

Reference(s) :

1.	L M Deshmukh , "Industrial Safety Management: Hazard Identification and Risk control", 6th Edition, Tata Mcgraw Hill,New Delhi, 2010
2.	Phillip E Hagan, John F.Montgometry, James T.O'Reilly "Accident Prevention Manual for business and Industry", 13th edition, National Safety Council, Chicago, 2009.
3.	"Occupational Safety Manual" BHEL, Trichy, 2010.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E46 - New and Renewable Energy Sources								
MCT								
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 impart the knowledge of future energy systems with a focus on promoting the use of renewable energy resources and technologies.
Course outcomes	At the end of the course, the student will be able to 1. Possess the knowledge of global energy resources. 2. Understand the concepts of Hydrogen energy storage and conversion techniques. 3. Recognize the concepts of solar energy collectors and the applications of solar energy. 4. Describe the working principle of solar power plant, photo voltaic conversion and solar cells. 5. List the contributions of tidal energy, wave energy, ocean thermal energy and geothermal energy in energy utilization. 6. Outline the working principle of open and closed ocean thermal energy conversion system and geothermal energy availability and limitation. 7. Categorize the availability and the conversion method of wind energy. 8. Explain the performance of wind energy conversion system's turbine and generators with environmental impacts. 9. Categorize the availability and the conversion method of biomass energy. 10. Choose the method of producing biogas, ethanol and bio diesel.

Solar Energy

Solar radiation - Availability- Measurement and estimation- Isotropic and an isotropic models - Introduction to solar collectors (liquid flat- Plate collector - Air heater and concentrating collector) and thermal storage - Steady state transient analysis - Photovoltaic solar cell - Hybrid systems - Thermal storage- Solar array and their characteristics evaluation – Solar distillation – Solar drying.

Wind Energy

Wind energy - General considerations - Wind Power plant design – Horizontal axis wind turbine - Vertical axis wind turbine - Rotor selection - Design considerations - Number of blades - Blade profile - Power regulation - Yaw system - Choice of power plant - Wind mapping and selection of location - Cost analysis and economics of systems utilizing renewable sources of energy.

Ocean Thermal Energy Conversion

Wave and Tidal energy - Availability - Geographical distribution - Power generation using OTEC - Wave and Tidal energy - Scope and economics - Geothermal energy - Availability - Limitations.

Hydrogen Energy

Electrolytic and thermo chemical hydrogen production – Metal hydrides and storage of hydrogen – Hydrogen energy conversion systems hybrid systems – Economics and technical feasibility- Applications of fuel cells.

New Energy Sources

Biofuels classification – Biomass production for energy forming – Energy through fermentation – Pyrolysis – Gasification and combustion - Aerobic and Anaerobic bio conversion process - Feed stock - Properties of bio-gas composition - Biogas plant design and operation - Alcoholic fermentation – Phase change materials.

Text book

1. G. S. Sawhney, " Non Conventional Resources of Energy", PHI Learning Pvt. Ltd.. 2012
2. Rai G.D, "Non conventional Energy sources", Khanna Publishers, New Delhi, 2010.

Reference(s) :

1. Bent Sorensen., "Renewable Energy", Academic Press, Elsevier, New Delhi, 2011.
2. Kothari.D.P, Singal.K.C and Rakeshranjan., "Renewable energy sources and emerging technologies", PHI learning Pvt Ltd, New Delhi,2011.
3. Tasneem abbasi and Abbasi.S.A, "Renewable energy sources", PHI learning Pvt Ltd, New Delhi, 2011.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E47 MEMS and NEMS								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	To impart the knowledge on MEMS & NEMS, micro fabrication techniques and applications to the design and manufacturing of a MEMS device, Nano electronics and their various applications.
Course outcomes	At the end of the course, the students will be able to, 1. Know the concepts in micro electro mechanical systems and understand the losses in miniaturization. 2. Understand the physics, materials, basic structures and properties of MEMS. 3. Fine tune their designs in to working MEMS devices. 4. Gain knowledge about the various micro fabrication techniques. 5. Recognize a fundamentals of micro system Packaging. 6. Know the overview of MEMS applications. 7. Outline the basic concept of NEMS. 8. Identify the assembly of Nano electronics. 9. Understand the architecture of MEMS and Nano Electronics. 10. Learn about the various application of NEMS.

Introduction to microsystem

Basics of MEMS-Microsystem and microelectronics-working and principle of MEMS-scaling loss in miniaturizations-materials for MEMS –Silicon as MEMS materials-Crystal structure-Silicon compounds-Quartz-Polymers for MEM-Properties of MEMS.

Mechanics for microsystem and fabrication techniques

Static bending of thin plates-Mechanical vibrations-thermo mechanics-Fracture mechanics-Finite element analysis- stress analysis. Fabrication technique- photo lithography-diffusion-oxidation-CVD-PVD-Etching process-bulk micromanufacturing-surface micromanufacturing-LIGA-SLIGA- Micro pumps.

Microsystem packaging and applications

Packaging techniques -die preparation –surface bonding-wire bonding-sealing-applications of micro system-automotive bio medical- aerospace and telecommunications field.

Nano electronics

Basics of nano electronics-Nano electronics with tunneling devices-super conducting devices-Molecular nanotechnology-Applications of MNT-Direct self-assembly-device assembly-Electrostatic self-assemblynano tubes-nano wire and carbon 60-Dielectrophoretic nano assembly.

Architecture and applications

Architecture of MEMS-Requirements of nano systems-Development of nano electronics and structuring-Application of NEMS-Deposition of coatings-Three dimensional materials-Dewatering.

Text book

1	Tai – Ran Hsu,"MEMS& Microsystems: Design and Manufacture ", Tata Mc Graw Hill, 2014.
2	Michael PycraftInrushes , "Nano Electro Mechanics in Engineering & biology '' ,CRC press New York,2011.
3	Goser.K ,Dienstuh .J , " Nano Electronics &Nanosystems '' , Springer International Edition, 2008.

Reference(s) :

1	Tai – Ran Hsu,"MEMS and Microsystems Design and Manufacture",Tata-McGrawHill, New Delhi, 2008.
2	Marc Madou, "Fundamentals of Microfabrication", CRC Press, New York, 2009.
3	Norio Taniguchi, "Nano Technology", Oxford University Press, New York, 2010.
4	Chang Liu, "Foundation Of MEMS", Pearson education india limited, 2006.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E48 Mechanical Vibration								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VIII		3	0	0	60	3	50	50	100
Objectives	To impart knowledge on mechanical vibrations of single, multiple degrees of freedom, continuous systems and various experimental methods of vibration analyses.							
Course outcomes	At the end of the semester student will able to 1. Understand the concept of single degree free, damped and forced vibration system. 2. Understand about different mathematical functions used for vibration system. 3. Ability to calculate spring, mass coupled system and two degree of freedom vibration. 4. Ability to calculate forced vibration system, vibration absorber and isolation. 5. Ability to analyses stiffness matrix, Eigen values, Eigen vectors and orthogonal properties. 6. Understand the modal analysis, matrix inversion and numerical methods for fundamental frequencies. 7. Acquaintance with wave equation and Euler equation for beams. 8. Ability to analyses the vibration strings, rods and plates. 9. Derive and analysis of various vibration measuring devices. 10. Understand the free and forced vibration tests.							

Fundamentals of Vibration

Introduction – Single degree freedom free vibration systems – Damped vibrations – Single degree freedom forced vibration with elastically coupled viscous dampers, Duhamel's Integral – Impulse Response function – Virtual work – Lagrange's equation-– Transient Vibration.

Two Degree-of-Freedom Systems

Free vibration of spring-coupled system – Mass coupled system – Vibration of two degree freedom system – Forced vibration – Vibration Absorber – Vibration isolation.

Multi Degree-of-Freedom Systems

Normal mode of vibration – Flexibility Matrix and Stiffness Matrix – Eigen values and Eigen vectors – orthogonal properties – Modal matrix - Modal Analysis – Forced Vibration by matrix inversion - Numerical methods for fundamental frequencies.

Vibration of Continuous Systems

Systems governed by wave equations – Euler Equation for Beams –— Vibration of strings – Vibration of rods – Vibration of plates.

Vibration Measurements and Analysis

Vibration instruments – Vibration exciters Measuring Devices – Analysis – Vibration Tests – Free and Forced Vibration tests- wear-fretting.

Text book

1	William Tyrrell Thomson and Marie Dillon Dahleh, "Theory of Vibration with Applications", 5th edition, Pearson New international, 2014.
2	Rao, S.S., "Mechanical Vibrations", 5th Edition, Addison Wesley Longman, New York, 2010.

Reference(s) :

1	D J Inman, "Engineering vibration" 4th edition, Pearson Education, 2014.
2	M P Norton and D.G. Karczub, "Fundamentals of noise and vibration analysis for engineers", Cambridge University, 2003.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E51 – Computer Integrated Manufacturing								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	To enlighten the basic concepts of group technology and computer aided process planning, computer aided planning and control, ways and means of computer monitoring and integrated manufacturing system.
Course outcomes	At the end of the semester student will able to 1. Identify the opportunities and problem in production systems. 2. Associate the production system with manufacturing operations. 3. Infer the concepts of group technology. 4. Interpret the functions of computer aided process planning. 5. Assess the types of the computer aided production planning. 6. Recognize automated production planning & control. 7. Summarize facts about computer aided production monitoring and control 8. Describe concepts of computer in quality control inspection & testing. 9. Apply the basic concepts of machine tools and computer control systems. 10. Analyze the concepts and techniques of FMS and integration of CIM.

Introduction

Objectives of a manufacturing system-identifying business opportunities and problems classification production systems-linking manufacturing strategy and systems analysis of manufacturing operations.

Group Technology and Computer Aided Process Planning

Part families-parts classification and coding - group technology machine cells benefits of group technology. Process planning function CAPP - Computer generated time standards.

Computer Aided Planning And Control

Production planning and control-cost planning and control-inventory management-Material requirements planning (MRP)-shop floor control-Factory data collection system-Automatic identification system-barcode technology- automated data collection system.

Computer Monitoring

Types of production monitoring systems-structure model of manufacturing process-process control and strategies- direct digital control-supervisory computer control-computer in QC – contact inspection methods non-contact inspection method - computer-aided testing - Integration of CAQC with CAD/CAM.

Integrated Manufacturing System

Definition - application - features - types of manufacturing systems-machine tools-materials handling system-computer control system – CNC Programming, DNC systems manufacturing cell. Flexible manufacturing systems (FMS) - the FMS concept-transfer systems - head changing FMS - variable mission manufacturing system - CAD/CAM system - human labor in the manufacturing system-computer integrated manufacturing system benefits. Artificial Intelligence and Expert system in CIM-CIM and mechatronics interfacing.

Text book

1	Groover M.P., "Automation, Production System and CIM", Prentice-Hall of India, 2011.
2	David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi, 2010.

Reference(s) :

1	Yorem Koren, "Computer Integrated Manufacturing Systems", McGraw Hill, 2010.
2	Ranky Paul G., "Computer Integrated Manufacturing", Prentice Hall International 2012.
3	P.Radhakrishnan and S.Subramanyan, "CAD / CAM / CIM ", Wiley Eastern Ltd., New Age International Ltd., 2010.
4	Yeomamas R.W., Choudry A. and Ten Hagen P.J.W., "Design Rules for a CIM system", North Holland Amsterdam, 2010.
5	Yoram Koren, “Computer Control of Manufacturing Systems ", McGraw-Hill Book Company, 2011.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E52 Energy Auditing and Management								
MCT								
Semester		Hours / Week			Total hrs	Credit	Maximum Marks	
		L	T	P		C	CA	ES	Total
VIII		3	0	0	45	3	50	50	100
Objectives	To study an energy utilization, evaluation of energy conservation measures, understand the energy management concepts, learn the methods of energy audit and usage of instruments and asses the outcome of energy audit.							
Course outcomes	At the end of the semester student will able to 1. Recognise the power demand in the world and the need for energy management. 2. Identify the energy consumption pattern and conservation potential in Industries and commercial establishments. 3. Understand the energy management concepts. 4. Acquire the knowledge and the basic skills for energy monitoring, energy bench marking and energy action planning. 5. Understand the need and different approaches of energy audit. 6. Know the instruments used for monitoring and saving of energy. 7. Identify the opportunities and options for energy saving. 8. Prepare and present the audit report. 9. Know functioning of thermal energy systems of industrial units and organizations. 10. Identify the opportunities and options for the thermal energy conservation and management.							

Introduction

Energy Scenario – Role of Energy Managers in Industries – Energy monitoring, auditing & targeting – Economics of various Energy Conservation schemes. Total Energy Systems-Harmonic analy sis and mitigation- Smart grid.

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Energy Management

Energy management – Various approaches, cost effectiveness, bench marking, optimization of energy requirement and maximization of system efficiencies. Fuels and energy substitution.

Energy Audit

Energy audit – need, preliminary audit, detailed audit, methodology and approach. Instruments for audit, monitoring energy and energy savings.

Assessment and Reporting

Evaluation of saving opportunities – determining the savings in INR, noneconomic factors, conservation opportunities, estimating cost of implementation. Energy audit reporting – the plant energy study report, importance, effective organization, report writing and presentation.

Energy Saving Case Studies

Case study – simple calculations of energy savings and conservation in process equipment's like boilers, heat exchangers and furnaces.

Text book

1	Paul W OCallaghan, "Energy management", Tata McGraw Hill Education Pvt. Ltd., 2003.
2	Albert thumann, "Hand book of Energy audit", Fairmont Press, 2014.

Reference(s) :

1.	ShaligramPokharel, Energy Analysis for Planning and Policy, CRC Press, 2014.
2.	ISO 50001: 2011 - Energy management systems — Requirements with guidance for use.
3	Thumann and W.J. Younger: Handbook of energy audits, Fairmont Press, Georgia, USA (2003).

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E53 – Enterprise Resource Planning								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	To learn the concept of business Intelligence, E-Commerce, Project management, Materials Requirement Planning and the concepts of Quality Management.
Course outcomes	At the end of the semester student will able to 1. Understand the ERP related technologies. 2. Apply the concept of data warehousing and data mining. 3. Learn about ERP life cycle and requirement. 4. Understand the Process definitions and project management activities. 5. Understand the concepts of ERP performance and business modules 6. Apply the concepts in plant maintains maintenance and quality management 7. Understand the process of ERP market and modules structure . 8. Develop the skills to design oracle and E Business techniques.. 9. Understand the basic concept of manufacturing and quality management. 10. Understand the preventive maintenance control CAQ and CIQ management

ERP and Technology

Introduction Related Technologies – Business Intelligence – E-Commerce and E-Business – Business Process Reengineering – Data Warehousing – Data Mining – OLAP – Product life Cycle management – SCM – CRM

ERP Implementation

Implementation Challenges – Strategies – Life Cycle – Pre-implementation Tasks – Requirements – Methodologies – Package selection – Project Teams – Process – Vendors and Consultants – Data Migration – Project management – Post Implementation Activities.

ERP in Action & Business Modules

Operation and Maintenance – Performance – Maximizing the ERP System – Business Modules – Finance – Manufacturing – Human Resources – Plant maintenance – Materials Management – Quality management – Marketing – Sales, Distribution and service.

ERP Market and Modules Structure

Marketplace – Dynamics – SAP AG – Oracle – PeopleSoft – JD Edwards – QAD Inc – SSA Global – Lawson Software – Epicor – Intutive. Enterprise Application Integration – ERP and E-Business – ERP II – Total quality management – Future Directions – Trends in ERP-Materials Requirement Planning (MRP)-Master Production Schedule (MPS);Bill of Material (BOM);Inventory Records; Closed Loop MRP; Manufacturing Resource Planning (MRP-II),

ERP Manufacturing perspective:

Finance, Sales and Distribution, Manufacturing and Production Planning- Material and Capacity Planning; Shop Floor Control; Quality Management; JIT/Repetitive Manufacturing; Cost Management ; Engineering Data Management; Engineering Change Control ; Configuration Management; Serialisation / Lot Control; Tooling - Preventive Maintenance Control; Equipment Tracking; Component Tracking; Plant Maintenance Calibration Tracking; Plant Maintenance Warranty Claims Tracking, Quality Management - Functions of Quality Management; CAQ and CIQ; Materials Management- Pre-purchasing; Purchasing; Vendor Evaluation; Inventory Management and Invoice Verification and Material Inspection

Text book (s)

1.	Alexis Leon, “ERP DEMYSTIFIED”, Tata McGraw Hill, Second Edition, 2008.
2.	Mary Sumner, “Enterprise Resource Planning”, Pearson Education, 2007.

Reference(s) :

1.	Jim Mazzullo,”SAP R/3 for Everyone”, Pearson,2007.
2.	Jose Antonio Fernandz, “ The SAP R /3 Handbook”, Tata McGraw Hill, 1998.
3.	Biao Fu, “SAP BW: A Step-by-Step Guide”, First Edition, Pearson Education, 2003.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 ME E54 – Non Destructive Testing Methods								
MCT								
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 syllabus framed is to impart knowledge on basic principles underlying each NDT technique and common types of defects arising in different types of manufactured products and the NDT method(s) best suited to evaluate them.
Course Outcomes	At the end of the course, the students will be able to, 1. Learn the fundamentals of the NDT Techniques. 2. Study the salient features and limitation of different NDT methods. 3. Understand the different techniques in radiographic testing. 4. Summarize the applications and limitations of radiographic testing. 5. Understand the different types of eddy current testing. 6. Acquire knowledge about the ultrasonic testing. 7. Understand the special techniques available for testing. 8. Acquire sound knowledge about the basic familiarity of emerging NDT techniques. 9. Understand the defects arise in the material. 10. Acquire knowledge for selection of appropriate NDT technique(s) for new inspection jobs.

Introduction of NDT Techniques

Basics of non-destructive testing and evaluation-visual examination-liquid penetrant testing and magnetic particle testing - Advantages and limitations of each of these techniques.

Radiographic Testing

Radiography principle - electromagnetic radiation sources - X-ray films, exposure – penetrameter - radiographic imaging - inspection standards and techniques - neutron radiography - Radiography applications, limitations and safety.

Eddy Current Testing and Ultrasonic Testing

Eddy current principle - depth of penetration - eddy current response - eddy current instrumentation - probe configuration - applications and limitations - Properties of sound beam - ultrasonic transducers - inspection methods - flow characterization technique - immersion testing.

Special/Emerging Techniques

Leak testing - Acoustic Emission testing – Holography – Thermography - Magnetic Resonance Imaging - Magnetic Barkhausen Effect - In-situ metallography.

Defects in materials / products and Selection of NDT Methods

Study of defects in castings – weldments – forgings - rolled products - defects arising during service. Selection of NDT methods to evaluate them - Standards and codes.

Text book(s) :

1.	Prakash Ravi," Nondestructive Testing Techniques", New Age International Publishers, 1st Rev edition, 2010.
2.	Paul E Mix," Introduction to Nondestructive testing: a training guide", Wiley, 2nd edition New Jersey, 2005.

Reference(s) :

1.	American Society for Metals, “Non-Destructive Evaluation and Quality Control”: Metals Hand Book 1992, Vol. 17, 9th Ed, Metals Park, OH.
2.	Baldev raj, Jayakumar.t, Thavasimuthu.m, Practical Non Destructive Testing, Narosa publishing house, newdelhi, 3rd edition, 2009.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E55 - Operations Research								
MCT								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	60	3	50	50	100

Objective(s)	To impart knowledge about optimization technique, managerial decisions for the effective utilization of available resources in engineering and business.
Course Outcomes	At the end of the course, the student will be able to 11. Explain the importance and phases of Operation Research. 12. Form the Linear programming model and solve it by graphical method and simplex algorithms. 13. Recognize the balanced and unbalanced transportation models and predict optimum solution by MODI method. 14. Solve balanced and unbalanced assignment problems by Hungarian method. 15. Outline and solve the shortest route, minimal spanning tree and maximal flow network problems. 16. Construct the networks and solve CPM and PERT problems. 17. Identify various deterministic Inventory models and solve EOQ problems. 18. Evaluate the probabilistic Inventory models with simple discrete and continuous cases. 19. Select queuing models to solve queuing problems. 20. Describe Simulation and solve simple inventory and queuing problems in simulation.

Linear Model

Introduction - The Phases of OR study - Linear programming – Graphical method– Simplex algorithm – Big M method - Duality formulation.

Transportation Problems

Balanced and Unbalanced transportation models – LP formulation - Initial solution by North West Corner method, Least cost method and Vogel's approximation method – Optimality test by MODI method - Assignment Problems - LP formulation - Hungarian method - Balanced and Unbalanced assignment problems.

Network Models

Introduction, Shortest Route - Minimal Spanning Tree - Maximum flow models – Project Networks - CPM and PERT networks – Critical path scheduling - Crashing of project networks.

Inventory Models

Deterministic Inventory models - Economic Order Quantity - Quantity discount models - Multi product EOQ models - Introduction to Probabilistic Inventory models–Simple Discrete cases and Continuous cases.

Queuing Theory & Simulation

Queuing models - Queuing systems and structures – Notation parameter – Single server and multi-server models – Poisson input – Exponential service - Constant rate service – Infinite population–Simulation–Simple Inventory and queuing problems in simulation.

Text Book(s):

1	Hamdy A. Taha, "Operation Research - An Introduction", Prentice – Hall of India Private Limited, New Delhi. 7th Edition, 2004.

Reference(s):

1	Wayne L. Winston, "Operations Research – Applications and Algorithms", Cengage Learning, 4th Edition, 2011.
2	Frederick S. Hillier And Gerald J. Lieberman, "Introduction To Operations Research", McGraw Hill Publishing Co., New Delhi, 8th Edition, 2007.
3	Perm Kumar Gupta, D.S. Hira, "Operations Research", S.Chand and Company Ltd., 2007.
4	R. Panneerselvam, 'Operations Research" Prentice Hall of India Private Ltd, New Delhi, 2003.

K.S. Rangasamy College of Technology – Autonomous 2014								
40 MCE56- Database Management 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)	1. Learn the fundamentals of data base systems and Data Models 2. Review the database file organization and Indexing 3. Understand the Transaction management concepts							
Course Outcomes	At the end of the course, the students will be able to 1. Recognize the fundamentals of database system 2. Review the various Data Models 3. Realize the concept of Relational Model 4. Review the concept of Normalization 5. Explore the various types of SQL commands 6. Demonstrate the concept of Set operations and Subqueries in SQL 7. Discover the various File Organization concepts 8. Explore the concept of Indexing and Hashing 9. Realize the concept of Transaction and Concurrency control 10. Review the concept of Recovery System							

Introduction to Database

Introduction: Purpose of Database systems – View of Data - Database Architecture, ER model: The Entity-Relationship Model – Constraints – Entity-Relationship Diagrams

Relational Model

Relational Model: Structure of Relational Databases – Database Schema – keys - The Relational Algebra, Relational Database design: Functional dependencies - Normalization for Relational Databases- First Normal form – Second Normal form – Third Normal form – BCNF – Fourth Normal form – Fifth Normal Form.

SQL

SQL Data Definition – Modification of the Database – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null Values – Aggregate Functions – Nested Subqueries.

File Organization and Indexing

File Organization: Fixed-Length Records – Variable Length Records, Organization of Records in Files, Indexing and Hashing: Basic Concepts – Ordered Indices – Static Hashing – Dynamic Hashing.

Transaction Management

Transaction Concept – A Simple Transaction Model – Serializability, Concurrency Control: Lock-Based Protocols, Recovery System: Failure Classification – Storage – Recovery and Atomicity.

Text book:

1	Abraham Silberschatz, Henry F. Korth and S. Sudarshan - “Database System Concepts”, Sixth Edition, McGraw-Hill, 2013

Reference(s) :

1.	RamezElmasri and Shamkant B. Navathe, “Fundamental Database Systems”, Seventh Edition, Pearson Education, 2015.
2.	Raghu Ramakrishnan, “Database Management System”, Third Edition, Tata McGraw-Hill Publishing Company, 2007.
3.	Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- “Database System Implementation”, Second Edition, Pearson Education, 2008.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E57 Industrial Design and Applied Ergonomics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	This course stresses the industrial design perspectives of ergonomics, user friendliness compatibility and man-product system match between man and surroundings. The course has been developed and broadened considerably to improve design ergonomics aimed at user-centred design and to develop basic and applied knowledge on usage, comfort and safety and on users' physical, sensory and cognitive characteristics.
Course outcomes	The student will be able to 1. Summarize fundamentals of ergonomics associated with anatomy and anthropometry. 2. Associate Work study, work design and ergonomic legislations. 3. Identify psychosocial behavior aspects among workers. 4. Apply Management theories of motivation and Behavior based safety. 5. Determine Anthropometric factors pertaining to sitting and standing 6. Assess Workstation design pertaining to static and dynamic work using posture evaluation tool 7. Formulate factors concerned with Cognitive ergonomics in industrial design 8. Assess Ergonomic design process 9. Correlate Macroergonomic methods with industrial design 10. Infer from applied ergonomic in design Case studies

Fundamentals of Ergonomics

Ergonomics -The focus of ergonomics, ergonomics and its areas of application in the work system - Anatomy: Human body-structure and function- Posture and Health.

work study and method study- Workplace Design and Assessment; Task Analysis; Questionnaire and Interview Design; Product Design and Evaluation; Designing for manufacture and maintenance; Health and Safety Legislation and Ergonomics.

Behaviour and perception

Communication and cognitive issues- psycho-social behavior aspects- information processing and perception- cognitive aspects and mental workload-Factors contributing to personality, Fitting the man to the job, Influence of difference on safety, Method of measuring characteristics, Accident Proneness. human error and risk perception- Motivation- Management theories of motivation, Frustration and Conflicts-Attitudes- Principles of Learning, Forgetting, Motivational requirements- Behavior Based Safety (BBS) – Implementation.

Anthropometry and Work Design

Anthropometrics-anthropometry: body growth and somato types- static and dynamic anthropometry: Performance support ergonomics approach and design intervention to work station**:** standing- anthropometry landmarks: sitting postures- Anthropometry: squatting and cross- legged postures- measuring techniques- visual display units, vertical work surface-horizontal work surface-movement- work counter -risk factors for musculoskeletal disorders in the workplace. Environmental factors influencing worker comfortability. Postural Evaluation Tools, Rapid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA).

Application of Ergonomics

Principles, Human Skill & Performance and Display, Controls and Virtual Environments- Cognitive Ergonomics, Human Information Processing; Memory; Reading; Perception; Navigation; Problem Solving; Decision Making, Human-Computer Interaction, Input/output Technology, Usability; Evaluation; Health problems. Research techniques in Ergonomic data generation, interpretation and application of statistical methods. Ergonomic design process **:**Ergonomic design methodology-ergonomics criteria/check- design process involving-checklist for task easiness

Macroergonomics and case studies.

Macro ergonomic methods-Participatory ergonomics-Parallel suggestion involvement, job involvement, high involvement, implementation issues- Case Studies.

Text book

1.	Mark S Sanders, Ernest J Mccormick, "Human Factors In Engineering & Design", Mcgraw-Hill Education Private Limited, 7th Edition, 2013.
2.	Work Design: Industrial Ergonomics – Knoz, Stephan A., Johnson, Steven, Holcomb Hathaway, Scottsdale, 7th edition,2007
3.	"Introduction to Work Study", ILO, Oxford and IBH Publishing company, Bombay, 3rd Edition, 2008.

Reference(s) :

1.	M.I.Khan, " Industrial Ergonomics"PHI Learning Private Limited,Newdelhi,2010
2.	The Ergonomics of Workspaces and Machines: A design manual – Clark, T.S. & Corlett, E.N., CRC press, 2003.
3.	R.S. Bridger ,"Introduction to Ergonomics", Taylor & Francis, 2nd Edition, 2007.

K.S.Rangasamy College of Technology – Autonomous								R 2014
40 MC E58 – Wireless Communication								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	50	50	100

Objectives	To impart knowledge on wireless communication and cellular networks, modulation techniques and mobile propagation, different wireless standards.
Course outcomes	At the end of the course, the students will be able to, 1. Discuss the evolution of wireless communication. 2. Outline the concepts of cellular communication and its capacity. 3. Analyze radio wave propagation model. 4. Implement the various channel modeling techniques. 5. Classify the various modulation techniques for wireless communication. 6. Know the performance of modulation techniques in fading channels. 7. Analyze the various equalization and diversity techniques. 8. Distinguish the various multiple access techniques. 9. Describe the existing wireless standards. 10. Compare the wireless standards under development and their importance.

Introduction to wireless communication and cellular concept

Evolution of mobile communications, mobile radio systems, trends in cellular radio and personal communications. Cellular Concept-Principles of Cellular networks, Frequency reuse, channel assignment, handoff, Interference and system capacity, Improving Coverage and capacity in Cellular systems.

Mobile radio propagation model

Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models, Indoor propagation models, Small scale Multipath propagation, Impulse model, Small scale Multipath measurements, parameters of Mobile multipath channels, types of small scale fading, statistical
Models for multipath fading channels.

Wirelesstransceivers

Structure of wireless communication link, Modulation and demodulation, Quadrature Phase Shift Keying, $\pi/4$-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance infading channels.

Signal processing in wireless systems

Principle of Diversity, Macro diversity, Micro diversity, Signal Combining Techniques, Transmit diversity, Equalisers-Linear and Decision Feedback equalisers, Review of Channel coding and Speech coding techniques.

Wireless standards

Second Generation, Third Generation and Fourth Generation Wireless Standards, Blue tooth, GSM, GPRS, CDMA in IS-95/CDMA2000, Wi-Fi, WiMax.

Text book

1	T.S.Rappaport, 'Wireless Communications: Principles and Practice', PearsonEducation/ Prentice Hall of India, 2013.
2	Andreas.F.Molisch, 'Wireless Communications', Second Edition, Wiley and IEEE, 2010.

Reference(s) :

1	AndreaGoldsmith,WirelessCommunications,Cambridge UniversityPress,2007.
2	William Stallings, Wireless Communications and Networks, PHI/PearsonEducation, 2009.
3	JochenSchiller,"Mobile Communications", Pearson, 2008