Curriculum & Syllabus

of

B.E. Mechanical Engineering

(For the batch admitted in 2007-08)

K.S.RANGASAMY COLLEGE OF TECHNOLOGY
TIRUCHENGODE – 637 215

(An Autonomous Institution affiliated to Anna University of Technology Coimbatore and approved by AICTE New Delhi)

K.S.Rangasamy College of Technology - Autonomous Regulation	R 2007
Department	Mechanical Engineering
Programme Code & Name	11 : B.E. Mechanical Engineering

K.S.Rangasamy College of Technology, Tiruchengode – 637 215								
Curriculum for the Programmes under Autonomous Scheme								
Regulation	R 2007							
Department	Department of Mechanical Engineering							
Programme Code & Name	11 : B.E. Mechanical Engineering							
Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110101G	Technical English	3	0	0	3	50	50	100
07110102G	Engineering Mathematics I	3	1	0	4	50	50	100
07110103G	Applied Physics	3	1	0	4	50	50	100
07110104G	Applied Chemistry	3	1	0	4	50	50	100
07110105G	Fundamentals of Programming	3	1	0	4	50	50	100
07110106S	Basics of Electrical and Electronics Engineering	4	0	0	4	50	50	100
	PRACTICAL							
07110107P	Applied Physics Laboratory	0	0	3	2	50	50	100
07110108P	Applied Chemistry Laboratory	0	0	3	2	50	50	100
07110109P	Programming Laboratory	0	0	3	2	50	50	100
07110110P	Engineering Practices Laboratory	0	0	3	2	50	50	100
	Total	19	4	12	31	1000		
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110201G	Communication Skills	4	0	0	3	50	50	100
07110202G	Engineering Mathematics II	3	1	0	4	50	50	100
07110203G	Materials Science	3	0	0	4	50	50	100
07110204G	Environmental Science	3	1	0	4	50	50	100
07110205S	Electrical Drives and Control	3	1	0	4	50	50	100
07110206S	Fluid Mechanics and Machinery	3	1	0	4	50	50	100
	PRACTICAL							
07110207P	Engineering Graphics Laboratory	1	0	3	3	50	50	100
07110208P	Electrical Engineering Laboratory	0	0	3	2	50	50	100
07110209P	Fluid Mechanics and Machinery Laboratory	0	0	3	2	50	50	100
07110210P	Comprehension I	0	0	3	0	100	00	100
	Total	20	4	12	30	1000		

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Programme Code & Name	11 : B.E. Mechanical Engineering							
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110301G	Engineering Mathematics III	3	1	0	4	50	50	100
07110302C	Engineering Thermodynamics	4	1	0	4	50	50	100
07110303C	Applied Mechanics	4	1	0	4	50	50	100
07110304C	Instrumentation and Control System	3	0	0	3	50	50	100
07110305C	Manufacturing Technology I	3	0	0	3	50	50	100
07110306C	Electronics and Microprocessors	3	0	0	3	50	50	100
	PRACTICAL							
07110307P	Manufacturing Technology Laboratory I	0	0	3	2	50	50	100
07110308P	Metrology, Metallurgy and Instrumentation Laboratory	0	0	3	2	50	50	100
07110309P	Electronics and Microprocessor Laboratory	0	0	3	2	50	50	100
07110310P	Comprehension II	0	0	3	0	100	00	100
07110311P	Career Competency Development I	0	0	2	0	100	00	100
	Total	20	3	14	27	1100		
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110401S	Probability and Statistics	3	1	0	4	50	50	100
07110402C	Thermal Engineering	4	1	0	4	50	50	100
07110403C	Strength of Materials	4	1	0	4	50	50	100
07110404C	Manufacturing Technology II	3	0	0	3	50	50	100
07110405C	Theory of Machines I	4	1	0	4	50	50	100
07110406C	Object Oriented Programming	3	0	0	3	50	50	100
	PRACTICAL							
07110407P	Thermal Engineering Laboratory	0	0	3	2	50	50	100
07110408P	Strength of Materials Laboratory	0	0	3	2	50	50	100
07110409P	Manufacturing Technology Laboratory II	0	0	3	2	50	50	100
07110410P	Comprehension III	0	0	3	0	100	00	100
07110411P	Career Competency Development II	0	0	2	0	100	00	100
	Total	21	4	14	28	1100		

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Programme Code & Name	11 : B.E. Mechanical Engineering							
Semester V								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110501S	Professional Ethics	3	0	0	3	50	50	100
07110502C	Automobile Engineering	3	0	0	3	50	50	100
07110503C	Design of Machine Elements I	4	1	0	4	50	50	100
07110504C	Theory of Machines II	4	1	0	4	50	50	100
07110505C	Applied Hydraulics and Pneumatics	3	0	0	3	50	50	100
07110506C	CAD/CAM	3	0	0	3	50	50	100
	PRACTICAL							
07110507P	Hydraulics and Pneumatics Laboratory	0	0	3	2	50	50	100
07110508P	Computer Aided Machine Drawing Laboratory	0	0	3	2	50	50	100
07110509P	Dynamics Laboratory	0	0	3	2	50	50	100
07110510P	Comprehension IV	0	0	3	0	100	00	100
07110511P	Career Competency Development III	0	0	2	0	100	00	100
Total		20	2	14	26	1100		
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110601S	Principles of Management	3	0	0	3	50	50	100
07110602C	Design of Machine Elements II	4	1	0	4	50	50	100
07110603C	Gas Dynamics and Jet Propulsion	4	1	0	4	50	50	100
07110604C	Power Plant Engineering and Energy Economics	3	0	0	3	50	50	100
07110605C	Heat and Mass Transfer	4	1	0	4	50	50	100
071106**E	Elective I	3	0	0	3	50	50	100
	PRACTICAL							
07110607P	Computer Aided Manufacturing Laboratory	0	0	3	2	50	50	100
07110608P	Heat Transfer Laboratory	0	0	3	2	50	50	100
07110609P	Mini Project	0	0	3	2	100	00	100
07110610P	Comprehension V	0	0	3	0	100	00	100
07110611P	Career Competency Development IV	0	0	2	0	100	00	100
Total		21	3	14	27	1100		

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Programme Code & Name	11 : B.E. Mechanical Engineering							
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110701G	Total Quality Management	3	0	0	3	50	50	100
07110702C	Resource Management Techniques	4	1	0	4	50	50	100
07110703S	Mechatronics and Robotics	3	0	0	3	50	50	100
07110704C	Finite Element Method	4	1	0	4	50	50	100
071107**E	Elective II	3	0	0	3	50	50	100
071107**E	Elective III	3	0	0	3	50	50	100
	PRACTICAL							
07110707P	Analysis and Simulation Laboratory	0	0	3	2	50	50	100
07110708P	Mechatronics Laboratory	0	0	3	2	50	50	100
07110709P	Project Work - Phase I	0	0	4	2	100	00	100
07110710P	Career Competency Development V	0	0	2	0	100	00	100
Total		20	2	15	26	1000		
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
07110801C	Engineering Economics and Cost Analysis	3	0	0	3	50	50	100
071108**E	Elective IV	3	0	0	3	50	50	100
071108**E	Elective V	3	0	0	3	50	50	100
	PRACTICAL							
07110804P	Project Work - Phase II	0	0	40	20	50	50	100
Total		9	0	40	29	400		

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Regulation	R 2007							
Department	Department of Mechanical Engineering							
Programme Code & Name	11 : B.E. Mechanical Engineering							
List of Electives								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
Elective - I								
07110641E	Numerical Methods	3	0	0	3	50	50	100
07110642E	Unconventional Machining Processes	3	0	0	3	50	50	100
07110643E	Renewable Sources of Energy	3	0	0	3	50	50	100
07110644E	Design of Jigs, Fixtures and Press Tools	3	0	0	3	50	50	100
07110645E	Thermal Turbo Machines	3	0	0	3	50	50	100
07110646E	Fundamentals of IT	3	0	1	3	50	50	100
Elective - II								
07110751E	Plant Layout and Material Handling	3	0	0	3	50	50	100
07110752E	Entrepreneurship Development	3	0	0	3	50	50	100
07110753E	Internal Combustion Engines	3	0	0	3	50	50	100
07110754E	Maintenance Engineering	3	0	0	3	50	50	100
07110755E	Modern Materials	3	0	0	3	50	50	100
07110756E	Advanced Welding Technology	3	0	0	3	50	50	100
Elective - III								
07110761E	Nano Technology	3	0	0	3	50	50	100
07110762E	Concurrent Engineering	3	0	0	3	50	50	100
07110763E	Production Planning and Control	3	0	0	3	50	50	100
07110764E	Refrigeration and Air-conditioning	3	0	0	3	50	50	100
07110765E	Product Design and Costing	3	0	0	3	50	50	100
07110766E	IT Essentials	3	0	0	3	50	50	100
Electives - IV								
07110871E	Composite Materials	3	0	0	3	50	50	100
07110872E	Marketing Management	3	0	0	3	50	50	100
07110873E	Vibration and Noise Control	3	0	0	3	50	50	100
07110874E	Cryogenics	3	0	0	3	50	50	100
07110875E	Quality Control and Reliability Engineering	3	0	0	3	50	50	100
07110876E	Advanced Strength of Materials	3	0	0	3	50	50	100
Electives - V								
07110881E	Process Planning and Cost Estimation	3	0	0	3	50	50	100
07110882E	Design of Heat Exchangers	3	0	0	3	50	50	100
07110883E	Industrial Safety Engineering	3	0	0	3	50	50	100
07110884E	Nuclear Engineering	3	0	0	3	50	50	100
07110885E	Modern concepts of Engineering Design	3	0	0	3	50	50	100
07110886E	Tribology	3	0	0	3	50	50	100

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Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110101G	TECHNICAL ENGLISH	3	0	0	3	50	50	100
Objective(s)	To help learners improve their skills in vocabulary and to enable them to use words appropriately in different academic and professional contexts, familiarize with different rhetorical functions of technical English, develop strategies that could be adopted while reading texts, acquire the ability to speak effectively in English in real life and career related situations and organized academic and professional writing.							
1	GRAMMAR AND VOCABULARY				Total Hrs	9		
Word formation with prefixes and suffixes – synonyms and antonyms – verb patterns -subject - verb agreement – tenses (simple and compound tenses) - simple, compound and complex sentences - impersonal passive voice – use of conditionals - comparative adjectives (affirmative and negative) – expanding nominal compounds - articles - use of prepositions - phrasal verbs – commonly mispronounced and misspelt words – British and American vocabulary.								
2	LISTENING				Total Hrs	9		
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.								
3	SPEAKING				Total Hrs	9		
Verbal and non verbal communication - speech sounds – syllables – word stress (structure and content words) - sentence stress - intonation - Pronunciation drills/ tongue twisters – formal and informal English - oral practice - developing confidence - introducing oneself - asking for or eliciting information - describing objects – offering suggestions and recommendations – expressing opinions (agreement / disagreement) - giving instructions.								
4	READING				Total Hrs	9		
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 – sequencing of sentences.								
5	WRITING				Total Hrs	9		
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 - analysing / 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).								
Total hours to be taught						45		
Text book(s):								
1	Rizvi M Ashraf, "Effective Technical Communication", 1st Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.							
References :								
1	Balasubramanian M and Anbalagan G, "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.							

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Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110102G	ENGINEERING MATHEMATICS I	3	1	0	4	50	50	100
Objective(s)	To impart analytical skills to the students in the areas of differential equations and transform techniques. This is a necessary one for effective learning of all engineering subjects like heat conduction, communication systems, electro-optics and electro magnetic theory. This course will also be required as pre-requisite for post graduate studies, specialized studies and research.							

1	MATRICES	Total Hrs	12
Column matrix as vector – linear independent and dependent of vector – Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties of eigen values and eigenvectors – Cayley – Hamilton theorem (without proof) – Similarity transformation (concept only) – Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation.			
2	GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS	Total Hrs	12
Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involutes and evolutes – Envelopes – Properties of envelopes and evolutes –Evolute as envelope of normals.			
3	FUNCTIONS OF SEVERAL VARIABLES	Total Hrs	12
Functions of two variables – Partial derivatives – Total differential – Maxima and minima – Constrained maxima and minima – Lagrange's multiplier method – Jacobians.			
4	ORDINARY DIFFERENTIAL EQUATIONS	Total Hrs	12
Linear differential equations of Second and higher order with constant coefficient when the R.H.S is e^{ax}, $x^n \; n>0, \sin ax$, $\cos ax$, $e^{ax}x^n$, $e^{\alpha x}\sin\beta x$, $e^{\alpha x}\cos\beta x$, $x^n \sin\alpha x$ and $x^n \cos\alpha x$ – Differential Equations with variable coefficients (Cauchy's Form and Legendre's Linear Equation).			
5	DIFFERENTIAL EQUATIONS AND ITS APPLICATIONS	Total Hrs	12
Simultaneous first order linear equations with constant coefficients – Method of variation of parameters – Solution of specified differential equations connected with electric circuits, bending of beams and simple harmonic motion (Differential equations and associated conditions need be given).			
Total hours to be taught			60

Text book(s):

1	Veerarajan. T., "Engineering Mathematics for first year", Fourth Edition Tata McGraw- Hill Publishing Company Limited, New Delhi, 2005.

References :

1	Kandasamy. P, Thilagavathy. K and Gunavathy. K, "Engineering Mathematics" –S.Chand and Co. – New Delhi 2007.
2	Grewal. B.S., "Higher Engineering Mathematics", Thirty Eighth Edition, Khanna Publishers, Delhi, 2004.
3	Kreyszig. E., "Advanced Engineering Mathematics," Eighth Edition, John Wiley and Sons (Asia) Limited, Singapore 2001.
4	Venkataraman.M.K, "Engineering Mathematics, Volume I & II Revised Enlarged Fourth Edition", The National Pub. Co., Chennai, 2004.

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Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110103G	APPLIED PHYSICS	3	1	0	4	50	50	100
Objective(s)	To understand the concepts involved in design of acoustically good buildings, structural identification of engineering materials, non-destructive techniques, application of quantum physics, application of laser in engineering and technology.							
1	LASERS				Total Hrs	12		
Introduction. Principle of spontaneous emission and stimulated emission. Population inversion, pumping. Types of lasers - He-Ne, CO_2, Nd YAG, Ruby lasers, Semiconductor laser. Applications - lasers in microelectronics, welding, heat treatment, cutting, holography.								
2	FIBER OPTICS AND APPLICATIONS				Total Hrs	12		
Principles. Modes of propagation. - Crucible-crucible technique. Classification based on materials, refractive index profile. Splicing. Losses in optical fiber. Light sources for fiber optics. Detectors. Fiber optical communication links. Fiber optic sensors - temperature, displacement, voltage and magnetic field measurement.								
3	QUANTUM PHYSICS AND APPLICATIONS				Total Hrs	12		
Introduction to Quantum theory. Dual nature of matter and radiation - de Broglie wave length. Uncertainty principle. Schrödinger's equation. Particle in a box. Optical microscope - limitations of optical microscopy. Electron microscope - Scanning electron microscope, Transmission electron microscope and STEM.								
4	ULTRASONICS				Total Hrs	12		
Introduction. Production – magnetostriction effect, magnetostriction generator, inverse piezoelectric effect, piezoelectric generator. Detection of ultrasonic. Properties. Cavitation. Industrial applications – drilling, welding, soldering and cleaning. Non Destructive Testing – pulse echo system through transmission, resonance system. Medical applications – cardiology, ultrasonic imaging.								
5	VACUUM SCIENCE				Total Hrs	12		
Introduction. Importance of vacuum in industries. Schematic diagram of a vacuum system. Pumping speed and throughput. Types of pumps - Working principle, construction, pressure range, limitations and pumping characteristics of rotary pump, diffusion pump, turbo molecular pump - measurement of vacuum using gauges.								
Total hours to be taught						60		
Text book(s):								
1	Avadhanalu M.N. and Kshirsagar P.G, "A Textbook of Engineering Physics", S.Chand & Company Ltd, New Delhi, 2005.							
References :								
1	Jayakumar S , "Engineering Physics", R K Publishers, Coimbatore, 2003.							
2	Arumugam M, "Engineering Physics", Anuradha Publications, Kumbakonam, 2006							
3	Ganesan.S, Iyan Durai N, "Applied Physics" KKS Publishers, Chennai, 2007.							

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		L	T	P	C	CA	ES	Total
07110104G	APPLIED CHEMISTRY	3	1	0	4	50	50	100
Objective(s)	To make the students conversant with the principles involved in electro chemistry, corrosion, inhibition, water treatment for industrial purposes, energy storage devices, fuel combustion, polymer and engineering materials.							
1	WATER				Total Hrs	12		
Turbidity, colour, acidity, alkalinity, nitrogen, fluoride – (Definition, sources and sanitary significance only) – Water – Hardness – Estimation of Hardness by EDTA method – Boiler feed water – scale formation, corrosion, caustic embrittlement, primary and forming – softening of water – limesoda process – zeolite process – demineralization – desalination – electrodialysis and reverse osmasis.								
2	ELECTROCHEMISTRY				Total Hrs	12		
Electrochemical cells – reversible and irreversible cells – EMF – measurements – Standard Weston Cadmium cell – Nernst Equation – problems – Electrodes – Single electrode potential – Types of electrodes – Calomel electrode – Electrochemical series – significance – potentiometric titrations – Batteries – Lead acid and Ni-Cd batteries.								
3	CORROSION AND CORROSION CONTROL				Total Hrs	12		
Corrosion – Electrochemical and chemical – Mechanism – corrosion reaction – types of corrosion – differential aeration – (granular pitting) – corrosion control – Sacrificial anode and impressed current method – Inhibitors – Protective coatings – Preliminary treatment – Electroplating (Cr & Ni) – paints – Constituents and their function – mechanism of drying.								
4	FUELS AND COMBUSTION				Total Hrs	12		
Fuels – Calorific Values – Gross and net – Theoretical air for combustion – flue gas analysis – Orsat analysis – Coal – proximate and ultimate analysis – their importance – metallurgical coke – Petrol – Straight run, cracked and polymer petrols – Synthetic petrol – Fisher Tropsch and Bergius methods – Octane number – improving octane number by additives – Diesel – Cetane number – Water gas, producer gas, LPG.								
5	HIGH POLYMERS				Total Hrs	12		
Polymer structure – Nomenclature – Polymerization – types – mechanism – Free radical only – coordination polymerization – mechanism – Individual polymers – Polyethylene, polypropylene, PVC, Teflon, acrylics, Nylon-6-6, Bakelite, Polyster, epoxy, polyurethane – Structure Preparation, properties and uses – Compounding and fabrication – Compression, Injection, Extrusion, blow moulding – Foamed plastics.								
Total hours to be taught						60		
Text book(s):								
1	R.Palanivelu, R.Parimalam, B.Srividya, K.Tamilarasu and P.Padmanaban, “Applied Chemistry”, Department of Science and Humanities, KS Rangasamy College of Technology.							
References :								
1	Jain P C & Monica Jain, ″Engineering Chemistry″, Dhanpat Rai Publishing Co., New Delhi, 14th Edition, 2002.							
2	Clair N Sawyer and Perry L Mc Carty, ″ Chemistry for Environmental Engineering″, TMH Book Company, New Delhi, 14th Edition, 2002.							
3	Dara S S, ″A text book of Engineering Chemistry″, S.Chand & Co. Ltd., 2003.							
4	Uppal M M revised by S C Bhatia, ″Engineering Chemistry″, Khanna Publishers, New Delhi, 6th Edition, 2001.							

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		L	T	P	C	CA	ES	Total
07110105G	FUNDAMENTALS OF PROGRAMMING	3	1	0	4	50	50	100
Objective(s)	To learn the basic concepts of computing and develop skills in programming using C language.							

1	COMPUTER BASICS	Total Hrs	9
Evolution of computers- Generations of computers- Classification of computers- Applications of computers- Computer components of a computer system – hardware – software booting.			
2	SOFTWARE, PROGRAMMING AND INTERNET	Total Hrs	9
Problem solving techniques – Program control structures- Programming paradigms- Programming languages- Generations of Programming languages- Language translators – Features of programming language - Internet- Evolution- Basic Internet terms- Getting connected to Internet-Applications.			
3	C FUNDAMENTALS	Total Hrs	9
Introduction to C- Constants- Variables- Data types- Operators and Expressions- Managing Input and Output operations- Decision Making and Branching- Looping.			
4	ARRAYS AND FUNCTIONS	Total Hrs	9
Arrays- Character Arrays and Strings- User defined functions- Storage Classes.			
5	STRUCTURES AND FILES	Total Hrs	9
Structures- Definition- Initialization- Array of Structures- Structures within structures- Structures and Functions- Unions- File Management in C.			
Total hours to be taught			45

Text book(s):

1	Dr.K.Duraiswamy, “Fundamentals of programming”, Technician Publications.

References :

1	ITL Education Solutions Limited, A N Kamthane "Computer Programming", Pearson Education (India), 2007.
2	E. Balagurusamy, “Programming in ANSI C ”, TMH, 2004.(Unit III, IV and V).
3	V.Rajaraman, “Fundamentals of Computers”, Fourth Edition, PHI, 2006.
4	Pradip Day, Manas Ghosh, “Computer Fundamentals and Programming in C”, Oxford University Press, 2006.

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		L	T	P	C	CA	ES	Total
07110106S	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	4	0	0	4	50	50	100
Objective(s)	To make the students to understand the basic concepts of electrical and electronics engineering and learn about the industrial machines with their significances.							
1	ELECTRICAL CIRCUITS AND MEASUREMENTS				Total Hrs	12		
Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits. Operating principles of moving coil and moving iron instruments (Ammeters, voltmeters), dynamometer type, watt meters and energy meters.								
2	ELECTRICAL MACHINES				Total Hrs	12		
Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, Induction Motors and Stepper Motors.								
3	SEMICONDUCTOR DEVICES AND APPLICATIONS				Total Hrs	12		
Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Necessity of Biasing - Principles of Basing circuits - Elementary Treatment of Small Signal Amplifier. Characteristics and Simple Applications of SCR, DIAC, TRIAC and UJT.								
4	DIGITAL ELECTRONICS				Total Hrs	12		
Binary Number System - Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversions.								
5	FUNDAMENTALS OF COMMUNICATION ENGINEERING				Total Hrs	12		
Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations. Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).								
Total hours to be taught						60		
Text book(s):								
1	Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering" TMH, Second Edition, 2006.							
References :								
1	Nagsarkar T K and Sukhija M S, "Basics of Electrical Engineering", Oxford press 2005.							
2	Mehta V K , "Priciples of Electronics", S.Chand & Company Ltd, 1994.							
3	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.							
4	Premkumar N, "Basic Electrical Engineering ", Anuradha Publishers, 2003.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110107P	APPLIED PHYSICS LABORATORY	0	0	3	2	50	50	100
Objective(s)	To give experimental exposure in different branches of physics like optics, properties of matter, ultrasonics, electronics, etc.,							

1	Particle size determination using Diode Laser.	Total Hrs	3
2	Determination of Laser parameters – Wavelength, Refractive Index and Angle of Divergence.	Total Hrs	3
3	Determination of acceptance angle in an optical fiber	Total Hrs	3
4	Determination of Thickness of fiber-Air wedge method.	Total Hrs	3
5	Determination of velocity of sound and compressibility of liquid-Ultrasonic Interferometer	Total Hrs	3
6	Determination of Wavelength of Mercury Spectrum–Spectrometer Grating.	Total Hrs	3
7	Determination of Specific Resistance of given coil of wire - Carey Foster's Bridge	Total Hrs	3
8	Determination of Thermal conductivity of a Bad conductor-Lee's Disc method	Total Hrs	3
9	Determination of Hysteresis losses in a Ferromagnetic material.	Total Hrs	3
10	Determination of Young's Modulus of the material in the form of Bar-Cantilever method	Total Hrs	3
11	Determination of Band Gap of Semiconductor material.	Total Hrs	3
12	Determination of Viscosity of liquid-Poiseuille's method	Total Hrs	3
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110108P	APPLIED CHEMISTRY LABORATORY	0	0	3	2	50	50	100
Objective(s)	Educate the theoretical concepts experimentally.							

1	Estimation of hardness of Water by EDTA	Total Hrs	3
2	Estimation of alkalinity of Water sample	Total Hrs	3
3	Estimation of Chloride in Water sample	Total Hrs	3
4	pH titration	Total Hrs	3
5	Potentiometric	Total Hrs	3
6	Conductometric titration	Total Hrs	3
7	Determination of EMF of an unknown cell	Total Hrs	3
8	Determination of degree of dissociation of weak electrolyte.	Total Hrs	3
9	Estimation of Ferric iron by spectrophotometry	Total Hrs	3
10	Determination of Total solids in boiler feed water	Total Hrs	3
11	Determination of water of crystallization of a crystalline salt (Copper Sulphate)	Total Hrs	3
12	Determination of sodium and potassium in a water sample (by flame photometry)	Total Hrs	3
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110109P	PROGRAMMING LABORATORY	0	0	3	2	50	50	100
Objective(s)	To develop skills in programming using C language.							

1	Write a C program to print Pascal's triangle.	Total Hrs	3
2	Write a C program to print the sine and cosine series.	Total Hrs	3
3	Write a C program to perform Matrix multiplication.	Total Hrs	3
4	Write a C program to prepare and print the sales report.	Total Hrs	3
5	Write a C program to perform string manipulation functions like string concatenations, comparison, find the length and string copy without using library functions.	Total Hrs	3
6	Write a C program to arrange names in alphabetical order.	Total Hrs	3
7	Write a C program to calculate the mean, variance and standard deviation using functions.	Total Hrs	3
8	Write a C program to perform sequential search using functions.	Total Hrs	3
9	Write a C program to print the Fibonacci series and to calculate the factorial of the given number using functions.	Total Hrs	3
10	Write a C program to print the mark sheet of n students using structures.	Total Hrs	3
11	Write a C program for mark sheet processing using files.	Total Hrs	3
12	Write a C program to merge the given two files	Total Hrs	3
	Operating System : Windows / Unix clone Compiler : C compiler		
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110110P	ENGINEERING PRACTICES LABORATORY	0	0	3	2	50	50	100
Objective(s)	To impart knowledge on basic concepts of plumbing, sheet metal, wiring, welding. It also includes the procedures to be followed for individual work like cutting a pipe, threading a pipe, plumbing layout preparation, sheet metal area calculation with minimum waste, welding methods, precautions, wiring methods, layouts and safety measures.							

	PLUMBING		
1	Safety aspects in Plumbing.	Total Hrs	3
2	Study of tools and equipments - preparation of models	Total Hrs	3
3	Cutting and Threading of G.I. Pipes	Total Hrs	3
4	Study of valves, taps and repairing.	Total Hrs	3
5	Measuring and marking practice of PVC & G.I. pipes - connection to service line	Total Hrs	3
	SHEET METAL		
6	Study of Tools, Equipments and Safety precautions	Total Hrs	3
7	Drawing of tools and accessories	Total Hrs	3
8	Different types of joints making - knocked up, double grooving joints	Total Hrs	3
9	Model making –Trays, Baskets and Funnels	Total Hrs	3
	ELECTRICAL WIRING		
10	Safety aspects of Electrical wiring	Total Hrs	3
11	Study of Electrical materials and wiring components	Total Hrs	3
12	Wiring circuit for a lamp using single and Stair case switches.	Total Hrs	3
13	Wiring circuit for fluorescent lamps	Total Hrs	3
14	Calculation of power and energy.	Total Hrs	3
	WELDING AND SOLDERING		
15	Safety aspects of Welding and Soldering	Total Hrs	3
16	Study of Gas and Arc Welding Equipments	Total Hrs	3
17	Welding of Lap, Butt, T-joints & Corner Joints	Total Hrs	3
18	Soldering of Small Electrical and Electronic Circuits	Total Hrs	3
Total hours to be taught			45

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Department	Mechanical Engineering		Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
07110201G	COMMUNICATION SKILLS	4	0	0	3	50	50	100	
Objective(s)	To equip students with effective speaking and listening skills in English, help them develop the soft skills and people skills which will make them to excel in their jobs and enhance their performance at placement interviews.								
1	LISTENING				Total Hrs	12			
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									
2	COMMUNICATION				Total Hrs	12			
What is communication? What does it involve? Accuracy, fluency and appropriateness, Levels of formality, Differences between spoken and written communication. Greeting and introduction, Marketing requests, Asking for permission, giving/declining help, Giving instructions, Art of small talk, Taking part in casual conversation, Making a short formal speech, Describing people, place, things and events.									
3	CONVERSATION SKILLS				Total Hrs	12			
Using the telephone - Preparing for a call, Stages of a call, Handling calls, Identifying self, Asking for repetitions, Spelling out names or words. Giving information on the phone, Making requests, Answering calls, Leaving messages on answer machines, Making/changing appointments, Making complaints, Reminding, Agreeing/disagreeing, Listening, Listening and taking messages, Giving instructions and responding to instructions.									
4	REMEDIAL GRAMMAR AND VOCABULARY				Total Hrs	12			
Subject –verb agreement, Tenses, 'Do' forms, Active and passive voice, Use of negatives, Prepositions, Phrasal verbs. Correct use of words, Use of formal words in informal situations, Indianisms, Commonly confused words, Common errors and remedial measures									
5	WRITTEN COMMUNICATION AND CAREER SKILLS				Total Hrs	12			
Writing e-mails, Writing reports, Note-taking and note-making, Preparing curriculum vitiate and cover letters, Facing an interview, Presentation skills, and Persuasion skills.									
Total hours to be taught						60			
Text book(s):									
1	Rizvi M. Ashraf, "Effective Technical Communication". I Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.								
References :									
1	Kiranmai Dutt P, Geetha Rajeevaan and Prakash C L N, "A course in Communication Skills", by Ebek-Cambridge University Press India Pvt. Ltd., 2007.								
2	Naterop, cup "Telephoning in English – Cambridge University Press India Pvt. Ltd., 2007								
3	Richard, "New Interchange Services (Student's Book)" – Introduction, Level -1,Level -2, Level -3, Cambridge University Press India Pvt. Ltd., 2007.								

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110202G	ENGINEERING MATHEMATICS II	3	1	0	4	50	50	100
Objective(s)	This course is intended to impart knowledge to students in the areas of complex variables and transform techniques. This is a necessary one for effective learning of all engineering subjects like heat conduction, communication systems, electro-optics and electro magnetic theory. This course will also be required as pre-requisite for post graduate studies, specialized studies and research.							
1	MULTIPLE INTEGRALS				Total Hrs	12		
Double integration in Cartesian and Polar coordinates – Change of order of integration – Area between two curves – Area as double integrals – Triple integration in Cartesian coordinates – Volume as Triple integrals (Simple problems only).								
2	VECTOR CALCULUS				Total Hrs	12		
Gradient, divergence and curl – Line, surface and volume integrals – Green's, Gauss divergence and Stoke's theorems (without proof) – Verification of the above theorems and evaluation of integrals using them.								
3	ANALYTIC FUNCTIONS				Total Hrs	12		
Function of a complex variable – Analytic function – Necessary conditions – Cauchy – Riemann equations – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions - Conformal mapping: $w = z + a, az, 1/z$ and bilinear transformation.								
4	COMPLEX INTEGRATION				Total Hrs	12		
Cauchy's theorem (without proof) – Cauchy's integral formula – Taylor and Laurent series (without proof) – Singularities – Classification – Cauchy's residue theorem – Contour integration – circular and semi-circular contours (excluding poles on real axis).								
5	LAPLACE TRANSFORM				Total Hrs	12		
Laplace Transform – Conditions for existence – Transform of elementary functions – Basic properties – Derivatives and integrals of transforms – Transforms of derivatives and integrals – Initial and final value theorems – Transform of unit step function – Transform of periodic functions. Inverse Laplace transform – Convolution theorem – Solution of linear ODE of second order with constant coefficients and first order simultaneous equations with constant coefficients using Laplace transformation.								
Total hours to be taught						60		
Text book(s):								
1	Veerarajan. T., "Engineering Mathematics (for first year), Fourth Edition Tata McGraw- Hill Publishing Company Limited, New Delhi, 2005.							
References :								
1	Kandasamy. P, Thilagavathy. K and Gunavathy. K, "Engineering Mathematics" – S.Chand and Co. New Delhi 2007.							
2	Venkataraman.M.K, "Engineering Mathematics, Volume I & II Revised Enlarged Fourth Edition", The National Pub. Co., Chennai, 2004.							
3	Widder. D.V., "Advanced Calculus", Second Edition, Prentice Hall of India, New Delhi, 2000.							

<table>
<tr><td colspan="8">K.S.Rangasamy College of Technology - Autonomous Regulation</td><td>R 2007</td></tr>
<tr><td colspan="2">Department</td><td>Mechanical Engineering</td><td colspan="3">Programme Code & Name</td><td colspan="4">11 : B.E. Mechanical Engineering</td></tr>
<tr><td colspan="9">Semester II</td></tr>
<tr><td colspan="2" rowspan="2">Course Code</td><td colspan="2" rowspan="2">Course Name</td><td colspan="3">Hours / Week</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 colspan="2">07110203G</td><td colspan="2">MATERIALS SCIENCE</td><td>3</td><td>0</td><td>0</td><td>4</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="2">Objective(s)</td><td colspan="7">To impart fundamental knowledge in various engineering subject and applications like conduction, super conducting and magnetic materials, dielectric new engineering materials and nano-materials in modern technology.</td></tr>
<tr><td>1</td><td colspan="5">SEMI CONDUCTING MATERIALS AND DEVICES</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="9">Elemental and compound semiconductors. Intrinsic and extrinsic semiconductors - Properties. Carrier concentration in intrinsic and extrinsic semiconductors (qualitative). Material preparation - Czochralski's technique and zone refining technique. Hall effect - Hall coefficient in extrinsic semiconductors, experimental determination of Hall coefficient. Application of Hall effect. Semiconductor devices – Solar Cells, LED, Photodiode, LDR, LCD and Strain Gauges.</td></tr>
<tr><td>2</td><td colspan="5">MAGNETIC MATERIALS</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="9">Ferro and ferrimagnetic materials – Properties. Heisenberg and domain theory of ferromagnetism. Hysteresis. Hard and soft magnetic materials. Ferrites – structure, preparation and applications. Devices and applications - Permanent magnets, transformer cores, magneto optical recording, magnetic valves and bearings, Superconducting Magnets, SQUIDS.</td></tr>
<tr><td>3</td><td colspan="5">SMART MATERIALS</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="9">Shape Memory alloys SMA) – Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA. Nano-phase materials – preparation – mechanical alloying and solgel technique, properties and applications. Superconductivity BCS theory of superconductivity (qualitative),Types of superconductors, properties - High Tc superconductors. Application of superconductors – SQUID, Cryotron, Magnetic levitation. Metallic glasses – Preparation, properties & applications.</td></tr>
<tr><td>4</td><td colspan="5">NANO MATERIALS AND CHARACTERIZATION</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="9">Fabrication methods – Top down processes – Milling, lithographics, machining process – Bottom-up process – Vapour phase deposition methods, plasma-assisted deposition process, MBE and MOVPE, liquid phase methods, colloidal and solgel methods – Methods for templating the growth of nano-materials – Ordering of nano-systems, self-assembly and self-organization – Preparation, safety and storage issues.</td></tr>
<tr><td>5</td><td colspan="5">NANO DEVICES AND THEIR VARIOUS APPLICATIONS</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="9">Nano-magnetic materials – Particulate nano-magnets and geometrical nano-magnets – Magneto resistance – Probing nano-magnetic materials – Nano-magnetism in technology – Carbon nano-tubes – fabrication-applications – Organic FET, organic LED's – Organic photo voltaics – Injection lasers, quantum cascade lasers, optical memories, electronic applications, coulomb blockade devices.</td></tr>
<tr><td colspan="8">Total hours to be taught</td><td>45</td></tr>
<tr><td colspan="9">Text book(s):</td></tr>
<tr><td>1</td><td colspan="8">Raghavan V, "Materials Science and Engineering - A first course", Prentice Hallof India, New Delhi, 2001.</td></tr>
<tr><td colspan="9">References :</td></tr>
<tr><td>1</td><td colspan="8">Jayakumar S, "Materials Science", R K Publishers, Coimbatore, 2004.</td></tr>
<tr><td>2</td><td colspan="8">James F Shackelford, S "Introduction to Materials Science for Engineers", 6th edition, Macmillan Publishing Company, New York. 2004.</td></tr>
<tr><td>3</td><td colspan="8">William D Callister Jr, "Materials Science and Engineering – An Introduction", John Wiley and Sons Inc., 6th edition, New York, 2003.</td></tr>
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Department	Mechanical Engineering			Program code & Name		11 : B.E. Mechanical Engineering		
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum marks		
		L	T	P	C	CA	ES	Total
07110204G	ENVIRONMENTAL SCIENCE	3	1	0	4	50	50	100
Objective(s)	The student should be conversant with the evolution of environmentalism and the importance of environmental studies. Focuses on the various natural resources and the current threats to their sustainability. Significance and protection of bio diversity and various forms of environmental degradation. The significant international conventions and protocols for the protection of environment							
1	ATMOSPHERE AND ECOSYSTEM				Total Hrs	9		
Atmosphere – composition of atmosphere (troposphere, stratosphere, mesosphere and thermosphere) - Ozone and ozone depletion – Air pollution – sources, effects and control – Green house effect - Global warming – Climate change – Acid rain - Planet Earth – Biosphere – Hydrosphere – Lithosphere. Concept of ecosystem – structure and functions of ecosystem- producers, consumers and decomposers - Energy flow – Ecological succession-Food chains-Food webs- Ecological pyramids-Introduction, types, characteristic features-structures and function of forest, grassland and aquatic ecosystems (ponds and rivers) - Case Studies in current scenario.								
2	WATER RESOURCES AND ITS TREATMENT				Total Hrs	9		
Water – hydrologic cycle – ground water – water shed – water use and quality – point and non-point sources of pollution – Oceans and fisheries – salinity – temperature – density – pressure – light – bioluminescence – Tsunamis – Glaciers – Water pollution – dissolved oxygen – surface water treatment – waste water treatment – Thermal pollution, noise pollution and control - Case Studies in current scenario.								
3	LAND RESOURCES AND ITS DEGRADATION				Total Hrs	9		
Land – weathering and erosion - types of weathering – types of soil – soil erosion – land slides – Wet land and deforestation- deserts – types – desertification – land degradation – features of desert – geochemical cycling – solid and hazardous waste, chemical waste, radio active waste – non hazardous waste - Case Studies in current scenario.								
4	FUTURE POLICY AND ALTERNATIVES				Total Hrs	9		
Future policy and alternatives – fossil fuels – nuclear energy – solar energy – wind energy – hydroelectric energy – geothermal energy – tidal energy – sustainability – green power – nano technology – international policy - - Case Studies in current scenario.								
5	BIO DIVERSITY AND HUMAN POPULATION				Total Hrs	9		
Introduction to Bio diversity-Definition, genetic species and ecosystem diversity. Biogeographical classification of India – Biodiversity in India – India as mega diversity nation – hotspots of biodiversity in India – threats to biodiversity – endemic and endangered- habitat – conservation of biodiversity – environment protection act – issues and possible solution – population growth - population explosion – environment and human health - Case Studies in current scenario.								
Total hours to be taught						45		
Text book :								
1.	Environmental Science by R.Palanivelu, R.Parimalam, and B.Srividhya							
References :								
1.	Linda D. Williams – “Environmental Science Demystified”, Tata McGraw Hill Publishing Company Limited, 2005							
2.	G. Tyler Miller, JR _ “Environnemental Science “, Thomson, 2004							
3.	William P. Cunningham – “Principles of Environmental Science”, Tata McGra Hill, New Delhi, 2007							
4.	Bharucha Erach –“The Biodiversity of INDIA”, Mapin Publishing Private Limited, Ahamedabad, India.							
5.	Trivedi R.K., “Hand Book of Environmental Laws, Rules, Guidelines, Compliances and Standards”, Volume I & II, Environmedia							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110205S	ELECTRICAL DRIVES AND CONTROL	3	1	0	4	50	50	100
Objective(s)	To impact knowledge on (i) Characteristics types of loads (ii) Constructional details, principle of operation and performance of DC and AC drives (iii) Application of electrical drives.							
1	INTRODUCTION				Total Hrs	12		
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors.								
2	DRIVE MOTOR CHARACTERISTICS				Total Hrs	12		
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound – AC single phase and three phase induction squirrel cage and slip ring induction motors – stepper motor.								
3	STARTING METHODS				Total Hrs	12		
Types of D.C. Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.								
4	CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES				Total Hrs	12		
Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers (Block diagram representation only) – applications.								
5	CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES				Total Hrs	12		
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – (Block diagram representation only) Applications.								
Total hours to be taught						60		
Text book(s):								
1	G. K. Dubey, “Fundamentals of Electrical Drives”, Narosa Publ. House, 1995.							
References :								
1	Vedam Subrahmaniam, “Electric Drives (concepts and applications)”, Tata McGraw-Hill, 2001.							
2	Nagrath.I.J. & kothari.D.P, “Electrical Machines”, Tata McGraw-Hill, 1998.							
3	Pillai.S.K “A first course on Electric drives”, Wiley Eastern Limited, 1998							
4	M.D.Singh, K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 1998.							
5	H.Partab, “Art and Science & Utilisation of electrical energy”, Dhanpat Rai & Sons, 1994.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110206S	FLUID MECHANICS AND MACHINERY	3	1	0	4	50	50	100
Objective(s)	To understand the basics of fluid flow concepts, providing the working principle of fluid machines, classification of fluids, fluid properties and governing equations. To help the learners to understand the real time machine principles.							

1	BASIC CONCEPTS AND PROPERTIES	Total Hrs	12
Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers.			
2	FLUID KINEMATICS AND FLUID DYNAMICS	Total Hrs	12
Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation -Equation of streamline - stream function – velocity potential function– fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube.			
3	INCOMPRESSIBLE FLUID FLOW	Total Hrs	12
Viscous flow - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) – Hydraulic and energy gradient - flow through pipes - Darcy - weisback's equation – pipe roughness -friction factor Moody's diagram-minor losses - flow through pipes in series and in parallel – power transmission.			
4	HYDRAULIC TURBINES	Total Hrs	12
Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagrams - head and specific work - components of energy transfer - degree of reaction. Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - Kaplan turbine - working principles - velocity triangles - work done.			
5	HYDRAULIC PUMPS	Total Hrs	12
Pumps: definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, Workdone - Reciprocating pump: classification, working principle, Basic principles of indicator diagram.			
Total hours to be taught			60

Text book(s):

1	Dr.Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 9th edition Laxmi publications (P) Ltd, New Delhi, 2005.

References :

1	Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
2	Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications (P) Ltd, New Delhi, 1995.
3	White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2003.
4	Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.
5	Som, S.K., and Biswas, G., "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, 2nd Edition, 2004.

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Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110207P	ENGINEERING GRAPHICS LABORATORY	1	0	3	3	50	50	100
Objective(s)	To develop graphical skills for communicating technical drawings, ideas and designs of engineering products and national / international standards relating to technical drawings and procedures. Further, to give knowledge in 2D and 3D drawing concepts to understand different types of solids in full and in section.							

1	CONCEPTS AND CONVENTIONS	Total Hrs	4
Importance of graphics in engineering communication of concepts and ideas in the design of engineering products – conventional and computer methods – layout, orthographic and isometric representation techniques - relative merits and demerits – 2D and 3d modeling - specifications of size and layout of drawing sheets – Lettering and dimensioning – conventions followed.			
2	CURVES AND SHAPES USED IN ENGINEERING PRODUCTS	Total Hrs	4
Primitive and Prismatic shapes - Conics – ellipse, parabola and hyperbola – equations used and parametric interpretations – ellipsoid, paraboloid and hyperboloid – involutes and cycloids – applications - tangents and normals – mathematical requirements – their importance and applications to engineering products.			
3	FREE HAND SKETCHING PRACTICES	Total Hrs	7
Representation of Three Dimensional objects – Need for and importance of multiple views and their orientations – Concept of orthographic projection - Developing skills through free hand sketching of multiple views from pictorial views of objects – isometric (pictorial) representation of objects from multiple views – simple exercises to practice.			
4	DEVELOPMENT OF SURFACES – PRACTICES	Total Hrs	5
Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones - freehand sketching practices - simple exercises to practice.			
5	2D DRAFTING	Total Hrs	20
Importance of 2D drafting – sketching, mirroring, scaling, copying (simple and multiple) dimensioning - wiring diagram and piping layout drawings - Practice of Computer Aided Drafting and dimensioning using appropriate software packages.			
6	SOLID MODELING	Total Hrs	20
3D modeling techniques - constructive solid geometry (CSG) and boundary representation (BRep) techniques - solid modeling of simple and moderately complex engineering products – table, chair, V-block, flange coupling (one) half, bolts and nuts, computer monitor, slotted angle rack and such other products - Practice of solid modeling and extraction of 2D views using appropriate software packages.			
Total hours to be taught			60

Text book(s):

1	K.V.Nataraajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2006.

References :

1	M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education, 2005.
2	Luzadder and Duff, “Fundamentals of Engineering Drawing” Prentice Hall of India Pvt. Ltd, XI Edition - 2001.
3	Dhananjay.A. Jolhe, “Engineering Drawing”, Tata McGraw Hill Publishing Co., 2007.
4	K.Venugopal, “Engineering Graphics”, New Age International (P) Limited, 2002.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110208P	ELECTRICAL ENGINEERING LABORATORY	0	0	3	2	50	50	100
Objective(s)	To equip students with electrical and electronics knowledge in several applications like motors and motor starters, more specifically load test on different type of motors, different type of speed control system.							

1	Load test on DC Shunt Motor	Total Hrs	3
2	Load test on DC Series motor	Total Hrs	3
3	Load test on DC compound motor	Total Hrs	3
4	Speed control of DC motor (Armature and field control)	Total Hrs	3
5	Speed control of DC motor (Ward – Leonard method)	Total Hrs	3
6	Speed control of three phase induction motor (Voltage control)	Total Hrs	3
7	Speed control of three phase induction motor (Voltage / frequency control)	Total Hrs	3
8	Load test on single phase Induction Motor	Total Hrs	3
9	Load test on three phase Induction motor	Total Hrs	3
10	No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)	Total Hrs	3
11	Speed control of three phase slip ring induction motor	Total Hrs	3
12	Study of DC motor and induction motor starters	Total Hrs	3
Total hours to be taught			45

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110209P	FLUID MECHANICS AND MACHINERY LABORATORY	0	0	3	2	50	50	100
Objective(s)	To equip students with fundamental knowledge in fluid properties, flow pattern, flow rate calculation, role of friction in flow rate calculation, types of pumps and characteristic of pumps and turbine.							

1	Determination of the Coefficient of discharge of given Orifice meter.	Total Hrs	3
2	Determination of the Coefficient of discharge of given Venturi meter.	Total Hrs	3
3	Calculation of the rate of flow using Rota meter.	Total Hrs	3
4	Determination of friction factor for a given set of pipes.	Total Hrs	3
5	Conducting experiments and drawing the characteristic curves of centrifugal pump	Total Hrs	3
6	Conducting experiments and drawing the characteristic curves of reciprocating pump.	Total Hrs	3
7	Conducting experiments and drawings characteristics curves of centrifugal blowers	Total Hrs	3
8	Conducting experiments and drawing the characteristic curves of Pelton wheel.	Total Hrs	3
9	Conducting experiments and drawing the characteristics curves of Francis turbine.	Total Hrs	3
10	Conducting experiments and drawing the characteristic curves of Kaplan turbine.	Total Hrs	3
Total hours to be taught			45

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110210P	COMPREHENSION I	0	0	3	0	100	00	100
Objective(s)	i. To improve the skill level of Engineering, Technology and Applied Science students. ii. To improve the employability of students in placement interviews.							
1	For each subject 200 Keywords/important words or terms (5 units x 40 words) are to be prepared using the students.							
2	These 200 Keywords are to be printed in double column (2 x 50 words) and in 2 pages and is to be handled over each student for all the subjects.							
3	The staff who handled the subject in the previous semester will handle their discussion period (3 periods / semester) as given below.							
4	The staff will question the students using 'W' and 'H' type questions linking the keywords.							
5	In a similar way the students have to prepare themselves for all the keywords.							
6	Each test will carry 100 questions and two hours duration. The questions will be of objective type: 'W' and 'H' type questions by attaching with keywords.							
7	Based on Test-I and Test-II, sessional marks (maximum 50 marks) will be awarded.							
8	Test-III will be held for all the units and all the subjects. The passing norms will be similar as other subjects (i.e. minimum 50/100 marks)							

Schedule for Conduct of Comprehension Subject		
Total No of weeks planned:10	Total No of subjects: 5 to 7	Total duration per week: 3 periods

Week No	Duration: 1½ period Subject No (No of units)	Duration: 1½ period Subject No (No of units)
W1	S1(3)	S2(3)
W2	S3(3)	S4(3)
W3	S5(3)	S6(3)
W4	Test-I (Portion: 3 units in each subject)	
W5	S1(2)	S2(2)
W6	S3(2)	S4(2)
W7	S5(2)	S6(2)
W8	Test-II (Portion: 2 units in each subject)	
W9	Discussion	
W10	Test-III (All 5 units and all the subjects)	

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110301G	ENGINEERING MATHEMATICS III	3	1	0	4	50	50	100
Objective(s)	The course objective is to impact analytical skills to the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.							
1	PARTIAL DIFFERENTIAL EQUATIONS				Total Hrs	12		
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of stand-ard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.								
2	FOURIER SERIES				Total Hrs	12		
Drichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series –Parseval's Identity – Harmonic Analysis.								
3	BOUNDARY VALUE PROBLEMS				Total Hrs	12		
Classification of second order quasi linear partial differential equations- Solutions of one dimensional wave equation – One dimensional heat equation-steady state solution of two dimensional heat equation (Insulated edges excluded)-Fourier series solutions in Cartesian coordinates.								
4	FOURIER TRANSFORM				Total Hrs	12		
Fourier trans form pair- Sine and Cosine transforms– Properties – Transforms of simple functions – Convolution theorem- Parseval's Identity – Problems.								
5	Z -TRANSFORM AND DIFFERENCE EQUATIONS				Total Hrs	12		
Z-transform - Elementary properties – Initial and final value theorem-Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.								
Total hours to be taught						60		
Text book(s):								
1	Veerarajan.T, "Engineering mathematics-III", Tata McGraw Hill Publishing Company Limited, New Delhi, 2007.							
References :								
1	Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillen , New York ,1988.							
2	Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.							
3	Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.							
4	Wylie C. Ray and Barrett Louis, C., "Advanced Engineering Mathematics", Sixth Edition, McGraw-Hill, Inc., New York, 1995.							
5	Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110302C	ENGINEERING THERMODYNAMICS	4	1	0	4	50	50	100
Objective(s)	To achieve an understanding of principles of thermodynamics and to be able to use it in accounting for the bulk behaviour of the simple physical systems. To provide in-depth study of thermodynamic principles, thermodynamics of state, basic thermodynamic relations, Principle of Psychrometry and Properties of pure substances. To enlighten the basic concepts of vapour power cycles.							
1	BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS				Total Hrs	12		
Basic concepts - concept of continuum, macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat. Concept of ideal and real gases. First law of thermodynamics – application to closed and open systems, internal energy, specific heat capacities, enthalpy, steady flow process with reference to nozzle and diffuser, turbine and compressor.								
2	SECOND LAW OF THERMODYNAMICS AND ENTROPY				Total Hrs	12		
Kelvin's and Clausius statements of second law, cyclic heat engine, equivalence of Kelvin Planck and Clausius statements, Reversibility and irreversibility, Carnot cycle, Carnot's theorem and thermodynamics temperature scale. Clausius theorem and its inequality, Entropy principle and applications – heat through finite temperature difference, mixing of two fluids								
3	PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE				Total Hrs	12		
Properties of pure substances – Thermodynamic properties of pure substances in solid, liquid and vapour phases, phase rule, P-V,T-S, P-T, H-S diagrams, dryness fraction and its measurements, thermodynamic properties of steam. Calculations of work done and heat transfer in flow processes. Rankine cycle, Reheat cycle and Regenerative cycle.								
4	THERMO DYNAMIC RELATIONS				Total Hrs	12		
Mathematical theorems, Maxwell's equation, TdS equation, difference in heat capacities, energy equation, Joule-Kelvin effect, Joule Thomson Coefficient, Clausius Clapeyron equation, equation of state, compressibility.								
5	PSYCHROMETRY				Total Hrs	12		
Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heating or cooling, cooling and dehumidification, heating and humidification adiabatic mixing.								
Total hours to be taught						60		
Text book (s) :								
1	Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 1998.							
Reference(s) :								
1	Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.							
2	Venwylen and Sontang, "Classical Thermodynamics", Wiley Eastern, 1987.							
3	Cengel, "Thermodynamics" An Engineering Approach, Third Edition, Tata Mc Graw Hill, New Delhi. 2003.							
4	Holman.J.P., "Thermodynamics", 3rd Edition. McGraw-Hill, 1995.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110303C	APPLIED MECHANICS	4	1	0	4	50	50	100
Objective(s)	At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.							

1	FUNDAMENTALS	Total Hrs	12
Introduction - Units and Dimensions - Laws of Mechanics – 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 – Principle of transmissibility – Single equivalent force.			
2	EQUILIBRIUM OF RIGID BODIES	Total Hrs	12
Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem - Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions.			
3	PROPERTIES OF SURFACES AND SOLIDS	Total Hrs	12
Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia - Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.			
4	DYNAMICS OF PARTICLES	Total Hrs	12
Displacement, Velocity, acceleration and their relationship – Relative motion – Curvilinear motion – Newton's law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.			
5	FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS	Total Hrs	12
Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction. Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.			
Total hours to be taught			60

Text book (s) :

1	Beer,F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, 1997.

Reference(s) :

1	Ashok Gupta, "Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)", Pearson Education Asia Pvt., Ltd., 2002.
2	Hibbeller, R.C."Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2000.
3	Irving H. Shames, "Engineering Mechanics - Statics and Dynamics", IV Edition – Pearson Education Asia Pvt. Ltd., 2003.
4	Palanichamy, M.S., Nagan, S., "Engineering Mechanics – Statics & Dynamics", Tata McGraw-Hill, 2001.
5	Rajasekaran, S, Sankarasubramanian, G., "Fundamentals of Engineering Mechanics", Vikas Publishing House Pvt. Ltd., 2000.

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Department	Mechanical Engineering		Programme Code & Name			11 : B.E. Mechanical Engineering		
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110304C	INSTRUMENTATION AND CONTROL SYSTEM	3	0	0	3	50	50	100
Objective(s)	To understand the principles of measurements, methods of measurement and its application in manufacturing industries.							
1	MEASUREMENTS				Total Hrs	9		
General Concepts - Units and Standards - Measuring instruments - Sensitivity, readability, range of accuracy, precision - Static and dynamic response - Repeatability hystersis - Systematic and random errors – Correction calibration								
2	INSTRUMENTS				Total Hrs	9		
Transducer, modifying (intermediate) and terminal stages - Mechanical and Electrical transducers – Preamplifiers-Charge amplifiers-Filters-Attenuators-D'arsonval-CRO-Oscillographs-Recorders-Microprocessor based data logging, processing and output.								
3	MEASUREMENTS ON PARAMETERS				Total Hrs	9		
Dimensions, displacement, velocity, acceleration, impact - Force, torque, power-Strain – Pressure - Humidity - Temperature - Flow-Time, frequency and phase angle - Noise and sound level; Flow visualization-Shadow graph, interferometer, schlieren, laser - Doppler Effect- Anemometer.								
4	AUTOMATIC CONTROL SYSTEMS				Total Hrs	9		
Basic elements - Feedback principle, implication of measurements - Error detectors - Final actuating Elements - Two Position, multiposition, floating proportional controls - Relays - Servo amplifiers - Servo motors - Mechanical, Electrical, magnetic, electronic, hydraulic, pneumatic systems.								
5	APPLICATION OF CONTROL SYSTEMS				Total Hrs	9		
Governing of speed - Kinetic and Process Control - Pressure, temperature, fluid level, flow - Thrust and flight control - Photoelectric controls.								
Total hours to be taught						45		
Text book(s):								
1	Beckwith T.G. and Lewis Buck N., "Mechanical Measurements ", Addison Wesley, 1991.							
Reference(s) :								
1	Adams L.F., "Measurement and Instrumentation ", The English Language Book Society, 1975.							
2	Donald P. Eckman, "Industrial Instrumentation ", Wiley Eastern, 1985.							
3	Holman J.P., "Experimental Methods for Engineers ", McGraw Hill Book Company, 1971.							
4	Pearson, Bric B, "Technology of Instrumentation ", English University Press Ltd., 1957.							
5	Sirhi R.S. and Radhakrishna H.C., "Mechanical Measurements ", Wiley Eastern Limited, 1983.							

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Department	Mechanical Engineering		Programme Code & Name			11 : B.E. Mechanical Engineering		
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110305C	MANUFACTURING TECHNOLOGY I	3	0	0	3	50	50	100
Objective(s)	To introduce the students to the concept of some basic manufacturing processes and fabrication techniques. Concept of metal casting, metal joining and metal forming are introduced.							
1	CASTING PROCESSES				Total Hrs	9		
Moulding sands - Types and properties. Patterns - Types of patterns. Selection of patterns. Pattern allowances. Classifications of castings according to mould materials and moulding methods. Special casting techniques. Fettling and finishing of castings. Defects in castings. Inspection of castings.								
2	FABRICATION PROCESSES				Total Hrs	9		
Classification of welding process: Principle of gas welding. Arc welding. Resistance welding. Solid state welding. Thermo chemical welding. Radiant energy welding. Brazing and soldering. Thermal cutting of metals or alloys.								
3	BULK DEFORMATION PROCESSES				Total Hrs	9		
Forging: Classification of forging processes. Forging processes. Forging defects and inspection. Rolling: Classification of rolling processes. Rolling mill. Rolling of bars and shapes. Extrusion: Classification of extrusion processes. Extrusion equipments. Examples. Drawing: Drawing of rods, wires and tubes.								
4	SHEET METAL FORMING PROCESSES				Total Hrs	9		
Sheet metal forming methods: Shearing, Blanking, Bending, Stretch forming, Deep forming. Spinning processes.								
5	SPECIAL FORMING PROCESSES AND PLASTICS				Total Hrs	9		
High Velocity Forming: Explosive forming, Electro hydraulic forming. Magnetic pulse forming. Pneumatic. Mechanical high velocity forming. Plastics working: Types of plastics. Plastic moulding processes.								
Total hours to be taught						45		
Text book (s) :								
1	Hajra Choudhury, Elements of Workshop Technology, Vol. I and II, Media Promotors Pvt Ltd., Mumbai, 2001.							
Reference(s) :								
1	Chapman, W.A.J., “Production Technology” Vol II,Oxford & IBH Publishing Co. Ltd., 1986.							
2	JainR.K., “Production Technology”,KhannaPublishers, 2001							
4	HMT Production Technology, Tata McGraw-Hill Publishing Limited, 1994.							
5	Serope Kalpajian, Steven R.Schmid, Manufacturing Engineering and Technology, Pearson Education, Inc. 2002(Second Indian Reprint).							
6	Rao P.N., Manufacturing Technology, Tata McGraw-Hill Publishing Limited, II Edition, 2002.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110306C	ELECTRONICS AND MICROPROCESSORS	3	0	0	3	50	50	100
Objective(s)	To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors.							
1	SEMICONDUTORS AND RECTIFIERS				Total Hrs	9		
Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors type and N-type –PN junction-Zenor effect-Zenor diode characteristics-Half wave and full wave rectifiers-Bridge rectifiers.								
2	TRANSISTORS AND AMPLIFIERS				Total Hrs	9		
Bipolar junction transistor- Class A, B and C amplifiers- Field effect transistor-Characteristics and applications-Concept of feedback-Negative feedback-Application in temperature and motor speed control.								
3	DIGITAL ELECTRONICS				Total Hrs	9		
Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra-Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters.								
4	8085 MICROPROCESSOR				Total Hrs	9		
Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set-Addressing modes-Simple programs using arithmetic and logical operations.								
5	INTERFACING AND APPLICATIONS OF MICROPROCESSOR				Total Hrs	9		
Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.								
Total hours to be taught						45		
Text book (s) :								
1	Salivahanan S, Suresh Kumar N, Vallavaraj A, “Electronic Devices and Circuits” First Edition, Tata McGraw-Hill, 1999.							
Reference(s) :								
1	Dougles V.Hall, “Microprocessor and Interfacing”, Programming and Hardware, Tata McGraw-Hill, 1999.							
2	Malvino and Leach, “Digital Principles and Applications”, Tata McGraw-Hill, 1996.							
3	Mehta V.K, “Principles of Electronics”, S. Chand and Company Ltd, 1994.							
4	Milman and Halkias, “Integrated Electronics”, Tata McGraw-Hill publishers, 1995.							
5	Ramesh Goankar, “Microprocessor Architecture”, Programming and Applications with 8085, Wiley Eastern, 1998.							

<table>
<tr><td colspan="7">K.S.Rangasamy College of Technology - Autonomous Regulation</td><td>R 2007</td></tr>
<tr><td>Department</td><td colspan="2">Mechanical Engineering</td><td colspan="2">Programme Code & Name</td><td colspan="3">11 : B.E. Mechanical Engineering</td></tr>
<tr><td colspan="8">Semester III</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours / Week</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>07110307P</td><td>MANUFACTURING TECHNOLOGY LABORATORY I</td><td>0</td><td>0</td><td>3</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">To introduce the students to the concept of some basic manufacturing processes and fabrication techniques. Concept of metal casting, metal joining and metal forming are introduced.</td></tr>
<tr><td>1</td><td colspan="4">PREPARATION OF SAND MOULD
i) Mould with solid, split patterns
ii) Mould with loose-piece pattern
iii) Mould with Core</td><td>Total Hrs</td><td colspan="3">8</td></tr>
<tr><td>2</td><td colspan="4">WELDING
Arc welding of Single V- butt joint, double V- butt joint
Gas welding Practices</td><td>Total Hrs</td><td colspan="3">8</td></tr>
<tr><td>3</td><td colspan="4">SHEET METAL
Fabrication of sheet metal components with riveting</td><td>Total Hrs</td><td colspan="3">8</td></tr>
<tr><td>4</td><td colspan="4">SMITHY
Tools and Equipments - Making simple parts.</td><td>Total Hrs</td><td colspan="3">8</td></tr>
<tr><td>5</td><td colspan="4">MACHINE ASSEMBLY PRACTICE
Assembling of mechanical equipments</td><td>Total Hrs</td><td colspan="3">8</td></tr>
<tr><td>6</td><td colspan="4">STUDY
i) Study of industrial trusses.
ii) Study of Pipe fittings</td><td>Total Hrs</td><td colspan="3">5</td></tr>
<tr><td colspan="6">Total hours to be taught</td><td colspan="3">45</td></tr>
</table>

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110308P	METROLOGY, METALLURGY AND INSTRUMENTATION LABORATORY	0	0	3	2	50	50	100
Objective(s)	To understand the instrumentation system and measurements of various parameters.							

1	Torque Measurement	Total Hrs	3
2	Force Measurement	Total Hrs	3
3	Pressure Measurement	Total Hrs	3
4	Temperature Measurement	Total Hrs	3
5	Strain Measurement	Total Hrs	3
6	Velocity and Acceleration Measurement	Total Hrs	3
7	Vacuum Measurement	Total Hrs	3
8	Displacement Measurement	Total Hrs	3
9	Floating Gauge Micrometer	Total Hrs	3
10	Auto Collimator	Total Hrs	3
11	Tool Maker’s Microscope	Total Hrs	3
12	Profile projector	Total Hrs	3
13	Angle Measurement Using Sine Bar	Total Hrs	3
14	Preparation of Specimen	Total Hrs	3
15	Microscopic study of ferrous metals	Total Hrs	3
16	Microscopic study of non-ferrous metals	Total Hrs	3
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110309P	ELECTRONICS AND MICROPROCESSOR LABORATORY	0	0	3	2	50	50	100
Objective(s)	To enable the students to understand the fundamental concepts of Semi Conductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors and using microprocessor to do various operations.							

ELECTRONICS			
Study of the following			
1	Characteristics of PN Junction Diode	Total Hrs	2
2	Characteristics of Zener Diode	Total Hrs	2
3	Characteristics of CE Transistor	Total Hrs	2
4	Characteristics of JFET	Total Hrs	2
5	Characteristics of Uni-Junction Transistor	Total Hrs	2
6	Logic Gates (Basic Gates)	Total Hrs	2
7	Half Adder and Full Adder	Total Hrs	2
8	Shift Registers and Counters	Total Hrs	1
MICROPROCESSOR			
1	Block Transfer	Total Hrs	5
2	8 bit Addition, Subtraction	Total Hrs	5
3	Multiplication and Division	Total Hrs	5
4	Maximum and Minimum of block of data	Total Hrs	5
5	Sorting	Total Hrs	5
6	Stepper Motor Interfacing	Total Hrs	5
Total hours to be taught			45

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester III								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110310P	COMPREHENSION II	0	0	3	0	100	00	100
Objective(s)	i. To improve the skill level of Engineering, Technology and Applied Science students. ii. To improve the employability of students in placement interviews.							
1	For each subject 200 Keywords/important words or terms (5 units x 40 words) are to be prepared using the students.							
2	These 200 Keywords are to be printed in double column (2 x 50 words) and in 2 pages and is to be handled over each student for all the subjects.							
3	The staff who handled the subject in the previous semester will handle their discussion period (3 periods / semester) as given below.							
4	The staff will question the students using 'W' and 'H' type questions linking the keywords.							
5	In a similar way the students have to prepare themselves for all the keywords.							
6	Each test will carry 100 questions and two hours duration. The questions will be of objective type: 'W' and 'H' type questions by attaching with keywords.							
7	Based on Test-I and Test-II, sessional marks (maximum 50 marks) will be awarded.							
8	Test-III will be held for all the units and all the subjects. The passing norms will be similar as other subjects (i.e. minimum 50/100 marks)							

Schedule for Conduct of Comprehension Subject		
Total No of weeks planned:10	Total No of subjects: 5 to 7	Total duration per week: 3 periods

Week No	Duration: 1½ period Subject No (No of units)	Duration: 1½ period Subject No (No of units)
W1	S1(3)	S2(3)
W2	S3(3)	S4(3)
W3	S5(3)	S6(3)
W4	Test-I (Portion: 3 units in each subject)	
W5	S1(2)	S2(2)
W6	S3(2)	S4(2)
W7	S5(2)	S6(2)
W8	Test-II (Portion: 2 units in each subject)	
W9	Discussion	
W10	Test-III (All 5 units and all the subjects)	

K.S.Rangasamy College of Technology - Autonomous Regulation									R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering				
Semester III									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
07110311P	CAREER COMPETENCY DEVELOPMENT I	0	0	2	0	100	00	100	
Objective(s)	i. To improve the skill level of Engineering, Technology and Applied Science students. ii. To improve the employability of students in placement interviews								
Skills sets to be improved	a. Aptitude skills • Arithmetic ability • Verbal Reasoning • Non verbal Reasoning b. Programming Skills • C Language • AutoCAD • ProE c. Written Communication Skills • Comprehension • Grammar • Essay Writing • Technical Report Writing • Technical Paper Writing d. Oral Communication Skills • News Reading • Informing a News item • Self introduction • 2 Minutes Talk – Informed • 2 Minutes Talk – Extempore e. Technical Paper Presentation • Presenting a paper on recent topics f. Group Interaction • Debate • Group Discussion – Informed Topic • Group Discussion – Topic on the spot g. Technical Interview Skills • Basic MPC knowledge • Broad Knowledge of the branch • Indepth knowledge on specific subjects of interest h. HR Interview Skills • Adoptability • Creativity • Flexibility • Achievement orientation • Continuous learning • Hardworking nature • Decisiveness • Self development • Questioning								
Focus	The focus of CCD is to develop these in three semesters (CCD-I, II and III) and reinforce them in another two semesters (CCD IV and V).								
Execution	• Total No. of weeks : 12 • 3 Hrs/week and 2 credits • Only Continuous Assessment and No End Semester examination. • Evaluation based on written test, oral test and technical paper presentation. • Every 20 students should be engaged by a staff member during communication hour and oral test								

	• Every 30 students should be monitored by a staff member to conduct written test.	
Schedule	Week	Activity
	1	Training
	2	Training
	3	Evaluation I - Written
	4	Evaluation I - Oral
	5	Training
	6	Evaluation II - Written
	7	Evaluation II - Oral
	8	Training
	9	Evaluation III - Written
	10 - 12	Evaluation III - Oral
Evaluation	Evaluation I	60 marks(average of 3 tests)
	Evaluation II	20 marks
	Evaluation III	20 marks
	Total	100 marks

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110401S	PROBABILITY AND STATISTICS	3	1	0	4	50	50	100
Objective(s)	At the end of the course, the students would Acquire skills in handling situations involving more than one random variable and functions of random variables. Be introduced to the notion of sampling distributions and have acquired knowledge of statistical techniques useful in making rational decision in management problems. Be exposed to statistical methods designed to contribute to the process of making scientific judgments in the face of uncertainty and variation.							
1	PROBABILITY AND RANDOM VARIABLE				Total Hrs	12		
Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions - Properties- Moments - Moment generating functions and their properties.								
2	STANDARD DISTRIBUTIONS				Total Hrs	12		
Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties.								
3	TWO DIMENSIONAL RANDOM VARIABLES				Total Hrs	12		
Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.								
4	TESTING OF HYPOTHESIS				Total Hrs	12		
Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.								
5	DESIGN OF EXPERIMENTS				Total Hrs	12		
Analysis of variance – One way classification – Completely Randomized block Design - Two – way classification – Randomized Block Design - Latin square.								
Total hours to be taught						60		
Text book (s) :								
1	Gupta, S.C, and Kapur, J.N., “Fundamentals of Mathematical Statistics”, Sultan Chand, Ninth edition, New Delhi, 1996.							
Reference(s) :								
1	Ross. S., “A first Course in Probability”, Fifth Edition, Pearson Education, Delhi 2002.							
2	Johnson. R. A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000.							
3	Lipschutz. S and Schiller. J, “Schaum’s outlines - Introduction to Probability and Statistics”, McGraw-Hill, New Delhi, 1998.							
4	Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, “Probability and Statistics for Engineers and Scientists”, Seventh Edition, Pearsons Education, Delhi, 2002.							
5	Johnson. R. A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12).							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110402C	THERMAL ENGINEERING	4	1	0	4	50	50	100
Objective(s)	To integrate the concepts, laws and methodologies from the first course in thermodynamics into the analysis of cyclic process. To apply the thermodynamic concepts into various thermal application like I.C engines Steam turbines and Refrigeration and Air conditioning Systems.							
1	GAS POWER CYCLES				Total Hrs	12		
Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure and air standard efficiency, Actual and theoretical P-V diagram of Four stroke engines, Actual and theoretical P-V diagram of two stroke engines.								
2	INTERNAL COMBUSTION ENGINES				Total Hrs	12		
Classification of I-C engines, I-C engine components and functions. Valve timing diagram and port timing diagram. Comparison of two stroke and four stroke engines. Fuel supply systems, Ignition Systems, Performance calculation. Comparison of petrol and diesel engine. Fuels, Air-fuel ratio calculation, Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control norms.								
3	STEAM BOILERS, MOUNTINGS AND ACCESSORIES				Total Hrs	12		
Classification of steam boilers, simple vertical boiler, Cochran boiler, Lancashire boiler, Babcock-Wilcox boiler. Loffler boiler, La-mount, Benson boilers. Difference between fire tube and water tube, low pressure and high pressure boiler. Boiler mountings and accessories.								
4	STEAM NOZZLES AND TURBINES				Total Hrs	12		
Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and reaction principles, compounding, velocity diagrams for simple and multistage turbines, speed regulations-governors and nozzle governors.								
5	REFRIGERATION AND AIR CONDITIONING				Total Hrs	12		
Introduction to Vapour Compression Refrigeration Systems - Working of a simple Vapour Compression Refrigeration System. Introduction to Vapour Absorption refrigeration System, working of Vapour Absorption Refrigeration System. Advantages of Vapour Compression System. Properties of a Refrigerant. Refrigerant Commonly used in Practice. Simple problems in VCRS. Introduction to Air Conditioning System-factors affecting comfort Air Conditioning. Classification of Air Conditioning summer Air Conditioning- winter Air Conditioning- year-round Air Conditioning, unitary Air conditioning.								
Total hours to be taught						60		
Text book (s) :								
1	Rajput, “Thermal Engineering”, S. Chand publishers, 2000.							
2	Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., “A course in Thermal Engineering”, Dhanpat Rai & Sons, Fifth edition, 2002.							
Reference(s) :								
1	Eastop and McConkey, “Applied Thermodynamics”, Addison Wesley, New Delhi. 1999.							
2	Khurmi R.S. and Guptha J.K., “Thermal Engineering”, S. Chand publishers, 2006.							
3	Rogers and Mayhew, ‘Engineering Thermodynamics – Work and Heat Transfer’, Addision Wesley, New Delhi, 1999.							
4	Rudramoorthy R, “Thermal Engineering”, Tata McGraw-Hill, New Delhi, 2003.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110403C	STRENGTH OF MATERIALS	4	1	0	4	50	50	100
Objective(s)	To gain knowledge of simple stresses, strains and deformation in components due to external loads. To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both. Effect of component dimensions and shape on stresses and deformations are to be understood. The study would provide knowledge for use in the design courses.							
1	STRESS, STRAIN AND DEFORMATION OF SOLIDS				Total Hrs	12		
Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses-Strain-Types of stresses –Stress strain diagram –Hook's Law-Factor of safety– Deformation of simple and compound bars under axial load – Bars of varying cross section-Thermal stress and strain– Elastic constants –Poisson's ratio-Volumetric Strain-Relation between E,C and K– Strain energy – Strain energy in uni axial loads.								
2	BEAMS - LOADS AND STRESSES				Total Hrs	12		
Types of beams: Supports and Loads – Shear force and Bending Moment in beams-Sign Convention – Cantilever, Simply supported and Overhanging beams – Relation between w, F and M -Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams.								
3	TORSION				Total Hrs	12		
Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Strength of a shaft and torsional stiffness – Composite shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – stresses in helical coil springs under torsion loads.								
4	BEAM DEFLECTION				Total Hrs	12		
Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method, Macaulay Method, and Moment-area Method –Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns.								
5	ANALYSIS OF STRESSES IN TWO DIMENSIONS				Total Hrs	12		
Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr's circle for biaxial stresses – Maximum shear stress - Strain energy in bending and torsion.								
Total hours to be taught						60		
Text book (s) :								
1	Bansal R.K, "Strength of materials", Laxmi Publications (P) ltd, New Delhi, 2004.							
Reference(s) :								
1	Beer F. P. and Johnston R, "Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002.							
2	Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995.							
3	Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997.							
4	Rajput .R.K, "Strength of materials" , S.Chand &Company Ltd, New Delhi,2003.							

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Department	Mechanical Engineering		Programme Code & Name		11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110404C	MANUFACTURING TECHNOLOGY II	3	0	0	3	50	50	100
Objective(s)	To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching. To understand the basic concepts of computer numerical control (CNC) machine tool and CNC programming.							
1	THEORY OF METAL CUTTING				Total Hrs	9		
Introduction: material removal processes, types of machine tools – theory of metal cutting: chip formation, orthogonal metal cutting, cutting tool materials, tool nomenclature, tool wear, tool life, surface finish, cutting fluids.								
2	CENTRE LATHE				Total Hrs	9		
Centre lathe, constructional features, cutting tools, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation.								
3	SPECIAL PURPOSE LATHES				Total Hrs	9		
Capstan and turret lathes – automatic lathes: semi automatic, automats – single spindle: cutting off, Swiss type, automatic screw type – multi spindle; cutting off, bar type.								
4	RECIPROCATING AND MILLING MACHINE				Total Hrs	9		
Reciprocating machine tools: shaper, planer, slotter; milling: types, milling cutters, operations; hole making : drilling, reaming, boring, tapping - machining time and power estimation for the above processes.								
5	ABRASIVE PROCESS, BROACHING AND GEAR CUTTING				Total Hrs	9		
Abrasive processes: grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding – honing, lapping, super finishing, polishing and buffing, abrasive jet grinding .Sawing machine: hack saw, band saw, circular saw; broaching machines: broach construction – push, pull, surface and continuous broaching machines, gear cutting: forming, generation, shaping, hobbing.								
Total hours to be taught						45		
Text book (s) :								
1	Choudhry, S.K.H., "Elements of Work Shop Technology, VoL II", Media Promotors Pvt Ltd., Mumbai, 2001.							
Reference(s) :								
1	HMT, "Production Technology", Tata McGraw Hill, 2005.							
2	Khanna,O.P., and Lal,M., " A Text Book of Production Technology" , Vol II , Dhanpat Rai & Sons, 1999.							
3	Kundra, T.K., Rao., P.N., and Tiwari, NLK.,, "Numerical Control and Computer Aided Manufacturing", Tata McGraw Hill,1996.							
4	Yoram Koren, "Computer Control of Manufactuting Systems", McGraw Hill,1998.							
5	Rao, P.N. "Manufacturing Technology", Metal Cutting and Machine Tools, Tata McGraw–Hill, New Delhi, 2003.							

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Department	Mechanical Engineering	Programme Code & Name		11 : B.E. Mechanical Engineering				
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110405C	THEORY OF MACHINES I	4	1	0	4	50	50	100
Objective(s)	To understand the layout of linkages in the assembly of a system/machine. To study the principles involved in assessing the displacement, velocity and acceleration at any point in a link of a mechanism To analyse the motion resulting from a specified set of linkages in a mechanism.							
1	BASIC OF MECHANISMS				Total Hrs	12		
Mechanisms, Classification of mechanisms, Kinematic inversions, Grashoff's law, Inversions of slider crank mechanism, Coupler curves, Spatial mechanisms, Straight line generators.								
2	POSITION ANALYSIS				Total Hrs	12		
Slider crank mechanisms and four bar mechanism, Velocities of points on a rigid body, Relative velocity, Velocity polygon, Acceleration of points on a rigid body, Relative acceleration, Acceleration polygon, Coriolis acceleration and Analytical method.								
3	KINEMATICS SYNTHESIS OF MECHANISMS				Total Hrs	12		
Chebyshev spacing for precision positions. Structural error Overlay method. Complex curve synthesis. Roberts's chebyshev theorem. Frudenstine's equation. Analytical synthesis using complex algebra. Synthesis of dwell mechanism.								
4	CAM AND FOLLOWERS				Total Hrs	12		
Classification of cam and follower. Displacement diagrams. Graphical layouts of cam profiles. Derivatives of follower motion. High speed cams standard motions. Plate cams with flat face and roller followers.								
5	GEARING AND GEAR TRAINS				Total Hrs	12		
Terminology and definitions. Law of gearing. Profile for gears. Involute gearing. Interchangeability. Interference and undercutting. Contact ratio. Standard and sub gear teeth. Contact ratio. Gear trains. Types. Parallel axis gear trains. Epicyclic gear trains.								
Total hours to be taught						60		
Text book (s) :								
1	R S Khurumi., "Theory of machines", first multicolor illustrative edition., S.Chand &company Ltd.,2005.							
Reference(s) :								
1	J.S.Rao, and Dukkipati, R.Y., Mechanism and Machine Theory, 2nd ed., Wiley Eastern Ltd., 1995.							
2	J.E.Shigley., Vicker Jr., J.J., Theory of Machines and Mechanisms, McGraw-Hill, 1995.							
3	S.S.Rattan , "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110406C	OBJECT ORIENTED PROGRAMMING	3	0	0	3	50	50	100
Objective(s)	Understand the concepts of OOP. Write simple applications using C++ and Java. Compare and contrast features of C++ and Java.							

1	INTRODUCTION	Total Hrs	9
Object-oriented paradigm, elements of object oriented programming-merits and demerits of OO methodology – C++ fundamentals – data types, operators and expressions, control flow, arrays, strings, pointers and functions			
2	PROGRAMMING IN C++	Total Hrs	9
Classes and objects – constructors and destructors, operators overloading – inheritance, virtual functions and polymorphism.			
3	FILE HANDLING	Total Hrs	9
C++ streams – console streams – console stream – formatted and unformatted console I/O operations, manipulators – file streams – classes file modes file pointers and manipulations file I/O – Exception handling			
4	JAVA INTRODUCTION	Total Hrs	9
An overview of Java, data types, variables and arrays, operators, control statements, classes, objects, methods – inheritance.			
5	JAVA PROGRAMMING	Total Hrs	9
Packages and interfaces, exception handling multithreaded programming, streams, Input / output.			
Total hours to be taught			45

Text book (s) :	
1	E. Balagurusamy, “Object Oriented Programming with C++”, McGraw-Hill, 2000.
2	E. Balagurusamy, “Object Oriented Programming with Java”, McGraw-Hill, 2000.
Reference(s) :	
1	K.R. Venugoal, Rajkumar Buyya, T.Ravisankar, “Mastering C++”, McGraw-Hill, (Unit I, II & III), 2003.
2	Herbert Schildt, “The Java 2 : Complete Reference”, Fourth edition, McGraw-Hill, 2002 (Unit I, II & III)
3	John R Hubbard, “Programming with C++”, Schaums Outline Series, McGraw-Hill, 2003.
4	H.M.Deitel, P.J.Deitel, “Java: How to Program”, Fifth Edition, Prentice Hall of India Private Limited, 2005.

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Department	Mechanical Engineering			Programme Code & Name		11 : B.E. Mechanical Engineering		
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110407P	THERMAL ENGINEERING LABORATORY	0	0	3	2	50	50	100
Objective(s)	To integrate the concepts, laws and methodologies from the first course in thermodynamics into the analysis of cyclic process. To apply the thermodynamic concepts into various thermal application like I.C engines, Steam turbines, Compressors and Refrigeration and Air conditioning Systems.							

1.	Introduction on thermal engineering laboratory experiments and their usefulness	Total Hrs	6
2.	Valve Timing and Port Timing Diagrams	Total Hrs	3
3.	Performance Test on 4-Stroke Diesel Engine	Total Hrs	3
4.	Heat Balance Test on 4-Stroke Diesel Engine	Total Hrs	3
5.	Morse Test on Multi-Cylinder Petrol Engine	Total Hrs	3
6.	Retardation Test to find Frictional Power of a Diesel Engine	Total Hrs	3
7.	Determination of Viscosity by Red Wood Viscometer	Total Hrs	3
8.	Determination of Flash Point and Fire Point	Total Hrs	3
9.	Performance test on Vapour Compression Refrigeration System	Total Hrs	3
10.	Performance and Energy Balance Test on a Steam Generator	Total Hrs	3
11.	Performance and Energy Balance Test on Steam Turbine	Total Hrs	3
12.	Performance test on Two Stage Air Compressor	Total Hrs	3
13.	Performance test on Air Conditioning System	Total Hrs	3
14.	Studies of Aerodynamic Shape using Wind Tunnel	Total Hrs	3
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110408P	STRENGTH OF MATERIALS LABORATORY	0	0	3	2	50	50	100
Objective(s)	To gain knowledge of simple stresses, strains and deformation in components due to external loads. To assess stresses and deformations through mathematical models of beams, twisting bars or combinations of both. Effect of component dimensions and shape on stresses and deformations are to be understood. The study would provide knowledge for use in the design courses.							

1	Tension test on a mild steel rod	Total Hrs	3
2	Double shear test on Mild steel and Aluminium rods	Total Hrs	3
3	Torsion test on mild steel rod	Total Hrs	3
4	Impact test on metal specimen	Total Hrs	3
5	Hardness test on metals - Brinnell and Rockwell Hardness Number	Total Hrs	3
6	Deflection test on beams	Total Hrs	3
7	Compression test on helical springs	Total Hrs	3
8	Compression test on wood specimen	Total Hrs	3
9	Compression test on brick specimen	Total Hrs	3
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110409P	MANUFACTURING TECHNOLOGY LABORATORY II	0	0	3	2	50	50	100
Objective(s)	To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching. To understand the basic concepts of computer numerical control (CNC) machine tool and CNC programming.							

1	Cutting Force Measurement	Total Hrs	5
2	Exercises in Slotter	Total Hrs	5
3	Exercises in centre lathe	Total Hrs	5
4	Exercises in Capstan and Turret Lathes	Total Hrs	5
5	Exercises in Drilling	Total Hrs	5
6	Exercises in shaping and planning Machines	Total Hrs	5
7	Exercises in Milling Machines	Total Hrs	5
8	Exercises in Grinding / Abrasive machining	Total Hrs	5
9	Gear Machining	Total Hrs	5
Total hours to be taught			45

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester IV								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110410P	COMPREHENSION III	0	0	3	0	100	00	100
Objective(s)	i. To improve the skill level of Engineering, Technology and Applied Science students. ii. To improve the employability of students in placement interviews.							
1	For each subject 200 Keywords/important words or terms (5 units x 40 words) are to be prepared using the students.							
2	These 200 Keywords are to be printed in double column (2 x 50 words) and in 2 pages and is to be handled over each student for all the subjects.							
3	The staff who handled the subject in the previous semester will handle their discussion period (3 periods / semester) as given below.							
4	The staff will question the students using 'W' and 'H' type questions linking the keywords.							
5	In a similar way the students have to prepare themselves for all the keywords.							
6	Each test will carry 100 questions and two hours duration. The questions will be of objective type: 'W' and 'H' type questions by attaching with keywords.							
7	Based on Test-I and Test-II, sessional marks (maximum 50 marks) will be awarded.							
8	Test-III will be held for all the units and all the subjects. The passing norms will be similar as other subjects (i.e. minimum 50/100 marks)							

Schedule for Conduct of Comprehension Subject		
Total No of weeks planned:10	Total No of subjects: 5 to 7	Total duration per week: 3 periods

Week No	Duration: 1½ period Subject No (No of units)	Duration: 1½ period Subject No (No of units)
W1	S1(3)	S2(3)
W2	S3(3)	S4(3)
W3	S5(3)	S6(3)
W4	Test-I (Portion: 3 units in each subject)	
W5	S1(2)	S2(2)
W6	S3(2)	S4(2)
W7	S5(2)	S6(2)
W8	Test-II (Portion: 2 units in each subject)	
W9	Discussion	
W10	Test-III (All 5 units and all the subjects)	

<table>
<tr><td colspan="7">K.S.Rangasamy College of Technology - Autonomous Regulation</td><td>R 2007</td></tr>
<tr><td>Department</td><td>Mechanical Engineering</td><td colspan="3">Programme Code & Name</td><td colspan="3">11 : B.E. Mechanical Engineering</td></tr>
<tr><td colspan="8">Semester IV</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours / Week</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>07110411P</td><td>CAREER COMPETENCY DEVELOPMENT II</td><td>0</td><td>0</td><td>2</td><td>0</td><td>100</td><td>00</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">i. To improve the skill level of Engineering, Technology and Applied Science students.
ii. To improve the employability of students in placement interviews</td></tr>
<tr><td>Skills sets to be improved</td><td colspan="7">a. Aptitude skills
• Arithmetic ability
• Verbal Reasoning
• Non verbal Reasoning
b. Programming Skills
• C Language
• AutoCAD
• ProE
c. Written Communication Skills
• Comprehension
• Grammar
• Essay Writing
• Technical Report Writing
• Technical Paper Writing
d. Oral Communication Skills
• News Reading
• Informing a News item
• Self introduction
• 2 Minutes Talk – Informed
• 2 Minutes Talk – Extempore
e. Technical Paper Presentation
• Presenting a paper on recent topics
f. Group Interaction
• Debate
• Group Discussion – Informed Topic
• Group Discussion – Topic on the spot
g. Technical Interview Skills
• Basic MPC knowledge
• Broad Knowledge of the branch
• Indepth knowledge on specific subjects of interest
h. HR Interview Skills
• Adoptability
• Creativity
• Flexibility
• Achievement orientation
• Continuous learning
• Hardworking nature
• Decisiveness
• Self development
• Questioning</td></tr>
<tr><td>Focus</td><td colspan="7">The focus of CCD is to develop these in three semesters (CCD-I, II and III) and reinforce them in another two semesters (CCD IV and V).</td></tr>
<tr><td>Execution</td><td colspan="7">• Total No. of weeks : 12
• 3 Hrs/week and 2 credits
• Only Continuous Assessment and No End Semester examination.
• Evaluation based on written test, oral test and technical paper presentation.
• Every 20 students should be engaged by a staff member during communication hour and oral test</td></tr>
</table>

	• Every 30 students should be monitored by a staff member to conduct written test.	
Schedule	Week	Activity
	1	Training
	2	Training
	3	Evaluation I - Written
	4	Evaluation I - Oral
	5	Training
	6	Evaluation II - Written
	7	Evaluation II - Oral
	8	Training
	9	Evaluation III - Written
	10 - 12	Evaluation III - Oral
Evaluation	Evaluation I	60 marks(average of 3 tests)
	Evaluation II	20 marks
	Evaluation III	20 marks
	Total	100 marks

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering		Program code & Name		11 : B.E. Mechanical Engineering			
Semester V								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110501S	PROFESSIONAL ETHICS	3	0	0	3	50	50	100
Objectives	To create an awareness on Ethics and Human Values and instill Moral and Social Values in Students.							
1	INTRODUCTION				Total Hrs	9		
Ethics defined – Engineering as a profession – Core qualities of professional practitioners – Theories of right action – Major ethical issues – Three types of inquiry – Kohlberg's stages of moral development – Carol Gilligan theory – Moral dilemmas – Moral autonomy – Value based ethics.								
2	ENGINEERING AS SOCIAL EXPERIMENTATION				Total Hrs	9		
Comparison with standard experiments – Relevant information – Learning from the past – Engineers as managers, consultants and leaders – Accountability – Role of codes – Code of ethics for engineers; introduction, rules of practice and professional obligations – The space shuttle challenger case study.								
3	ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK				Total hrs	9		
Safety and Risk – Types of risks – Safety and the engineer – Designing for safety – Risk Benefit analysis – Accidents - The three mile Island disaster case study – The Chernobyl disaster case study.								
4	RESPONSIBILITIES AND RIGHTS				Total Hrs	9		
Collegiality – Two senses of loyalty – Professional rights and responsibilities – Conflict of Interest – Collective Bargaining – Confidentiality – Acceptance of bribes / gifts – Occupational crimes – Whistle Blowing.								
5	GLOBAL ISSUES				Total Hrs	9		
Gloabalization – Cross Cultural Issues – The Bhopal gas tragedy case study – Computer ethics – Weapons development – Intellectual property rights (IPR)								
Total hours to be taught						45		
Text book :								
1	Govindarajan M, Natarajan S, Senthil Kumar V.S, "Engineering Ethics", Prentice Hall of India (P) Ltd, New Delhi, 2005.							
References:								
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 Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester V								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110502C	AUTOMOBILE ENGINEERING	3	0	0	3	50	50	100
Objective(s)	To impact knowledge to students in various systems of Automobile Engineering and to have the practice for Assembling and Dismantling of Engine Parts.							
1	VEHICLE STRUCTURE AND ENGINES				Total Hrs	9		
Types 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 – Turbo Chargers – Engine Emission Control by 3–Way Catalytic Controller – Electronic Engine Management System.								
2	ENGINE AUXILIARY SYSTEMS				Total Hrs	9		
Carburetor–working principle- Electronic fuel injection system – Mono-point and Multi -point Injection Systems – Construction, Operation and Maintenance of Lead Acid Battery - Electrical systems – Battery Generator – Starting Motor and Drives – Lighting and Ignition (Battery, Magneto Coil and Electronic Type)-Regulators-Cut outs.								
3	TRANSMISSION SYSTEMS				Total Hrs	9		
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.								
4	STEERING, BRAKES AND SUSPENSION				Total Hrs	9		
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 – Diagonal Braking System – Antilock Braking System.								
5	ALTERNATIVE ENERGY SOURCES				Total Hrs	9		
Use of Natural Gas, LPG, Biodiesel, Gasohol and Hydrogen in Automobiles - Electric and Hybrid Vehicles, Fuel Cells.								
Total hours to be taught						45		
Text book (s) :								
1	Sethi H.M, “Automobile Technology”, Tata McGraw-Hill, 2003.							
2	Kirpal Singh “Automobile Engineering Vol. 1& 2”, Standard Publishers, New Delhi, 1997.							
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, Tata McGraw-Hill, 2003.							
4	Joseph Heitner, “Automotive Mechanics”, 2nd edition, East-West Press, 1999.							

<table>
<tr><td colspan="7">K.S.Rangasamy College of Technology - Autonomous Regulation</td><td>R 2007</td></tr>
<tr><td>Department</td><td colspan="2">Mechanical Engineering</td><td colspan="2">Programme Code & Name</td><td colspan="3">11 : B.E-Mechanical Engineering</td></tr>
<tr><td colspan="8">Semester V</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2" colspan="2">Course Name</td><td colspan="3">Hours / Week</td><td>Credit</td><td colspan="2">Maximum Marks</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>C</td><td>CA</td><td>ES</td><td>Total</td></tr>
<tr><td>07110503C</td><td colspan="2">DESIGN OF MACHINE ELEMENTS I</td><td>4</td><td>1</td><td>0</td><td>4</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">To familiarize with various steps involved in the Design Process, principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements, standard practices and standard data and use catalogues and standard machine components.</td></tr>
<tr><td>1</td><td colspan="4">STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS</td><td colspan="2">Total Hrs</td><td>12</td></tr>
<tr><td colspan="8">Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations impact loding – calculation of principle stresses for various load combinations, eccentric loading – Design of curved beams – crane hook and ‘C’ frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations.</td></tr>
<tr><td>2</td><td colspan="4">DESIGN OF SHAFTS AND COUPLINGS</td><td colspan="2">Total Hrs</td><td>12</td></tr>
<tr><td colspan="8">Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys and key ways - Design of rigid and flexible couplings – Introduction to shock absorbing couplings - design of knuckle joints.</td></tr>
<tr><td>3</td><td colspan="4">DESIGN OF FASTNERS AND WELDED JOINTS</td><td colspan="2">Total Hrs</td><td>12</td></tr>
<tr><td colspan="8">Threaded fastners - Design of bolted joints including eccentric loading – Design of welded joints – Traverse, parallel fillet and eccentrically loaded welded joints.</td></tr>
<tr><td>4</td><td colspan="4">DESIGN OF SPRINGS AND LEVERS</td><td colspan="2">Total Hrs</td><td>12</td></tr>
<tr><td colspan="8">Design of helical, leaf, and torsional springs under constant loads and varying loads - Belleville springs – Design of Levers.</td></tr>
<tr><td>5</td><td colspan="4">DESIGN OF BEARINGS AND FLYWHEELS</td><td colspan="2">Total Hrs</td><td>12</td></tr>
<tr><td colspan="8">Design of – sliding contact and rolling contact bearings – Design of journal bearings calculation of bearing dimensions – Mckees equation – Lubrication in journal bearings – Design of flywheels involving stresses in rim and arm.</td></tr>
<tr><td colspan="7">Total hours to be taught</td><td>60</td></tr>
<tr><td colspan="8">Text book (s) :</td></tr>
<tr><td>1</td><td colspan="7">Juvinall R.C, and Marshek K.M, “Fundamentals of Machine Component Design”, John Wiley & Sons, Third Edition, 2002.</td></tr>
<tr><td>2</td><td colspan="7">Bhandari V.B, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 2003.</td></tr>
<tr><td>3</td><td colspan="7">R.S.Khurmi & J.K.Gupta,” A Text book of Machine design “, S.Chand & Company Ltd, 14” edition, 2008.</td></tr>
<tr><td colspan="8">Reference(s) :</td></tr>
<tr><td>1</td><td colspan="7">Norton R.L, “Design of Machinery”, Tata McGraw-Hill Book Co, 2004.</td></tr>
<tr><td>2</td><td colspan="7">Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.</td></tr>
<tr><td>3</td><td colspan="7">Ugural A.C, “Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.</td></tr>
<tr><td>4</td><td colspan="7">Spotts M.F., Shoup T.E “Design and Machine Elements” Pearson Education, 2004.</td></tr>
</table>

Note: (*Usage of P.S.G Design Data Book is permitted in the examination*)

STANDARDS

1. IS 10260: Part 1: 1982 Terms, definitions and classification of Plain bearings Part 1: Construction.
2. IS 10260: Part 1: 1982 Terms, definitions and classification of Plain bearings Part 2: Friction and Wear.
3. IS 10260: Part 1: 1982 Terms, definitions and classification of Plain bearings Part 3: Lubrication.

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Semester V								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110504C	THEORY OF MACHINES II	4	1	0	4	50	50	100
Objective(s)	To understand the force-motion relationship in components subjected to External Forces, force-motion characteristics of standard mechanisms, undesirable effects of unbalances resulting from prescribed motions in mechanism, effect of Dynamics of Undesirable Vibrations and different principles in mechanisms used for governing of machines.							
1	FORCE ANALYSIS				Total Hrs	12		
Rigid Body dynamics in general plane motion – Equations of motion - Dynamic force analysis - Inertia force and Inertia torque – D'Alemberts principle - The principle of superposition - Dynamic Analysis in Reciprocating Engines – Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque - Turning moment diagrams - Fly wheels – Engine shaking Forces.								
2	BALANCING				Total Hrs	12		
Static and dynamic balancing - Balancing of rotating masses - Balancing a single cylinder Engine - Balancing Multi-cylinder Engines - Partial balancing in locomotive Engines - Balancing linkages - balancing machines.								
3	FREE VIBRATION				Total Hrs	12		
Basic features of vibratory systems - idealized models - Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration critical speeds of simple shaft - Torsional systems; Natural frequency of two and three rotor systems.								
4	FORCED VIBRATION				Total Hrs	12		
Response to periodic forcing - Harmonic Forcing - Forcing caused by unbalance - Support motion – Force transmissibility and amplitude transmissibility - Vibration isolation.								
5	MECHANISMS FOR CONTROL				Total Hrs	12		
Governors - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors – Characteristics - Effect of friction - Controlling Force - other Governor mechanisms. Gyroscopes - Gyroscopic forces and Torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes.								
Total hours to be taught						60		
Text book (s) :								
1	Rattan S.S., "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1994.							
2	R S Khurumi., "Theory of machines", first multicolor illustrative edition., S.Chand &company Ltd.,2005.							
Reference(s) :								
1	J.S.Rao, and Dukkipati, R.Y., Mechanism and Machine Theory, 2nd ed., Wiley Eastern Ltd., 1995.							
2	J.E.Shigley., Vicker Jr., J.J., Theory of Machines and Mechanisms, McGraw-Hill, 1995.							
3	S.S.Rattan , "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.							
4	Rao J.S. and Dukkipati R.V., "Mechanism and Machine Theory ", Wiley-Eastern Limited, New Delhi, 1992.							
5	John Hannah and Stephens R.C., "Mechanics of Machines", Viva low-Priced Student Edition, 1999.							
6	Sadhu Singh "Theory of Machines" Pearson Education, 2002.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
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Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110505C	APPLIED HYDRAULICS AND PNEUMATICS	3	0	0	3	50	50	100
Objective(s)	To know the advantages and applications of Fluid Power Engineering and Power Transmission System. To learn the Applications of Fluid Power System in automation of Machine Tools and others Equipments.							

1	FLUID POWER SYSTEMS AND FUNDAMENTALS	Total Hrs	9
Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols.Basics of Hydraulics- Applications of Pascals Law- Laminar and Turbulent flow – Reynold's number – Darcy's equation – Losses in pipe, valves and fittings.			
2	HYDRAULIC SYSTEM AND COMPONENTS	Total Hrs	9
Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.			
3	DESIGN OF HYDRAULIC CIRCUITS	Total Hrs	9
Construction of Control Components : Director control valve – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers : Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.			
4	PNEUMATIC SYSTEMS AND COMPONENTS	Total Hrs	9
Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators. Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Penumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.			
5	DESIGN OF PNEUMATIC CIRCUITS	Total Hrs	9
Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.			
Total hours to be taught			45
Text book (s) :			
1	Anthony Esposito, "Fluid Power with Applications", Pearson Education, 2000.		
2	Majumdar S.R., "Oil Hydraulics", Tata McGraw-Hill, 2000.		
Reference(s) :			
1	Majumdar S.R., "Pneumatic systems – Principles and maintenance", Tata McGraw Hill, 1995.		
2	Anthony Lal, "Oil hydraulics in the service of industry", Allied publishers, 1982.		
3	Harry L. Stevart D.B, "Practical guide to fluid power", Taraoeala sons and Port Ltd. Broadey, 1976.		
4	Michael J, Prinches and Ashby J. G, "Power Hydraulics", Prentice Hall, 1989.		
5	Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987.		

<table>
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<tr><td>Department</td><td>Mechanical Engineering</td><td colspan="3">Programme Code & Name</td><td colspan="3">11 : B.E. Mechanical Engineering</td></tr>
<tr><td colspan="8">Semester V</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours / Week</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>07110506C</td><td>CAD/CAM</td><td>3</td><td>0</td><td>0</td><td>3</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">To gain knowledge on how computers are integrated at various levels of design and drafting. To understand the computer aided manufacturing and to handle the product data and various software used for manufacturing and design.</td></tr>
<tr><td>1</td><td colspan="4">DESIGN PROCESS</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="8">Introduction ,Design Process the Design Process and Steps, Morphology of Design, Product Cycle, Sequential Engineering, Role of Computers In Design, Computer Aided Engineering, Computer Aided Design, for Manufacturability Computer Aided Manufacturing ,Benefits of CAD</td></tr>
<tr><td>2</td><td colspan="4">INTERACTIVE COMPUTER GRAPHICS</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="8">Creation Of Graphics Primitives, Graphical In. Put Techniques, Display Transformation In 2d, Display Transformation In 3d, Viewing Transformation, Clipping Hidden Line Elimination, Mathematical Formulation For Graphics, Curve Fitting Techniques, Model Storage And Data Structure, Data Structure Organization, , Accessing Data Files, Integrated Data Processing Information System EDMS, Hierarchical Data Structure, Relational Data Structure, Data Storage. And Search Methods.</td></tr>
<tr><td>3</td><td colspan="4">SOLID MODELING</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="8">Geometric Modeling, Wire Frame, Surface, and Solid Model B-Rep Techniques, CSG-Techniques, Features Of Solid Modeling Packages, Parametric And Features, Interfaces to Drafting, Design Analysis</td></tr>
<tr><td>4</td><td colspan="4">COMPUTER AIDED MANUFACTURING</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="8">Introduction current trends in manufacturing engineering, Group technology, Design for manufacturing and assembly, Process planning techniques, Total approach to product development, Rapid prototyping, CAD/CAM interface, Introduction to CAD/CAM software packages</td></tr>
<tr><td>5</td><td colspan="4">PRODUCTION PLANNING</td><td colspan="2">Total Hrs</td><td>9</td></tr>
<tr><td colspan="8">Introduction to production planning and control, Shop floor control systems, Just in time approach, Product data management, Product modeling , Assembly and tolerance modeling</td></tr>
<tr><td colspan="6">Total hours to be taught</td><td colspan="2">45</td></tr>
<tr><td colspan="8">Text book (s) :</td></tr>
<tr><td>1</td><td colspan="7">Sadhu singh “Computer aided design and manufacturing “kanna publishers New Delhi, 1998.</td></tr>
<tr><td colspan="8">Reference(s) :</td></tr>
<tr><td>1</td><td colspan="7">P.Radhakrishnan and C.P.Kothandaraman.” computer graphics and design” Dhanpat raj and sons NewDelhi-1991</td></tr>
<tr><td>2</td><td colspan="7">E.Dieter George, “Engineering Design” .McGrow Hill International edition-1991.</td></tr>
<tr><td>3</td><td colspan="7">Ibrahim Zeid ”CAD-CAM Theory and Practice” Tata McGraw Hill publishing co Ltd-1991.</td></tr>
<tr><td>4</td><td colspan="7">Groover and Zimmers, CAD/CAM Coputered aided design and manufacturing prentice hall of India NewDelhi-1994.</td></tr>
<tr><td>5</td><td colspan="7">P.Rathakrishnan and subramanyam “CAD/CAM/CIM” Wiley Eastern Ltd. New Age International Ltd-1994.</td></tr>
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<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours / Week</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>07110507P</td><td>HYDRAULICS AND PNEUMATICS LABORATORY</td><td>0</td><td>0</td><td>3</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">To know the advantages and applications of Fluid Power Engineering and Power Transmission System. To learn the Applications of Fluid Power System in automation of Machine Tools and others Equipments.</td></tr>
<tr><td colspan="8">1. Basic Hydraulic circuit
2. Meter in and Meter out circuit
3. Hydraulics circuit using ladder diagram
4. Hydraulic circuit using PLC
5. Basic pneumatic circuit
6. Meter in and Meter out circuit
7. Electro pneumatic circuit
8. Synchronizing circuit
9. Automatic Reciprocation circuit
10. Pneumatic PLC circuit
11. Fluid power circuit using Automation studio software</td></tr>
<tr><td colspan="8">Text book(s) :</td></tr>
<tr><td>1</td><td colspan="7">Andrew Parr, “Hydraulics and Pneumatics – A Technician’s and Engineer’s Guide”, Jaico Publishing House, 2005.</td></tr>
<tr><td colspan="8">Reference(s):</td></tr>
<tr><td>1</td><td colspan="7">Janatics Manual.</td></tr>
</table>

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Department	Mechanical Engineering		Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester V									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
07110508P	COMPUTER AIDED MACHINE DRAWING LABORATORY	0	0	3	2	50	50	100	
Objective(s)	To understand and practice the drawings for machine components and simple assemblies using standard CAD packages, specifications of Indian Standards on drawing practices and standard components.								

1. DRAWING STANDARDS
   Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, and fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc.
2. INTRODUCTION TO DRAFTING SOFTWARE
   Drawing, Editing, Dimensioning, Plotting Commands, Layering concepts, Limits, Fits and Tolerances.
3. PREPARATION OF 2-D DRAWINGS
   Orthographic views of standard machine components: Brackets, V Blocks, Stop Block, Screw threads and Threaded fasteners.
4. ASSEMBLY DRAWING (Preparation of assembled view)
   Flange coupling, Plummer block bearing, Lathe Tailstock, Universal Joint. Machine vice, Stuffing box, Piston and connecting rod.

Reference(s):

1	Bhatt.N.D. and Panchal.V.M., “Machine Drawing”, Charotar Publishing House, 388001, 38th Edition, 2003.
2	P.S.G. Design Data Book
3	Ellen Finkelstein, “AutoCAD 2004 Bible”, Wiley Publishing Inc, 2003.
4	Sham Tikoo, “AutoCAD 2002 with Applications”, Tata McGraw-Hill Publishing Company, NewDelhi, 2002.
5	“CollabCAD Software”, National Informatics Centre (CAD Group), Govt. of India, A-Block, C.G.O. Complex, Lodhi Road, New Delhi 110003, 2003” .

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
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Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110509P	DYNAMICS LABORATORY	0	0	3	2	50	50	100
Objective(s)	To understand principles of governors, cam profile, gyroscopic effect, balancing of masses, moment of inertia, vibration and suspension systems.							

1. Governors - Determination of sensitivity, effort, etc. for Watt, Porter, Proell, Hartnell governors.
2. Cam - Study of jump phenomenon and drawing profile of the cam
3. Motorised Gyroscope-Verification of laws -Determination of gyroscopic couple.
4. Whirling of shaft-Determination of critical speed of shaft with concentrated loads.
5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of moment of inertia by oscillation method for connecting rod and flywheel.
8. Vibrating system - Spring mass system-Determination of damping co-efficient of single degree of freedom system.
9. Determination of influence co-efficients for multidegree freedom suspension system.
10. Determination of transmissibility ratio - vibrating table.
11. Determination of torsional frequencies for compound pendulum and flywheel system with lumped Moment of inertia.
12. Transverse vibration –free- Beam. Determination of natural frequency and deflection of beam.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering			Programme Code & Name		11 : B.E. Mechanical Engineering		
Semester V								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110510P	COMPREHENSION IV	0	0	3	0	100	00	100
Objective(s)	i) To comprehend the semester subjects studies. ii) To improve the technical knowledge of the students.							
Methodology	1. For each subject 200 Keywords / important words or terms (5 units x 40 words) are to be prepared. 2. These 200 Keywords are to be printed in double column (2 x 50 words) and in 2 pages and is to be handed over to each student for the subject. 3. The staff who is handling the subject in the current semester will handle the respective discussion period (3 periods / semester) as given below. 4. The staff will explain and question the students using 'W' and 'H' type questions linking the keywords. 5. In a similar way the students have to prepare themselves for all the keywords.							

Execution

The Schedule for Conduct of Comprehension Subject.

Week	Activity		
	First 1½ Period Subject (No. of units)	Next 1½ Period Subject (No. of units)	Hours
W1	S1 (2)	S2 (2)	3
W2	S3 (2)	S4 (2)	3
W3	S5 (2)	S6 (2)	3
W4	Test – I (Portion : 2 units in each subject)		1
W5	S1 (3)	S2 (3)	3
W6	S3 (3)	S4 (3)	3
W7	S5 (3)	S6 (3)	3
W8	Test – II (Portion : 3 units in each subject)		1
W9	Discussion		3
W10	Test – III (All 5 units and all the subjects)		1
		Total	24

Evaluation

- It is a two credit (3 hours / week) Laboratory type course
- Only Continuous Assessment (CA) and No End Semester examination.
- Each test will carry 100 questions distributed among the subjects in respective units.

Component	Weight age
Test – I	25
Test – II	25
Test – III	50
Total	100

S1	07110501G - Professional Ethics
S2	07110502C - Automobile Engineering
S3	07110503C - Design of Machine Elements -I
S4	07110504C - Theory of Machines -II
S5	07110505C - Applied Hydraulics and Pneumatics
S6	07110506C - CAD/CAM

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester V								
Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07140511P	CAREER COMPETENCY DEVELOPMENT III	0	0	2	0	100	00	100
Objective(s)	i. To improve the skill level of students. ii. To improve the employability of students							

1	Aptitude Skills	Hrs
a. Arithmetic ability : Partnership - Chain rule – Calendar – Permutation - Data Interpretation – Probability - Heights and Distance b. Verbal Reasoning : Logical Venn Diagrams - Logical Sequence of Words - Arithmetical reasoning - Data Sufficiency - Statement – Conclusion - Deriving condition from passages c. Nonverbal Reasoning : Rule detection - Cube and dice		8
2	Programming Skills	6
Pro/E - Sketch mode - Part mode - Assembly mode - Drawing mode		
3	Written Communication Skills	
Error correction in the usage of degrees of comparison, conditional clauses, numerical expressions and system international (SI) units. - Paragraph Writing.		4
Evaluation I – Written Test		2
4	Oral Communication Skills	
Group Discussion Demo - Listening comprehension Lab		2
Evaluation II – Group Discussion		2
5	Interview Skills (Association Session)	
Evaluation III - Technical Interview - **Technical Interview I (**Objective type questions from V th semester subjects)		4
Evaluation IV - HR Interview - **HR Interview I -** Adaptability, Self development, Creativity		4
Total		32

Reference(s):

1	R.S.Aggarwal , "Quantitative Aptitude", S.Chand & Company Ltd., New Delhi, Reprint 2007 (Twice) (Ch – 13, 14, 27, 30, 31, 34, 36, 37, 38, & 39) (Unit – I)
2	R.S.Aggarwal , "A Modern Approach to verbal & Non–verbal Reasoning", S.Chand & Company Ltd, New Delhi, 2008, Part I – Section I (Ch - 9,14,15 & 17) Part I–Section II (Ch – 5 & 6) Part II (Ch 12 & 14) (Unit – I)
3	Pro/E Wildfire Manual Book (Unit – II)
4	CCD Guide by English Department of KSRCT, 2008 (Unit – III, IV & V)
5	HR Interview Guide by Training Cell, KSRCT, 2008.

EVALUATION CRITERIA

S.No.	Particular	Test Portion	Marks
1	Evaluation I Written Test	Unit I – OQ – 50, Unit II – OQ – 30 Unit III – OQ 20	50
2	Evaluation II Group discussion	P – 5 Marks, C – 5 Marks, TS – 5 Marks	15
3	Evaluation III Technical Interview	6 questions each 2½ Marks	15
4	Evaluation IV HR Interview	Creativity – 6 Marks (Adoptability – 7 Marks, Self development – 7 marks)	20
P–Presentation C–Content Q–Queries OQ–Objective type question T–Total TS–Team Skills			T = 100

Note :

1. Question paper and keys will be supplied by the training cell for written test for Evaluation I
2. Respective Departments will conduct Evaluation I, II, III & IV, correct and submit the marks obtained by the students to the Training Cell.
3. HODs will display about 50 topics for oral communication.
4. All training & tests will be conducted on odd Saturdays, Session of 2 periods in FN & Session of 2 periods in AN & Association Session.
5. 66 students may be divided into 10 groups of 6 each. Each group may be evaluated in 10 Minutes for GD.
6. 60 objective type questions, 10 questions from each of 6 subjects are to be prepared. 1 question from each subject at random to be asked carrying 2½ marks each (6 x 2½ = 15 marks) for Technical Interview. Each section is divided into 3 groups of 22 each.

K.S.Rangasamy College of Technology - Autonomous Regulation							R 2007		
Department	Mechanical Engineering		Program code & Name			11 : B.E. Mechanical Engineering			
Semester VI									
Subject Code	Subject Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
07110601S	PRINCIPLES OF MANAGEMENT	3	0	0	3	50	50	100	
Objective(s)	Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge in international aspect of management.								
1.	HISTORICAL DEVELOPMENT				Total Hrs	9			
Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.									
2.	PLANNING				Total Hrs	9			
Nature & Purpose – Types of Plans – Steps involved in Planning – Objectives – Setting Objectives – process of Management by Objectives – Strategies, Policies & Planning Premises – Forecasting – Decision making.									
3.	ORGANISING				Total Hrs	9			
Nature and purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and limitations – De-Centralization and Delegation of Authority – Staffing – Selection process – Techniques – HRD – Managerial Effectiveness.									
4.	DIRECTING				Total Hrs	9			
Scope – Human Factors – Leadership – Types of Leadership – Motivation – Hierarchy of needs – Motivation Theories – Motivational Techniques – Job Enrichment – Communication – process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.									
5.	CONTROLLING				Total Hrs	9			
System and process of Controlling – Requirements for effective control – the Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.									
Total hours to be taught						45			
Text book (s):									
1.	Harold Kooritz & Heinz Weihrich, “Essentials of Management”, Tata McGraw-Hill, 1998.								
2.	Joseph L Massie, “Essentials of Management”, Prentice Hall of India, (Pearson) Fourth Edition, 2003.								
Reference(s):									
1.	Tripathy PC And Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999.								
2.	Decenzo David, Robbin Stephen A, “Personnel and Human Reasons Management”, Prentice Hall of India, 1996.								
3.	JAF Stomer, Freeman R. E and Daniel R “Gilbert Management”, Pearson Education, Sixth Edition, 2004.								
4.	Fraidoon Mazda, “Engineering Management”, Addison Wesley, 2000.								
5.	Prasad L.M, “Principles of Management”, Sultan Chand & Sons Ltd, 2003.								

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110602C	DESIGN OF MACHINE ELEMENTS II	4	1	0	4	50	50	100
Objective(s)	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.							
1	DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS				Total Hrs	12		
Selection of V belts and pulleys – selection of Flat belts and pulleys - Wire ropes and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.								
2	SPUR GEARS AND PARALLEL AXIS HELICAL GEARS				Total Hrs	12		
Gear Terminology-Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations - Parallel axis Helical Gears – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses. Estimating the size of the helical gears.								
3	BEVEL & WORM GEARS				Total Hrs	12		
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.								
4	DESIGN OF MACHINE ELEMENTS				Total Hrs	12		
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-internal and external shoe brakes.								
5	DESIGN OF TRANSMISSION SYSTEMS.				Total Hrs	12		
Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box.								
Total hours to be taught						60		
Text book (s) :								
1	Juvinall R. C., Marshek K.M., "Fundamentals of Machine component Design", – John Wiley & Sons Third Edition, 2002.							
2	Bhandari, V.B., "Design of Machine Elements", Tata McGraw-Hill Publishing Company Ltd., 1994.							
Reference(s) :								
1	Maitra G.M., Prasad L.V., "Hand book of Mechanical Design", II Edition, Tata McGraw-Hill, 1985.							
2	Shigley J.E and Mischke C. R., "Mechanical Engineering Design", McGraw-Hill International Editions, 1989.							
3	Prabhu. T.J., "Design of Transmission Elements", Mani Offset, Chennai, 2000.							
4	Norton R.L, "Design of Machinery", McGraw-Hill Book co, 2004.							
5	Hamrock B.J., Jacobson B., Schmid S.R., "Fundamentals of Machine Elements", McGraw-Hill Book Co., 1999.							

Note: (*Usage of P.S.G Design Data Book is permitted in the examination*)

STANDRDS

1. IS 4460: Parts 1 to 3: 1995, Gears – Spur and Helical Gears – Calculation of Load Capacity.
2. IS 7443 : 2002, Methods of Load Rating of Worm Gears
3. IS 15151: 2002, Belt Drives – Pulleys and V-Ribbed belts for Industrial applications – PH, PJ, PK, PI and PM Profiles: Dimensions.
4. IS 2122 : Part 1: 1973, Code of practice for selection, storage, installation and maintenance of belting for power transmission: Part 1 Flat Belt Drives.
5. IS 2122: Part 2: 1991, Code of practice for selection, storage, installation and maintenance of belting for power transmission: Part 2 V-Belt Drives.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110603C	GAS DYNAMICS AND JET PROPULSION	4	1	0	4	50	50	100
Objective(s)	To understand the basic difference between incompressible and compressible flow, phenomenon of shock waves and its effect on flow and basic knowledge about jet propulsion and Rocket Propulsion.							

1	COMPRESSIBLE FLOW – FUNDAMENTALS	Total Hrs	12
Energy and momentum equations for compressible fluid flows, various regions of flows, reference velocities, stagnation state, velocity of sound, critical states, Mach number, critical Mach number, types of waves, Mach cone, Mach angle, effect of Mach number on compressibility.			
2	FLOW THROUGH VARIABLE AREA DUCTS	Total Hrs	12
Isentropic flow through variable area ducts, T-s and h-s diagrams for nozzle and diffuser flows, area ratio as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles.			
3	FLOW THROUGH CONSTANT AREA DUCTS	Total Hrs	12
Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation, variation of flow properties, variation of Mach number with duct length. Isothermal flow with friction in constant area ducts Flow in constant area ducts with heat transfer (Rayleigh flow), Rayleigh line and Rayleigh flow equation, variation of flow properties, maximum heat transfer.			
4	NORMAL SHOCK	Total Hrs	12
Governing equations, variation of flow parameters like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock, Prandtl - Meyer equation, impossibility of shock in subsonic flows, flow in convergent and divergent nozzle with shock, normal shock in Fanno and Rayleigh flows, flow with oblique shock (elementary treatment only).			
5	PROPULSION	Total Hrs	12
Aircraft propulsion – types of jet engines – energy flow through jet engines, study of turbojet engine components – diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines – thrust, thrust power, propulsive and overall efficiencies, thrust augmentation in turbo jet engine, ram jet and pulse jet engines. Rocket propulsion – rocket engines - thrust equation – effective jet velocity - specific impulse – rocket engine performance, solid and liquid propellants, comparison of different propulsion systems.			
Total hours to be taught			60

Text book (s) :

1	Yahya. S.M., “Fundamental of compressible flow”, New Age International (p) Ltd., New Delhi, 1996.
2	Patrich.H. Oosthvizen, William E.Carscallen, “Compressible fluid flow”, McGraw-Hill, 1997.

Reference(s) :

1	Cohen. H., Rogers R.E.C and Sravanamutoo, “Gas turbine theory”, Addison Wesley Ltd., 1987.
2	Ganesan. V., “Gas Turbines”, Tata McGraw-Hill, New Delhi, 1999.
3	Rathakrishnan.E, “Gas Dynamics”, Prentice Hall of India, New Delhi, 2001.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110604C	POWER PLANT ENGINEERING AND ENERGY ECONOMICS	3	0	0	3	50	50	100
Objective(s)	To understand the importance of energy utilization in power plants and to understand various components, operations and applications of different types of power plants.							
1	POWER PLANT LAYOUTS				Total Hrs	9		
Layout of thermal, hydel, diesel, magneto Hydro dynamic (MHD), nuclear and gas turbine power plants. Geo thermal power generation, ocean thermal energy conversion (OTEC), tidal power generation, solar power generation and wind mill energy power generation.								
2	COMPONENTS OF THERMAL POWER PLANT				Total Hrs	9		
Fuel and ash handling, combustion equipment for burning coal, mechanical stokers, pulveriser, electrostatic precipitator (ESP), draught –natural and forced draught types, surface condenser types, cooling towers, chimney, feed water treatment and ejection system.								
3	NUCLEAR AND HYDEL POWER PLANTS				Total Hrs	9		
Nuclear Energy – fission, fusion reaction, types of reactors, pressurized water reactor, boiling water reactor, waste disposal and safety. Hydro-electric power plant, advantages of water power, essential elements, classification, classification of turbines, governing of turbines, mini and micro hydel plants.								
4	DIESEL AND GAS TURBINE POWER PLANT				Total Hrs	9		
Types of diesel plants, components, applications and advantages. Gas turbine power plant, fuels, gas turbine material, open and closed cycles, reheating, regeneration, inter-cooling, combined cycle.								
5	OTHER POWER PLANTS AND ECONOMICS OF POWER PLANTS				Total Hrs	9		
Energy - production, transport and control, Load duration curves, load factor. Cost of electric energy, types of tariffs, electric power generation in India, basic problems on power generation. Power plant economics, cost, depreciation, Indian energy scenario, problems.								
Total hours to be taught						45		
Text book (s) :								
1.	Nag P.K, “Power plant Engineering” - Second Edition, Tata McGraw-Hill, New Delhi, 2001.							
2.	K.K.Ramalingam, “Power Plant Engineering”, Scitech Publications (India) Pvt Ltd., 2002.							
Reference(s) :								
1.	G.R. Nagpal, “Power Plant Engineering”, Hanna Publishers, 1998.							
2.	G.D.Rai, “Introduction to Power Plant Technology”, Khanna Publishers, 1995.							
3.	R.K.Rajput, “Power Plant Engineering”, Laxmi Publications, 1995.							
4.	Frank D.Graham “Power Plant Engineers Guide”, D.B. Taraporevala Sons & Co, New Delhi, 1993.							
5.	T.Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, 1998.							
6.	El- Wakil M.M, “Power Plant Technology”, McGraw-Hill 1984.							
7.	Arora S.C and Domkundwar S, “A course in Power Plant Engineering”, Dhanpatrai, 2001.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110605C	HEAT AND MASS TRANSFER	4	1	0	4	50	50	100
Objective(s)	The course is intended to build up necessary background for the understanding of the physical behavior of the various modes of heat transfer, like, conduction, convection and radiation. To understand the application of various experimental heat transfer correlations in engineering calculations. To learn the thermal analysis and sizing of heat exchangers. To understand the basic concepts of mass transfer.							
1	CONDUCTION				Total Hrs		12	
Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems – Composite Systems – Critical Thickness of Insulation – Fins, Types, Effectiveness and efficiency Problems – Unsteady Heat Conduction – Lumped Analysis – Use of Heislers Chart.								
2	CONVECTION				Total Hrs		12	
Basic Concepts – Convective Heat Transfer Coefficients – Types of Convection – Forced Convection – External Flow – Flow over Plates, Cylinders and Spheres – Internal Flow – Laminar and Turbulent Flow – Combined Laminar and Turbulent – Flow over Bank of tubes – Free Convection – Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.								
3	PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS				Total Hrs		12	
Nusselt theory of condensation - pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers – LMTD Method of heat Exchanger Analysis – Effectiveness – NTU method of Heat Exchanger Analysis – Overall Heat Transfer Coefficient – Fouling Factors.								
4	RADIATION				Total Hrs		12	
Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoff's Law – Black Body Radiation –Grey body radiation, Shape Factor Algebra – Electrical Analogy – Radiation Shields.								
5	MASS TRANSFER				Total Hrs		12	
Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Convective Mass Transfer Correlations and problems.								
Total hours to be taught							60	
Text book (s) :								
1	Sachdeva R C, "Fundamentals of Engineering Heat and Mass Transfer" New Age International, 1995.							
Reference(s) :								
1	Rajput R.K "Heat and mass Transfer", S.Chand Publishers, 1999.							
2	Holman J.P "Heat and Mass Transfer" Tata McGraw-Hill, 2000.							

K.S.Rangasamy College of Technology Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110607P	COMPUTER AIDED MANUFACTURING LABORATORY	0	0	3	2	50	50	100
Objective(s)	To develop the students to perform the computer aided manufacturing process using different programming techniques.							

1. MANUAL PART PROGRAMMING (Using G and M Codes) in CNC lathe.
2. Part programming for Linear and Circular interpolation, Chamfering and Grooving
3. Part programming using standard canned cycles for Turning, Facing, Taper turning and Thread cutting
4. MANUAL PART PROGRAMMING (using G and M codes) in CNC milling.
5. Part programming for Linear and Circular interpolation and Contour motions.
6. Part programming involving canned cycles for Drilling, Peck drilling, and Boring.
7. Simulation and NC code generation
8. NC code generation using CAD / CAM softwares - Post processing for standard CNC Controls like FANUC, hiedenhain etc.

<table>
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<tr><td>Department</td><td>Mechanical Engineering</td><td colspan="3">Programme Code & Name</td><td colspan="3">11 : B.E. Mechanical Engineering</td></tr>
<tr><td colspan="8">Semester VI</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours / Week</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>07110608P</td><td>HEAT TRANSFER LABORATORY</td><td>0</td><td>0</td><td>3</td><td>2</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="7">The laboratory is intended to build up necessary background for the understanding of the physical behavior of the various modes of heat transfer, like, conduction, convection and radiation. To understand the application of various experimental heat transfer correlations in engineering calculations. To learn the thermal analysis and sizing of heat exchangers. To understand the basic concepts of mass transfer.</td></tr>
<tr><td colspan="8">1. Introduction
2. Shell and tube heat exchanger
3. Test on pin-fin apparatus
4. Heat transfer through lagged pipe apparatus
5. Two stage air compressor
6. Emissivity measurement
7. Heat transfer through composite wall
8. Heat transfer by natural convection
9. Stephen-Boltzsmann apparatus
10. Parallel flow and counter flow heat exchanger
11.Double pipe heat exchanger</td></tr>
</table>

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110609P	MINI PROJECT	0	0	3	2	100	00	100
Objective(s)	The objective of this project is to provide opportunity for the students to implement their skills acquired in the previous semesters to practical problems.							

The students in convenient groups of not more than 4 members have to take one small item for design and fabrication. Every project work shall have a guide who is the member of the faculty of the institution.

The item chosen may be small machine elements (Example-screw jack, coupling, machine vice, cam and follower, governor etc), attachment to machine tools, tooling (jigs, fixtures etc), small gear box, automotive appliances, agricultural implements, simple heat exchangers, small pumps, hydraulic /pneumatic devices etc.

The students are required to design and fabricate the chosen item in the college and demonstrate its working apart from submitting the project report. The report should contain assembly drawing, parts drawings, process charts relating to fabrication.

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<tr><td colspan="8">Semester VI</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">Course Name</td><td colspan="3">Hours / Week</td><td>Credit</td><td colspan="2">Maximum Marks</td><td></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>07110610P</td><td>COMPREHENSION V</td><td>0</td><td>0</td><td>3</td><td>0</td><td>100</td><td>00</td><td>100</td></tr>
<tr><td>Objective(s)</td><td colspan="8">i) To comprehend the semester subjects studies.
ii) To improve the technical knowledge of the students.</td></tr>
<tr><td>Methodology</td><td colspan="8">1. For each subject 200 Keywords / important words or terms (5 units x 40 words) are to be prepared.
2. These 200 Keywords are to be printed in double column (2 x 50 words) and in 2 pages and is to be handed over to each student for the subject.
3. The staff who is handling the subject in the current semester will handle the respective discussion period (3 periods / semester) as given below.
4. The staff will explain and question the students using ‘W’ and ‘H’ type questions linking the keywords.
5. In a similar way the students have to prepare themselves for all the keywords.</td></tr>
<tr><td rowspan="14">Execution</td><td colspan="8">The Schedule for Conduct of Comprehension Subject.</td></tr>
<tr><td rowspan="2">Week</td><td colspan="6">Activity</td></tr>
<tr><td colspan="3">First 1½ Period Subject (No. of units)</td><td colspan="2">Next 1½ Period Subject (No. of units)</td><td>Hours</td></tr>
<tr><td>W1</td><td colspan="3">S1 (2)</td><td colspan="2">S2 (2)</td><td>3</td></tr>
<tr><td>W2</td><td colspan="3">S3 (2)</td><td colspan="2">S4 (2)</td><td>3</td></tr>
<tr><td>W3</td><td colspan="3">S5 (2)</td><td colspan="2">S6 (2)</td><td>3</td></tr>
<tr><td>W4</td><td colspan="5">Test – I (Portion : 2 units in each subject)</td><td>1</td></tr>
<tr><td>W5</td><td colspan="3">S1 (3)</td><td colspan="2">S2 (3)</td><td>3</td></tr>
<tr><td>W6</td><td colspan="3">S3 (3)</td><td colspan="2">S4 (3)</td><td>3</td></tr>
<tr><td>W7</td><td colspan="3">S5 (3)</td><td colspan="2">S6 (3)</td><td>3</td></tr>
<tr><td>W8</td><td colspan="5">Test – II (Portion : 3 units in each subject)</td><td>1</td></tr>
<tr><td>W9</td><td colspan="5">Discussion</td><td>3</td></tr>
<tr><td>W10</td><td colspan="5">Test – III (All 5 units and all the subjects)</td><td>1</td></tr>
<tr><td colspan="6">Total</td><td>24</td></tr>
<tr><td rowspan="6">Evaluation</td><td colspan="8">▪ It is a two credit (3 hours / week) Laboratory type course
▪ Only Continuous Assessment (CA) and No End Semester examination.
▪ Each test will carry 100 questions distributed among the subjects in respective units.</td></tr>
<tr><td>Component</td><td colspan="7">Weight age</td></tr>
<tr><td>Test – I</td><td colspan="7">25</td></tr>
<tr><td>Test – II</td><td colspan="7">25</td></tr>
<tr><td>Test – III</td><td colspan="7">50</td></tr>
<tr><td>Total</td><td colspan="7">100</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>S1</td><td colspan="8">07110601G - Principles of Management</td></tr>
<tr><td>S2</td><td colspan="8">07110602C - Design of Machine Elements -II</td></tr>
<tr><td>S3</td><td colspan="8">07110603C - Gas Dynamics and jet propulsion</td></tr>
<tr><td>S4</td><td colspan="8">07110604C - Power Plant Engineering and Energy Economics</td></tr>
<tr><td>S5</td><td colspan="8">07110606C - Heat and Mass Transfer</td></tr>
<tr><td>S6</td><td colspan="8">071106**E - Elective-I</td></tr>
</table>

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110611P	CAREER COMPETENCY DEVELOPMENT IV	0	0	2	0	100	00	100
Objective(s)	i. To improve the skill level of students. ii. To improve the employability of students.							

1	COMPANY TYPE WRITTEN TEST IN APTITUDE, WRITTEN COMMUNICATION SKILLS	Hrs
Company based questions – Questions from Aptitude, Written communication and Comprehension. Evaluation I Written Test		6 2
2	COMPANY TYPE WRITTEN TEST IN VERBAL AND NON-VERBAL REASONING SKILLS	
Company based questions – Questions from Verbal and Non-verbal reasoning. Evaluation II Written Test		6 2
3	TECHNICAL SKILLS	
Questions from C language, ACAD, Pro/E. Evaluation III Written Test		6 2
4	INTERVIEW SKILLS(ASSOCIATION SESSION)	
Technical Interview – Questions from core subjects HR Interview - Flexibility, Achievement orientation, Decisiveness Evaluation IV – Technical & HR Interview.		4+4
	Total	32

Reference(s):

1	R.S.Aggarwal , "Quantitative Aptitude", S.Chand & Company Ltd., New Delhi, Reprint 2007 (Twice) (unit – I)
2	CCD Guide by English Department of KSRCT, 2008 (Unit – I)
3	R.S.Aggarwal , "A Modern Approach to verbal & Non – verbal Reasoning", S.Chand & Company Ltd, New Delhi, 2008, (unit – II)
4	Yashavant Kanetkar, " Let us 'C' ", BPB Publications, New Delhi, 2002 (unit – III)
5	AutoCAD 2000 Manual Book (unit – III)
6	Pro/E Wildfire Manual Book (unit III)
7	Company question papers(Unit I-III)
8	HR Interview Guide by Training cell (unit IV)

EVALUATION CRITERIA

S.No.	Particular	Test Portion	Marks
1	Evaluation I, Written Test	Unit 1 – Aptitude – 50 OQs, Written Communication & Comprehension – 50 OQs	25
2	Evaluation II Written Test	Unit II – Verbal Reasoning – 50 OQs, Non-verbal Reasoning – 50OQs	25
3	Evaluation III Written Test	Unit III – C Language -50OQs, ACAD – 25 OQs, Pro/E – 25 OQs	20
4	Evaluation IV Technical & HR Interview	Unit IV Technical Interview - 6 questions (each question 2.5 marks) HR Interview – Flexibility(5 marks), Achievement orientation(5 marks), Decisiveness(5 marks).	15 15
P – Presentation C – Content		OQ – Objective type question T – Total	T = 100

Note :

1. Question paper and keys will be supplied by the training cell for written test for Evaluation I, II & III
2. Respective Departments will conduct Evaluation I, II, III & IV, correct and submit the marks obtained by the students to the Training Cell.
3. All training & Evaluation tests will be conducted on odd Saturdays, Session of 2 periods in FN & Session of 2 periods in AN & Association Session.
4. 60 Interview type questions, 10 questions from each of 6 subjects of VIth Semester are to be prepared. 1 question from each subject at random to be asked carrying 2½ marks each (6 x 2½ = 15 marks) for Technical Interview. Each section is divided into 3 groups of 22 each.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110701G	TOTAL QUALITY MANAGEMENT	3	0	0	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.							
1	INTRODUCTION				Total Hrs	9		
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.								
2	TQM PRINCIPLES				Total Hrs	9		
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.								
3	STATISTICAL PROCESS CONTROL (SPC)				Total Hrs	9		
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, New Management tools.								
4	TQM TOOLS				Total Hrs	9		
Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages, Types.								
5	QUALITY SYSTEMS				Total Hrs	9		
Need for ISO 9000 Quality Systems, ISO 9000:2000 ISO 14000 Quality Systems – Elements Concepts, Implementation, Documentation, Quality Auditing, – Requirements and Benefits, Non Conformance report.								
Total hours to be taught						45		
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 (ISBN 0-324-06680-5).							
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” TMH, 2005.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110702C	RESOURCE MANAGEMENT TECHNIQUES	3	1	0	4	50	50	100
Objective(s)	To create awareness about optimization in utilization of resources and it is applications in industrial operations.							
1	LINEAR MODEL				Total Hrs	12		
The phases of OR study – formation of an L.P model- graphical solution – simplex algorithm – artificial variables technique– Big M method, two phase method.								
2	TRANSPORTATION PROBLEM				Total Hrs	12		
Optimal solution by north west corner method- least cost method – Vogel's approximation method – optimality test – MOBI method. Assignment problem – formulation – Hungarian method.-unbalanced assignment problem**.**								
3	NETWORK MODELS				Total Hrs	12		
Shortest route – minimal spanning tree - maximum flow models – project network- CPM and PERT network- critical path scheduling.								
4	INVENTORY MODELS & PROJECT MANAGEMENT				Total Hrs	12		
Inventory models - Economic order quantity models - Quantity discount models - Stochastic Inventory models - Multi product models - Inventory control models in practice. Project management- Introduction								
5	QUEUING THEORY & SIMULATION				Total Hrs	12		
Queuing models – queuing systems and structures – notation –parameter – single server and multiserver models – Poisson input – exponential service – constant rate service – infinite population. Introduction to Simulation, Introduction to Heuristics								
Total hours to be taught						60		
Text book (s) :								
1	Taha H.A, "Operation Research", Pearson Education sixth edition, 2003.							
Reference(s) :								
1	Hira and Gupta "Introduction to Operations Research", S.Chand and Co.2002.							
2	Hira and Gupta "Problems in Operations Research", S.Chand and Co, 2002.							
3	Panneerselvam, 'Operations Research" Prentice Hall of India, 2003.							
4	Wagner, "Operations Research", Prentice Hall Of India, 2000.							

K.S.Rangasamy College of Technology - Autonomous Regulation									R 2007
Department	Mechanical Engineering		Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
07110703C	MECHATRONICS AND ROBOTICS	3	0	0	3	50	50	100	
Objective(s)	To understand the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical and Electronic Systems.								
1	FUNDAMENTALS				Total Hrs	9			
Introduction to automation and mechatronic systems, development of robotics technology, robot anatomy and work volume, classification of robots, accuracy and control resolution in robot motion, overview of mechatronic components in robotic systems and devices.									
2	KINEMATICS				Total Hrs	10			
Coordinate frames, mapping and transforms, Euler angle representations, Direct Kinematics: Denavit-Hartenberg transformation, Inverse Kinematics, Differential Motion and Jacobians									
3	DYNAMICS				Total Hrs	9			
Introduction to dynamics and Position control, path planning, Newton-Euler formulations, Lagrangian method.									
4	HARDWARE				Total Hrs	10			
Various drives and actuators and their relative merits, Mechanics of robot grippers; sensors and transducers in robot applications, power transmission devices, robot programming, microprocessors, controllers and PLCs for robots; Introduction to robot vision.									
5	APPLICATIONS				Total Hrs	7			
Robot applications-Material handling, processing, assembly, inspection, space, underwater and medical applications.									
Total hours to be taught						45			
Text book (s) :									
1	Groover M. P., Industrial Robotics, Tata McGraw Hill, 2008								
2	Michael B Histand, Introduction to Mechatronics and Measurement Systems, McGraw Hill, 2003								
Reference(s) :									
1	Fu K. S., Robotics-Control, Sensing, Vision and Intelligence, McGraw Hill, 2008								
2	Craig J. J, Introduction to Robotics, Pearson Education, 2009								
3	Bolton W, Mechatronics, Person Education, 2009								
4	Smaili A. and Mrad F., Mechatronics, Oxford University Press, 2008								
5	Deb S. R, Robotics technology and flexible automation, Tata McGraw-Hill, 2009								
6	Ashitava Ghosal, Robotics, Oxford University Press, 2006								

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110704C	FINITE ELEMENT METHOD	4	1	0	4	50	50	100
Objective(s)	To understand the principles involved in discretization and finite element approach and learn to form stiffness matrices and force vectors for simple elements.							

1	FUNDAMENTAL CONCEPTS	Total Hrs	6

Relevance of FEA to design problems – Stresses and equilibrium – boundary conditions – Strain vs Displacement relations – Temperature effects - Potential energy and equilibrium – The Rayleigh Ritz method – Galerkin method – Solution of algebraic equations – Gaussian elimination.

2	ONE – DIMENSION PROBLEMS	Total Hrs	12

Finite element modeling–Coordinates and shape functions – Potential energy approach – Galerkin method – Element matrices and vectors – Assembly for global equations – Boundary conditions – Higher order elements - Shapes functions – Applications to axial loadings of rods – Extension to plane trusses.

3	ONE DIMENSIONAL BEAM AND SCALAR VARIABLE PROBLEMS	Total Hrs	12

One Dimensional beam element- formulation of stiffness matrix and load vectors – Assembly to Global equations –boundary conditions – Solutions and Post processing - Example Problems. Applications to scalar variable problems such as torsion, pressure heat transfer etc. - element- formulation of stiffness matrix and load vectors – Assembly to Global equations –boundary conditions – Solutions and Post processing - Example Problems.

4	TWO DIMENSIONAL PROBLEMS – VECTOR VARIABLE PROBLEMS	Total Hrs	9

Finite element modeling – CST and LST elements -Shapes functions – Element equations, Load vectors and boundary conditions – Assembly . Applications to Vector Variable problems – Plane Stress, Plane Strain and Axisymmetric problems – Formulation – element matrices – Assembly – boundary conditions and solutions - Examples.

5	ISOPARAMETRIC ELEMENT FORMULATIONS	Total Hrs	6

ISO parametric elements – Element shapes Functions – Element equations – Gaussian quadrature - Examples.

Total hours to be taught	45

Text book (s) :

1	T.R. Chandrupatla & A.D. Belegundu, “Introduction to Finite Elements in Engineering”, Pearson Education 2002, 3rd Edition.

Reference(s) :

1	Rao S.S., “The Finite Element Method in Engineering”, Pergammon Press, 1989.
2	Logan D.L., “A First course in the Finite Element Method”, Third Edition, Thomson Learning, 2002.
3	Robert D.Cook., David.S, Malkucs Michael E Plesha, “Concepts and Applications of Finite Element Analysis” 4Ed. Wiley, 2003.
4	Reddy J.N., “An Introduction to Finite Element Method”, McGraw-Hill International Student Edition, 1985.
5	David V Hutton “Fundamentals of Finite Element Analysis” 2004. McGraw Hill Publishers.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110707P	ANALYSIS AND SIMULATION LABORATORY	0	0	3	2	50	50	100
Objective(s)	To develop the students to perform finite element analysis of beams, trusses, bracket and plates using an analysis software and to perform simulation on various types of linkage mechanisms using a Simulation software and flow analysis using a CFD software.							

1. Introduction of CAE software.
2. Analysis of mechanical machine components using analysis software
3. Structural Analysis: Static analysis of 2D Beam, Plane Truss, Plane stress analysis of bracket, Stress analysis of Axi-symmetric component.
4. Thermal Analysis: Steady state and Transient 2D Conduction, Convection on plates.
5. Dynamics Analysis: Modal analysis, Harmonic analysis, Transient analysis. Analysis of linkage mechanisms using Simulation software.
6. Introduction of Simulation software.
7. Analysis of velocity and acceleration for mechanical linkages of different mechanisms.

Analysis software : Ansys11, Abacus (or) Simulia, Nastran
Simulation software : Adams

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110708P	MECHATRONICS LABORATORY	0	0	3	2	50	50	100
Objective(s)	To understand the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical and Electronic Systems experimentally.							

1. Design and testing of fluid power circuits to control
   i) velocity (ii) direction and (iii) force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software.
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
5. Servo controller interfacing for open loop
6. Servo controller interfacing for closed loop
7. PID controller interfacing
8. Stepper motor interfacing with 8051 Micro controller
   i) full step resolution (ii) half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LAB VIEW
10. Computerized data logging system with control for process variables like pressure flow and temperature

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110709P	PROJECT WORK – PHASE I	0	0	4	2	100	00	100
Objective(s)	The objective of the Project Work - Phase I is to enable the students in convenient groups of not more than 4 members and to search for related area in which the members are going to do their project. Project Work - Phase I involves in identifying right project work, acquiring knowledge on that area, making preliminary works towards phase II of the project work.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110710P	CAREER COMPETENCY DEVELOPMENT V	0	0	2	0	100	00	100
Objective(s)	i. To encourage the all round development of students by focusing on soft skills. ii.To improve the employability of students.							

1	COMPANY TYPE WRITTEN TEST IN APTITUDE, WRITTEN COMMUNICATION SKILLS	Hrs
Software and Core company based questions - Questions from Quantitative Ability, Analytical reasoning, Logical reasoning, Written communication, Programming and Technical Skills. Evaluation I Written Test		6 2
2	GROUP DISCUSSION	
Strategies in GD – Team work – Body Language – Mock GDs – Video Samples Evaluation II – Group Discussion		6 2
3	INTERVIEW SKILLS(TECHNICAL INTERVIEW)	
Keyword discussions on core subjects -Complex problem solving in programming and core subjects - Mock Technical Interviews Evaluation III Technical Interview		6 2
4	INTERVIEW SKILLS(HR INTERVIEW)	
Kinds of HR Interviews – Corporate culture – Mock Interviews – Video Samples Evaluation IV – HR Interview.		6 2
	Total	32

Reference(s):

1	R.S.Aggarwal , "Quantitative Aptitude", S.Chand & Company Ltd., New Delhi, Reprint 2007 (Twice) (unit – I)
2	CCD Guide by English Department of KSRCT, 2008 (Unit – I)
3	R.S.Aggarwal , "A Modern Approach to verbal & Non – verbal Reasoning", S.Chand & Company Ltd, New Delhi, 2008, (unit – I)
4	Company question papers(unit I)
5	Yashavant Kanetkar, " Let us 'C' ", BPB Publications, New Delhi, 2002 (unit – I)
6	Herbert Schildt, " The Complete Reference C++ ", TMH, 2003 (unit – I)
7	HR Interview Guide by Training cell (unit IV)

EVALUATION CRITERIA

S.No.	Particular	Test Portion	Marks
1	Evaluation I Written Test	Unit I – Questions from Software and core companies	40
2	Evaluation II	Unit II - Group Discussion	20
3	Evaluation III	Unit III – Technical Interview	20
4	Evaluation IV	Unit IV - HR Interview	20
Total			T = 100

Note :

1. Question papers and keys will be supplied by the training cell for written test for Evaluation I
2. Respective Departments will conduct Evaluation II, III & IV, correct and submit the marks obtained by the students to the Training Cell.
3. All training & Evaluation tests will be conducted on odd Saturdays, Session of 2 periods in FN & Session of 2 periods in AN & Association Session.
4. Each section is divided into groups and conduct Aptitude test, mock group discussions, interviews in every alternate Saturdays.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110801C	ENGINEERING ECONOMICS AND COST ANALYSIS	3	0	0	3	50	50	100
Objective(s)	To learn about the basics of economics and cost analysis related to engineering so as to take economically sound decisions.							

1	INTRODUCTION TO ECONOMICS	Total Hrs	9
Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis- V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.			
2	VALUE ENGINEERING	Total Hrs	9
Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor-equal payment series capital recovery factor-Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.			
3	CASH FLOW	Total Hrs	9
Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.			
4	REPLACEMENT AND MAINTENANCE ANALYSIS	Total Hrs	9
Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.			
5	DEPRECIATION	Total Hrs	9
Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.			
Total hours to be taught			45

Text book (s) :

1	Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2008.

References :

1	Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2002.
2	Donald.G. Newman, Jerome. P.Lavelle, “Engineering Economics and analysis” Engg. Press, Texas, 2002.
3	Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 1984.
4	Grant.E.L., Ireson.W.G., and Leavenworth, R.S, “Principles of Engineering Economy”, Ronald Press, New York,1990.
5	Smith, G.W., “Engineering Economy”, Lowa State Press, Iowa, Fourth Edition, 1987.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110804P	PROJECT WORK – PHASE II	0	0	40	20	50	50	100
Objective(s)	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. Six 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 background information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110641E	NUMERICAL METHODS	3	0	0	3	50	50	100
Objective(s)	With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically. At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses.							

1	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	Total Hrs	9
Linear interpolation methods (method of false position) – Newton's method – Statement of fixed point theorem – Fixed point iteration: x=g(x) method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods - Inverse of a matrix by Gauss Jordon method – Eigen value of a matrix by power method.			
2	INTERPOLATION AND APPROXIMATION	Total Hrs	9
Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton's forward and backward difference formulae.			
3	NUMERICAL DIFFERENTIATION AND INTEGRATION	Total Hrs	9
Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons's rules.			
4	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS	Total Hrs	9
Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.			
5	BOUNDARY VALUE PROBLEMS	Total Hrs	9
Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.			
Total hours to be taught			45

Text book (s) :

1. C.F. Gerald and P.O. Wheatley, 'Applied Numerical Analysis', Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. P. Kandasamy, K. Thilagavathy and K. Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.

Reference(s) :

1. E. Balagurusamy, 'Numerical Methods', Tata McGraw Hill Pub.Co.Ltd, New Delhi, 1999.
2. R.L. Burden and T.D. Faires, 'Numerical Analysis', Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
3. Venkataraman M.K, "Numerical Methods", national Publication Company, Chennai, 1991.
4. Sankara Rao K, Numerical Methods for Scientists and Engineers", 2nd Edition, Prentice Hall India, 2004.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110642E	UNCONVENTIONAL MACHINING PROCESSES	3	0	0	3	50	50	100
Objective(s)	This course will give a good perspective with adequate depth to understand the unconventional machining processes; its relative advantages were conventional techniques.							
1	INTRODUCTION				Total Hrs	9		
Unconventional machining Process-Need-clarification-Brief overview of all techniques.								
2	MECHANICAL ENERGY BASED PROCESSES				Total Hrs	9		
Abrasive Jet Machining-Water Jet Machining-Ultrasonic Machining.(AJM,WJM and USM). Working Principles-equipment used-Process parameters-MR-Variation in techniques used-Applications.								
3	ELECTRICAL ENERGY BASED PROCESSES				Total Hrs	9		
Electric Discharge Machining (EDM)-working Principles-equipments-Process Parameters-MRR-electrode/Tool-Power Circuits-Tool Wear-Dielectric-Flushing-Wire cut EDM-Applications.								
4	CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES				Total Hrs	9		
Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants- maskant- techniques of applying maskants-process parameters-MRR-Applications. Principles of ECM-equipments-MRR-Electrical circuit-Process parameters-ECG and ECH Applications.								
5	THERMAL ENERGY BASED PROCESSES				Total Hrs	9		
Laser Beam machining (LBM), plasma are machining (PAM) and Electron Beam Machining (EBM). Principles-Equipment-Types - Applications.								
Total hours to be taught						45		
Text book (s) :								
1	Vijay. Jain “Advanced Machining Processes” Allied Publishers Pvt.Ltd., New Delhi, ISBN 81-7764-294-4, 2002.							
Reference(s) :								
1	Benedict.G.F.”Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York, 1987.							
2	Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi, 1980.							
3	Me Geough,”Advanced Methods of Machining” Chapman and Hall, London, 1988.							
4	Paul De Garmo, J.T.Black, and Ronald A.Kosher, “Material and Processes in Manufacturing” Prentice Hall of India Pvt. Ltd. New Delhi (8^{th} Edition) ISBN-81-203-1243-0, 2001.							

K.S.Rangasamy College of Technology Autonomous Regulation								R 2007
Department	Mechanical Engineering	Program code & Name		11 : B.E - Mechanical Engineering				
Semester VI								
Course Code	Subject Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110643E	RENEWABLE SOURCES OF ENERGY	3	0	0	3	50	50	100
Objective(s)	To know detailed information about the renewable energy sources and their applications and impart knowledge on the environmental aspects of renewable energy sources.							
1	INTRODUCTION				Total Hrs	7		
World energy use – Reserves of energy resources – Environmental aspects of energy utilization – Renewable energy scenario in India – Potentials – Achievements – Applications								
2	SOLAR ENERGY				Total Hrs	10		
Solar thermal – Flat plate and concentrating collectors – Solar heating and cooling techniques – Solar desalination – Solar Pond – Solar cooker – Solar thermal power plant – Solar photo voltaic conversion – Solar cells – PV applications.								
3	WIND ENERGY				Total Hrs	8		
Wind data and energy estimation – Types of wind energy systems – Performance – Details of wind turbine generator – Safety and Environmental Aspects.								
4	BIOMASS ENERGY				Total Hrs	8		
Biomass direct combustion – Biomass gasifier – Biogas plant – Ethanol production – Bio diesel – Cogeneration – Biomass applications.								
5	OTHER RENEWABLE ENERGY SOURCES				Total Hrs	12		
Tidal energy – Wave energy – Open and closed OTEC Cycles – Small hydro – Geothermal energy – Fuel cell systems.								
Text Book:						45		
1	G.D. Rai, Non Conventional Energy Sources, Khanna Publishers, New Delhi, 1999.							
2	S.P. Sukhatme, Solar Energy, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997							
Reference(s) :								
1	Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.							
2	Twidell, J.W. & Weir, A., Renewable Energy Sources, EFN Spon Ltd., UK, 1986.							
3	G.N. Tiwari, Solar Energy – Fundamentals Design, Modelling and applications, Narosa Publishir House, New Delhi, 2002.							
4	L.L. Freris, Wind Energy Conversion systems, Prentice Hall, UK, 1990.							
5	Johnson Gary, L., Wind Energy Systems, Prentice Hall, New York, 1985.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110644E	DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	3	0	0	3	50	50	100
Objective(s)	To understand the principles, functions and design practices of Jigs, Fixtures and dies for press working, and understand the Principles of jigs and fixtures design, locating principles, locating elements and clamping Devices.							

1	PURPOSE TYPES AND FUNCTIONS OF JIGS AND FIXTURES	Total Hrs	9
Tool design objectives - Production devices - Inspection devices - Materials used in Jigs and Fixtures – Types of Jigs - Types of Fixtures-Mechanical actuation-pneumatic and hydraulic actuation-Analysis of clamping force-Tolerance and error analysis.			
2	JIGS	Total Hrs	9
Drill bushes –different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-Automatic drill jigs-Rack and pinion operated. Air operated Jigs components. Design and development of Jigs for given components.			
3	FIXTURES	Total Hrs	9
General principles of boring, lathe, milling and broaching fixtures- Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given component.			
4	PRESS WORKING TERMINOLOGIES AND ELEMENTS OF DIES AND STRIP LAY OUT	Total Hrs	9
Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements. Elements of progressive combination and compound dies:Die block-die shoe. Bolster plate-punch plate-punch holder-guide pins and bushes – strippers – knockouts-stops –pilots-Selection of standard die sets strip lay out-strip lay out calculations			
5	DESIGN AND DEVELOPMENT OF DIES	Total Hrs	9
Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies. Design considerations in forging, extrusion, casting and plastic dies.			
Total hours to be taught			45

Text book(s):

1	Edward G Hoffman, “Jigs & Fixture Design”, Thomson – Delmar Learning, Singapore 2004
2	Donaldson. C, “Tool Design”, Tata McGraw-Hill, 1986

References :

1	Kempster, “Jigs & Fixtures Design”, The English Language Book Society”, 1978
2	Joshi, P.H., “Jigs & Fixtures”, Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi 2004
3	Hiram E Grant, “ Jigs and Fixture” Tata McGraw-Hill, New Delhi, 2003
4	“Fundamentals of Tool Design”, CEEE Edition, ASTME, 1983
5	Design Data Handbook PSG College of Technology, Coimbatore

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110645E	THERMAL TURBO MACHINES	3	0	0	3	50	50	100
Objective(s)	To study the concept of thermal turbomachines and its functions							
1	INTRODUCTION OF TURBOMACHINES				Total Hrs	9		
Definitions of turbomachine - Types of turbomachines - Energy exchange in turbomachine - Turbine stage - Reheat factor - Polytropic efficiency of turbine stage - Compressor stage - Preheat factor - Polytropic efficiency of compressor stage								
2	CASCADE ANALYSIS AND AXIAL FLOW COMPRESSORS				Total Hrs	9		
Introduction to cascade analysis - Blade terminology - Blade forces - Analysis of turbine cascade - Analysis of compressor cascade - Cascade performance - Cascade losses and estimation - Introduction to axial flow compressors - Work input to compressor - Flow coefficient - Blade loading coefficient - Static pressure rise in compressor - Stage efficiency - Stage pressure ratio - Work done factor - Factors affecting stage pressure ratio - Degree of reaction - Power required interms of lift and drag forces - Multistage compressor - Three diamensional flow in axial compressor - Surging and stalling								
3	AXIAL FLOW FANS - CENTRIFUGAL COMPRESSOR – BLOWER AND FAN				Total Hrs	9		
Introduction to axial flow fans - Axial fan with UGV and DGV - Axial fan without guide vanes - Power input to fan - Fan efficiency - Introduction to Centrifugal compressor - blower and fan - Centrifugal compressor - Flow through inducing section - Flow through impeller channel - Flow through impeller with slip - Flow through diffuser - Flow through volute casing - h-s diagram for centrifugal compressor - Degree of reaction - Losses in centrifugal compressor - Centrifugal fans and blowers								
4	AXIAL FLOW TURBINES				Total Hrs	9		
Introduction - Axial flow turbine - Single stage impulse turbine - Blade efficiency - Flow coefficient - Stage loading coefficient - Stage efficiency - Compounding of turbine - Reaction turbine stages - Three dimensional flow in Axial turbines - Governing of turbines								
5	RADIAL TURBINES				Total Hrs	9		
Introduction - Construction and working of radial turbine - Ninety degree IFR turbine - h-s diagram of IFR turbine - Spouting velocity - Blade to gas speed ratio - Degree of reaction for 90° IFR turbine								
Total hours to be taught						45		
Text book(s):								
1	S.M.Yahya, “Turbines, Compressors and Fans” Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2005.							
References :								
1	A. J. Stepanoff , “Centrifugal and axial flow pumps”, Krieger Publishing Company							
2	Kadambi and Prasad “Turbomachinery”, New Age International (P) Ltd., New Delhi.							

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Department	Mechanical Engineering	Programme Code & Name		11 : B.E. Mechanical Engineering				
Semester VI								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110646E	FUNDAMENTALS OF IT	3	0	1	3	50	50	100
Objective(s)	To introduce the fundamentals of computer hardware and system software and to introduce basic TDBMS concepts.							
1	COMPUTER ARCHITECTURE AND SYSTEM SOFTWARE				Total Hrs		9	
Fundamentals of Computer Architecture – Organization of Small Computer – Execution of the Instructions – Input/output Devices – Measure of CPU Performance – Addressing modes – System Software – Assemblers – Loaders and linkers – Compilers and interpreters.								
2	OPERATING SYSTEMS AND COMPUTER NETWORKS				Total Hrs		9	
Operating system – memory management – Process management – File System Management – File Permissions – New Technology File System – Device Management – Computer Networks – Motivation and need for Computer Networks – Network topology – The OSI model – Important Routing devices – Types of Networks.								
3	RDBMS AND DATABASE DESIGN				Total Hrs		9	
Introduction to DBMS – data processing – the database technology – data models – RDBMS – ER modeling concept – Notations – Normalization – Need for Normalization – Process of Normalization – Types of Normal forms.								
4	SQL				Total Hrs		9	
SQL – The purpose of SQL – History of SQL – Data types – Statement Types – DDL statements – DML statements – Views – DCL statements – Embedded SQL – Best Practices.								
5	OLTP CONCEPTS				Total Hrs		9	
OLTP – Purpose – Transaction – Transaction Systems – Transaction Properties – Requirements for an OLTP System – Locks – Granularity of Locking – Intent Looking – Dead Lock – Time stamping – Security & Recovery Transaction log.								
Total hours to be taught							45	
Text book (s) :								
1	Foundation Program Books Vol-1 and Vol-2, Infosys.							
Reference(s) :								
1	Andrew S. Tanenbaum, Structured Computer Organization, PHI, 3rd ed., 1991.							
2	Silberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley, 1995.							
3	Henry F Korth, Abraham Silberschatz, Database System Concept, 2nd ed McGraw-Hill International editions, 1991.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110751E	PLANT LAYOUT AND MATERIAL HANDLING	3	0	0	3	50	50	100
Objective(s)	To understand the importance of energy utilization in power plants and to understand various components, operations and applications of different types of power plants.							
1	FACILITY LOCATION AND ANALYSIS				Total Hrs	9		
Location decisions - Qualitative and Quantitative factors, Simple models in single facility and multi facility problems.								
2	LAYOUT DESIGN				Total Hrs	9		
Facilities requirement, need for layout study – types of layout; Design cycle – SLP procedure – Algorithms – ALDEP, CORELAP, CRAFT								
3	CELLULAR LAYOUT				Total Hrs	9		
Group technology – Production Flow analysis (PFA), ROC (Rank Order Clustering) – Assembly Line balancing								
4	INTRODUCTION TO MATERIAL HANDLING				Total Hrs	9		
Principles, unit load concept, material handling system design, handling equipment types, selection and specification, containers and packaging.								
5	WAREHOUSE DESIGN				Total Hrs	9		
Introduction – Measuring & Benchmarking warehouse performance – Warehouse operations, Receiving and put away principles, Pallet Storage and Retrieval system, Case Picking systems – Warehouse layout – Computerizing warehouse operations								
Total hours to be taught						45		
Text book (s) :								
1	Tompkins, J.A. and J.A.White, “Facilities planning”, John Wiley, 2003.							
Reference(s) :								
1	Richard Francis.L. and John A.White, “Facilities Layout and location”, an analytical approach, Prentice Hall Inc., 2002.							
2	James Apple, M.Plant layout and “Material Handling”, John Wiley, 1977.							
3	Sundaresh Heragu, “Facilities Design”, PWS Publishing Company, Boston, 1997.							
4	Edward Frazelle, “World-Class Warehousing and Material Handling”, McGraw Hill Publishers, 2002.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering				
Semester VII									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ES	Total	
07110752E	ENTREPRENEURSHIP DEVELOPMENT	3	0	0	3	50	50	100	
Objective(s)	Study of this subject provides an understanding of the scope of an entrepreneur, key areas of development, financial assistance by the institutions, methods of taxation and tax benefits, etc.								
1	ENTREPRENEURSHIP				Total Hrs	9			
Entrepreneur-Types of Entrepreneurs-Difference between Entrepreneur and Entrepreneur-Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.									
2	MOTIVATION				Total Hrs	9			
Major Motives Influencing an Entrepreneur-Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test- Stress management, Entrepreneurship Development Programs- Need, Objectives.									
3	BUSINESS				Total Hrs	9			
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-Preparation of preliminary project Reports-Project Appraisal-Sources of Information-Classification of Needs and Agencies.									
9	FINANCING AND ACCOUNTING				Total Hrs	9			
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.									
5	SUPPORT TO ENTREPRENEURS				Total Hrs	9			
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.									
Total hours to be taught						45			
Text book (s) :									
1	S.S.Khanka “Entrepreneurial Development” S.Chand7 Co.Ltd.Ram Nagar New Delhi, 1999.								
2	Hisrich R D and Peters MP, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.								
Reference(s) :									
1	Rabindra N.Kanungo “Entreprenurship and invovation”, Sage Publications, New Delhi, 1998.								
2	EDII “Faulty and External Experts-A Hand Book for New Entrepreurs Publishers: Entrepreneurship Development” Institute of India, Ahmadabad, 1994.								

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Department	Mechanical Engineering		Programme Code & Name		11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110753E	INTERNAL COMBUSTION ENGINES	3	0	0	3	50	50	100
Objective(s)	To impart the knowledge in working process of spark ignition and compression ignition engines, Automobile pollution and its control, Pollution norms, Alternative fuels for I.C engines, Recent trends in I.C engines like learn burn engines, stratified charge engines, homogeneous charge ignition, plasma ignition and engine combustion.							
1	SPARK IGNITION ENGINES				Total Hrs	9		
Spark ignition Engine mixture requirements - Feedback Control Carburetors - Injection systems –Mono-point and Multi-point injection - Factors affecting knock - Combustion Chambers - Introduction to Thermodynamic analysis S.I. Engine combustion.								
2	COMPRESSION IGNITION ENGINES				Total Hrs	9		
States of combustion in C.I. Engine - Direct and indirect injection systems - Combustion chambers - Fuel spray behavior - spray structure, spray penetration and evaporation - Air motion - Turbo charging - Introduction to Thermodynamic Analysis of C.I. Engine combustion.								
3	ENGINE COMBUSTION				Total Hrs	9		
Combustion in SI and CI engines, stages of combustion in SI and CI engines, Normal combustion and Abnormal combustion, Stages of combustion - Combustion equations, Theoretical air, excess air, air fuel ratio, equivalence ratio, heating value of fuels.								
4	POLLUTANT FORMATION CONTROL				Total Hrs	9		
Pollutant - Sources and types - formation of NOx - Hydro-carbon Emission Mechanism - Carbon Monoxide Formation - Particulate emissions - Methods of controlling Emissions- Catalytic converters and Particulate Traps-Methods of measurements and Driving cycles- Various Euro norms of pollution.								
5	ALTERNATIVE FUELS AND RECENT TRENDS				Total Hrs	9		
Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio-Diesel - Properties, Suitability, Engine Modifications, Merits and De-merits as fuels. Learn Burn Engines - Stratified charge Engines - Gasoline Direct Injection Engine - Homogeneous charge compression Ignition - Plasma Ignition.								
Total hours to be taught						45		
Text book (s) :								
1	John B. Heywood, “Internal Combustion Engine Fundamentals", McGraw Hill, 1988.							
2	Dr.K.K.Ramalingam “Internal Combustion Engines Theory and Practice”, Scitech Publications (India) Pvt. Ltd., Chennai, 2002.							
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	V.Ganesan, “Internal Combustion Engines”, Second Edition, Tata McGraw Hill, 2004.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110754E	MAINTENANCE ENGINEERING	3	0	0	3	50	50	100
Objective(s)	To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities, to explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements and to illustrate some of the simple instruments used for condition monitoring in industry.							
1	PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING				Total Hrs	10		
Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity – Importance and benefits of sound Maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance economics.								
2	MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE				Total Hrs	9		
Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.								
3	CONDITION MONITORING				Total Hrs	9		
Condition Monitoring – Cost comparison with and without CM – On-load testing and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis								
4	REPAIR METHODS FOR BASIC MACHINE ELEMENTS				Total Hrs	9		
Repair methods for beds, slideways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.								
5	REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT				Total Hrs	8		
Repair methods for Material handling equipment - Equipment records –Job order systems -Use of computers in maintenance.								
Total hours to be taught						45		
Text book(s):								
1	Srivastava S.K., “Industrial Maintenance Management”, - S. Chand and Co., 2005.							
2	Bhattacharya S.N., “Installation, Servicing and Maintenance”, S. Chand and Co., 1995.							
References :								
1	Armstrong, “Condition Monitoring”, BSIRSA, 1988.							
2	Davies, “Handbook of Condition Monitoring”, Chapman &Hall, 1996.							
3	Garg M.R., “Industrial Maintenance”, S. Chand & Co., 1986.							
4	Higgins L.R., Mobley.K, Kaith Mobley.R “Maintenance Engineering Hand book”, McGraw Hill, 5th Edition, 2001.							
5	White E.N., “Maintenance Planning”, Control and Documentation, Gower Press, London, 1979.							
6	“Advances in Plant Engineering and Management”, Seminar Proceedings - IIPE, 1996.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110755E	MODERN MATERIALS	3	0	0	3	50	50	100
Objective(s)	To import the knowledge on the modern materials like smart, novel and nano materials to suit with the industrial needs.							
1	INTRODUCTION TO MATERIALS				Total Hrs	9		
Classes of materials – Smart/intelligent materials – Functional materials – Diverse areas of intelligent materials – primitive functions of intelligent materials – Examples of intelligent materials – Materials responsive to thermal, electrical, magnetic, optic, stress fields, Biocompatible materials and bio-Mimitics								
2	NOVEL MATERIALS				Total Hrs	9		
Amorphous and glassy materials – Structure – Preparation methods and novel properties – Shape memory alloys – working mechanism – pseudo elasticity – applications – Nickel-Titanium (Nitinol) alloys – Material characteristics of Nitinol – Introduction to Micro Electro Mechanical Systems (MEMS) – Silicon, porus Silicon and silicon oxide based MEMS –Fabrication of piezoelectric and piezo-resistive MEMS materials – Application to micro-actuators and microaccelerometers.								
3	NANO-STRUCTURED MATERIALS				Total Hrs	9		
Definition – Types – preparation and characterization techniques – Size effects on various properties – Carbon nanotubes – silicon and silicon oxide nano wires –Mechanical (hardness, ductility, elasticity), optical and electrical properties of nano tubes and nano wires – quantum wires and quantum dots.								
4	PZT, CMR & FERRO-FLUID				Total Hrs	9		
Structure of ABO3 and AB2O4 materials – Synthesis and properties of piezo-electric ,ferroelectric perovskites and spinel structured materials - PZT thin films –preparation (different techniques-Sol-gel, PLD,MOVCD) and applications-Introduction to magnetoresistance (MR) – GMR and CMR materials – Applications-Preparation and properties of ferro-fluids – Electro- Rheological fluids – Applications.								
5	MODERN SEMI CONDUCTING MATERIALS				Total Hrs	9		
Introduction to III – V and III - N Compounds – Synthesis techniques –CVD –VPE – Applications (White LED) – Technological importance of II – VI and I – III – VI2 binary, ternary and quaternary semiconductors – Introduction to non linear optics (NLO) and NLO materials - Novel applications of ZnO and TiO2 thin films.								
Total hours to be taught						45		
Text book(s):								
1	Mukesh V.Gandhi and Brian S.Thompson, Smart materials and structures, Chapman & Hall,London, 1992.							
2	T.W.Duerig, K.N.Melton, D.Stockel and C.M.Wayman, Engineering aspects of shape memory Alloys, Butterworth-Heinemann, 1990							
References :								
1	Sorab K. Gandhi, Fabrication Principles of VLSI, John Wiley,1996							
2	Charles P.Poole and Frank J Owens, Introduction to nano technology, Wiley Interscience,2003.							
3	Tapan Chatterji, Colossal magnetoresistive manganites, Kluwer Academic Publishers, 2004							
4	Malcolm E.Lines and Alastair M.Glass, Principles and applications of Ferroelectrics and Related materials, Oxford University Press, 2001							
5	A. Inoue and K.Hashimoto, Amorphous and Nanocrystalline Materials:Preparation,Properties and Applications, Springer Verlag							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110756E	ADVANCED WELDING TECHNOLOGY	3	0	0	3	50	50	100
Objective(s)	To enable the student to understand the principles, functions and practices adapted in industry to the Conventional welding processes and advanced welding processes such as laser welding, electron beam welding, plasma arc welding and etc.							
1	SOLID STATE WELDING PROCESSES				Total Hrs	9		
Fundamental principles, survey of the various pressure welding processes and their applications. Friction, explosive, diffusion, and Ultrasonic welding – principles of operation, profess characteristics and application.								
2	HIGH ENERGY BEAM WELDING				Total Hrs	9		
Heat generation and regulation, equipment details in typical set-up, electron beam welding in different degrees of vacuum, advantages and disadvantages, applications. Laser Welding: Principles of operation, advantages, and limitations, applications.								
3	ELECTRON SLAG WELDING				Total Hrs	9		
Heat generation, principles of operations, wire and consumable guide techniques, selection of current, voltage and other process variables, nature of fluxes and their choice. Electro-gas welding: Principle and applications, Narrow gap welding, Under Water welding.								
4	PLASMA ARC WELDING				Total Hrs	9		
Special features of plasma arc- transferred and non transferred arc, key hole and puddle-in mode of operation, micro low and high current plasma arc welding and their applications, plasma cutting, surfacing and applications.								
5	OTHER WELDING PROCESSES				Total Hrs	9		
Adhesive bonding and Welding of plastics, Cold pressure welding, High frequency Welding, Stud welding, Welding automation.								
Total hours to be taught						45		
Text book(s):								
1	Parmar .R.S."Welding Engineering and Technology" Khanna Publications, New Delhi, 1997.							
References :								
1	Khanna .O.P, " A Text Book of Welding Technology", Dhanpat Rai Publications, 2001.							
2	Nadkarni S.V. "Modern Arc Welding Technology", Oxford IBH Publishers. 1996.							
3	AWS- Welding Hand Book. 8th Edition. Vol- 2. "Welding Process", 1998.							
4	Christopher Davis. "Laser Welding- Practical Guide". Jaico Publishing House. 1994.							
5	Nadkarni S.V. "Modern Arc Welding Technology", Oxford IBH Publishers. 1996.							

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Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110761E	NANOTECHNOLOGY	3	0	0	3	50	50	100
Objective(s)	To understand the basics of nanotechnology and the behavior of nanostructures concepts of concurrent engineering us products after process planning.							
1	INTRODUCTION OF MATERIAL STRUCTURE				Total Hrs	9		
Scientific Revolutions – Types of Nanomachines and Nanotechnology-periodic table-Atomic structure molecules and phase Energy-Molecular and Atomic size-surfaces and dimensional space-Top down and bottom up.								
2	SYNTHESIS AND PROCESSING				Total Hrs	9		
Introduction to Nano scale materials - Synthesis and processing, method of nano structured materials preparation – mechanical grinding, wet chemical synthesis – sol-gel processing, gas phase synthesis, gas condensation processing, chemical vapour condensation – nano composite synthesis – processing.								
3	DYNAMIC BEHAVIORS				Total Hrs	9		
Opportunity at the nano scale - Length and time scale in structures-energy landscapes-Inter dynamic aspects of inter molecular forces-Evolution of band structure and Fermi surface.								
4	APPLICATIONS				Total Hrs	9		
Quantum dots - Nano wires-Nano tubes 2D and 3D films Nano and mesopores, micelles, bilayers, vesicles, bio-nano machines-biological membranes.								
5	PROPERTIES OF NANOSTRUCTURING				Total Hrs	9		
Influence of Nano structuring on Mechanical - Optical, electronic, magnetic and chemical properties-gram- size effects on strength of metals optical properties of quantum dots and quantum wires-electronic transport in quantum wires and carbon nano tubes-magnetic behavior of single domain particles and nanostructures-surface chemistry of tailored monolayer-self assembling.								
Total hours to be taught						45		
Text book (s) :								
1	Nano technology: Basic Science and Emerging technologies, Mick Wilson, Kamali Kannargare., Geoff Smith Overseas Press, 2005.							
Reference(s) :								
1	Introduction to Nanotechnology Charles P. Poole, Frank J. Owens, Wiley Interscience (2003).							
2	Nanotechnology: A gentle introduction to the next Big Idea, Mark A. Ratner, Daniel Ratner, Mark Ratne, Prentice Hall P7R:1st Edition, 2002.							

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name		11 : B.E. Mechanical Engineering				
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110762E	CONCURRENT ENGINEERING	3	0	0	3	50	50	100
Objective(s)	To understand the concepts of concurrent engineering, its process issues and economic analysis, including human consideration by real time case studies.							
1	INTRODUCTION AND BASIC PROCESS ISSUES				Total Hrs	9		
Introduction - basic concepts - traditional Vs concurrent approach - schemes and tools of concurrent engineering - application of computers in the practice of concurrent engineering. Process models - types - importance. Relation between models, specifications, technology, automation and process improvement. Fabrication processes - assembly processes - models of manufacturing, testing and inspection.								
2	CONCURRENT ENGINEERING APPROACH IN MANUFACTURING SYSTEMS				Total Hrs	9		
System design procedure - features - intangibles - assembly resource alternatives - task assignment - tools and tool changing - material handling alternatives.								
3	ECONOMIC ANALYSIS OF SYSTEMS				Total Hrs	9		
Types of manufacturing cost - pro-forma, cash-flow, determining allowable investment - evaluation of investment alternatives - sensitivity analysis - effect of recycling and rework.								
4	CONCURRENT AUTOMATED FABRICATION SYSTEMS				Total Hrs	9		
Introduction - methodology - preliminary and detailed work content analysis - alternatives - human resource considerations. "Technical - Economic" performance evaluation - concurrent assembly work station - strategic issues - technical issues - economic analysis								
5	CASE STUDIES OF CONCURRENT ENGINEERING PRACTICE				Total Hrs	9		
Automobile air-conditioning module - robot assembly of automobile rear-axles.								
Total hours to be taught						45		
Text book (s) :								
1	James L Nevins and Daniel E Whitney, "Concurrent Design of Products and Processes", McGraw Hill Publishing Company, 1989.							
Reference(s) :								
1	David D Bedworth, Mark R Handerson and Philip M Wilze, "Computer Integrated Design and Manufacturing", McGraw Hill International Edition, 1991.							
2	Proceedings of the "Summer School on Applications of Concurrent Engineering to Product Development" held at PSG College of Technology, May 1994.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110763E	PRODUCTION PLANNING AND CONTROL	3	0	0	3	50	50	100
Objective(s)	To understand the various components and functions of production planning and control such as work study, product planning, process planning, production scheduling, Inventory Control. To know the recent trends like manufacturing requirement planning (MRP II) and Enterprise Resource Planning (ERP).							

1	INTRODUCTION	Total Hrs	9
Objectives and benefits of planning and control-Functions of production control-Types of production-job-batch and continuous-Product development and design-Marketing aspect-Functional aspects-Operational aspect-Durability and dependability aspect-aesthetic aspect. Profit consideration-Standardization, Simplification and specialization-Break even analysis-Economics of a new design.			
9	WORK STUDY	Total Hrs	9
Method study, basic procedure –Selection-Recording of process-Critical analysis, Development-Implementation-Micro motion and memo motion study-work measurement-Techniques off work measurement-Time study –Production study –Work samping from standard data-Predetermined motion time standards.			
3	PRODUCTION PLANNING AND PROCESS PLANNING	Total Hrs	9
Production planning-Extending the original product information-Value analysis-Problems in lack of product planning-Process Planning and rounting-pre requisite information needed for process planning-steps in process planning-quantity determination in batch production-Machine capacity, balancing-Analysis of process capabilities in a multi product system.			
4	PRODUCTION SCHEDULING	Total Hrs	9
Production control systems-Loading and scheduling-Master Scheduling-Scheduling rules-Gantt charts-Perpetual loading-Basic scheduling problems-Line of balance-Flow production scheduling-Batch production scheduling-Product sequencing-Production control system-Periodic batch control-Material requirement planning kanban-Dispatching-Progress reporting and expediting-Manufacturing lead time-Techniques for aligning completion times and due dates.			
5	INVENTORY CONTROL AND RECENT TRENDS IN PPC	Total Hrs	9
Inventory control-Purpose of holding stock-Effect of demand on inventories-Ordering procedures.Two bin system-Ordering cycle system-Determination of Economic order quantity and economic lot size-ABC analysis-Recorder procedure-Introduction to computer integrated production planning systems-elements of JUST IN TIME SYSTREMS-Fundamentals of MRP II and ERP.			
Total hours to be taught			45

Text book (s) :

1	Martand Telsang, “Industrial Engineering and Production Management, S.Chand and Company, First edition,2000

Reference(s) :

1	Samson Eilon, “ Elements of production planning and control”, Universal book corpn.1984
2	Elwood S.Buffa, and Rakesh K.Sarin, “Modern Production/Operations Management”,8th Ed. John Wiley and Sons,2000.
3	K.C.Jain & L.N. Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers, 1990
4	N.G.Nair, “Production and Operations Management”, Tata McGraw-Hill, 1996.
5	S.N.Chary, “Theory and Problems in Production & Operations Management”, Tata McGraw hill, 1995
6	S.K.Hajra Choudhury, Nirjhar Roy and A.K. Hajra Choudhury, “Production Management”, Media Promoters and Publishers Pvt.Ltd., 1998.

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110764E	REFRIGERATION AND AIR-CONDITIONING	3	0	0	3	50	50	100
Objective(s)	To integrate the thermodynamic concepts into the analysis of refrigeration cycles, give awareness to students on parameter to be considered for designing Refrigeration and Air Conditioning and enable the student to design air conditioning system for building.							
1	REFRIGERATION CYCLE				Total Hrs	9		
Review of thermodynamic principles of refrigeration. Concept of Aircraft refrigeration system. Vapour compression refrigeration cycle - use of p-h charts - multistage and multiple evaporator systems - cascade system - COP comparison. Vapor absorption refrigeration system, Ammonia water and Lithium Bromide water systems. Steam jet refrigeration system.								
2	REFRIGERANTS, SYSTEM COMPONENTS AND BALANCING				Total Hrs	9		
Compressors - reciprocating and rotary (elementary treatment.) - condensers - evaporators - cooling towers. Refrigerants - properties - selection of refrigerants, Alternate Refrigerants, Refrigeration plant controls - testing and charging of refrigeration units. Balancing of system components. Applications to refrigeration systems - ice plant - food storage plants - milk -chilling plants – refrigerated cargo ships.								
3	PSYCHROMETRY				Total Hrs	9		
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.								
4	COOLING LOAD CALCULATIONS				Total Hrs	9		
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.								
5	AIR-CONDITIONING AND COMPONENTS				Total Hrs	9		
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.								
Total hours to be taught						45		
Text book (s) :								
1	Manohar Prasad, "Refrigeration and Air Conditioning", Wiley Eastern Ltd., 1983.							
2	Arora C.P., "Refrigeration and Air Conditioning", Tata McGraw-Hill New Delhi, 2006.							
Reference(s) :								
1	Roy.J Dossat, “Principles of Refrigeration”, Pearson Education 1997.							
2	Jordon and Prister, “Refrigeration and Air Conditioning”, Prentice Hall of India PVT Ltd., New Delhi, 1985.							
3	Stoecker N.F and Jones, "Refrigeration and Air Conditioning", TMH, New Delhi, 1981.							

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Department	Mechanical Engineering	Programme Code & Name		11 : B.E. Mechanical Engineering				
Semester VIIF								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110765E	PRODUCT DESIGN AND COSTING	3	0	0	3	50	50	100
Objective(s)	To enable the student to understand the several aspects of the design process and to apply them in practice. Also to train the student in the concept of product costing and other manufacturing economics in optimization of product design.							
1	PRODUCT DESIGN AND DEVELOPMENT				Total Hrs.	9		
Principles of creativity in design- integrated product development and concurrent engineering – Product analysis – Criteria for product design – Market research – Design for customer and design for manufacture – Product life cycle.								
2	ECONOMICS OF DESIGN				Total Hrs.	9		
Breaks even point - Selection of optimal materials and processes – Material layout planning – Value analysis – Re-engineering and its impact on product development.								
3	PRODUCT MODELING				Total Hrs.	9		
Product modeling – Definition of concept - fundamental issues – Role and basic requirement of process chains and product models –Types of product models – model standardization efforts – types of process chains – industrial demands.								
4	PRODUCT COSTING				Total Hrs.	9		
Bill of materials – Outline Process charts – Concepts of operational standard time - Work measurement by analytical estimation and synthesis of time – Budgets times – Labor cost and material cost at every stage of manufacture – W.I.P. costing								
5	RECENT ADVANCES AND CONCEPTS IN PRODUCT DESIGN				Total Hrs.	9		
Fundamentals of FEM and its significance to product design – Product life cycle management – Intelligent information system – Concept of Knowledge based product and process design.								
Total hours to be taught						45		
Text book(s) :								
1.	Sameul Eilon – "Elements of Production Planning and Control" – McMillan and Company, 1962.							
Reference(s):								
1.	Donald E. Carter – "Concurrent Engineering", Addison Wesley, 1992							
2.	George E. Dieter," Engineering Design – Materials and process approach", Tata McGraw Hill, 1991							
3.	Harry Nystrom – "Creativity and Innovation", John Wiley & Sons, 1979							
4.	Jones S.W., "Product Dosing and Process Selection", Butterworth Publications, 1973							
5.	Karl T. Ulrich, Stephen D. Eppinger –" Product Design and Development", McGraw Hill, 1994							

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Department	Mechanical Engineering		Programme Code & Name		11 : B.E. Mechanical Engineering			
Semester VII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110766E	IT ESSENTIALS	3	0	0	3	50	50	100
Objective(s)	To introduce and various essential concepts of IT							

1	ANALYSIS OF ALGORITHMS	Total Hrs	9
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.			
2	OBJECT ORIENTED CONCEPTS	Total Hrs	9
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.			
3	SYSTEM DEVELOPMENT METHODOLOGY	Total Hrs	9
System Development Methodology – Evolution of Software – Software Development Models – Requirement Analysis and Design – Software Construction – Software Testing – Software Quality.			
4	CLIENT SERVER CONCEPTS	Total Hrs	9
Client server computing – Back Ground – Client Server Technologies – Middle ware technologies – Introduction to Web Technology.			
5	WEB TECHNOLOGIES & USER INTERFACE DESIGN	Total Hrs	9
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.			
Total hours to be taught			45

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, 1991
2	Alfred V.Aho,John E.Hopcroft, Jeffrey D.Ullman, Design and Analysis of Computer Algorithms, Addison Wesley Publishing Co., 1998
3	Rojer Pressman, Software Engineering-A Practitioners approach, McGraw Hill, 5th ed., 2001
4	Wilbert O.Galitz, Essential Guide to User Interface Design, John Wiley, 1997
5	Alex Berson, Client server Architecture, Mc Grew Hill International, 1994
6	Dromey R.G., How to solve it by Computers, PHI, 1994

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110871E	COMPOSITE MATERIALS	3	0	0	3	50	50	100
Objective(s)	To impart knowledge on composite materials and their physical properties and Behaviour. The modern material revolution in the world to produce low density, high strength, high stiffness to weight ratio used in application of spacecraft, aircraft and automobile. Mainly this study focuses on the mechanics, performance, manufacturing and design of composite materials.							

1	INTRODUCTION	Total Hrs	9
Definition – Need – General Characteristics, Applications. Fibers – Glass, Carbon, Ceramic, Aramid and Natural fibers. Matrix –Selection of matrix- Epoxy, Polyester, Vinyl ester, Nylon, Ceramic and Metal Matrices – Fiber surface treatments, Glass Fiber and carbon fiber- Fillers and additives-Fiber content- density - void content.			
2	MECHANICS	Total Hrs	9
Fiber matrix interactions in a unidirectional lamina-Rule of mixture ,Continuous parallel fiber, Discontinuous parallel fiber–Micro failure modes in longitudinal Tension-Transverse tensile loading-Longitudinal compression loading –Characteristics of fiber reinforced lamina, coordinate axes, notation, stress transformation -Evaluation of four elastic moduli based on strength of materials approach - Longitudinal Young's modulus-transverse Young's modulus–major Poisson's ratio-Laminated structure-lamination theory.			
3	PERFORMANCE	Total Hrs	9
Static Mechanical Properties – Fatigue and Impact Properties – Pin bearing strength-damping properties-Environmental effects – Long term properties- Fracture Behavior - Damage Tolerance.			
4	MANUFACTURING	Total Hrs	9
Preperg - Sheet Molding Compounds-Bag Molding – Compression Molding – Pultrusion – Filament Winding – Resin Transfer Molding - SRIM process - ERM process -Tube Rolling – Quality Inspection methods.			
5	DESIGN	Total Hrs	9
Failure Predictions, Unidirectional Lamina, Unnotched Laminates, Notched Laminates-Laminate Design Consideration, Design criteria, Design allowables, Design guidelines- Joint design-Bolted and Bonded Joints. Metal Matrix Composites-Mechanical Properties-Manufacturing process.			
Total hours to be taught			45

Text book (s) :

1	Mallick, P.K., "Fiber Reinforced Composites: Materials, Manufacturing and Design", Marcel Dekker Inc, New York, 1993

Reference(s) :

1	Kaw and Autar K, "Mechanics of Composite Materials", CRC Press, London, 2006
2	Agarwal, B.D. and Broutman, L.J., "Analysis and Performance of Fiber Composites", John Wiley & Sons, New York, 1990
3	Gibson and Ronald, "Principles of Composite Material Mechanics", Tata McGraw-Hill, New Delhi, 1994
4	Chawla K.K, "Composite Materials and Engineering", Springer Verlag, New York, 2nd Edition, 2008

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Department	Mechanical Engineering	Programme Code & Name				11 : B.E. Mechanical Engineering		
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110872E	MARKETING MANAGEMENT	3	0	0	3	50	50	100
Objective(s)	To understand the various processes involved in Marketing and its Philosophy, Psychology of consumers and strategies for advertising, pricing and selling.							

1	MARKETING PROCESS	Total Hrs	9
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.			
2	BUYING BEHAVIOUR AND MARKET SEGMENTATION	Total Hrs	9
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.			
3	PRODUCT PRICING AND MARKETING RESEARCH	Total Hrs	9
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.			
4	MARKETING PLANNING AND STRATEGY FORMULATION	Total Hrs	9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.			
5	ADVERTISING SALES PROMOTION AND DISTRIBUTION	Total Hrs	9
Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.			
Total hours to be taught			45

Text book (s) :

1	Ramasamy and Nama kumari, “Marketing Environment: Planning , implementation and control the Indian context”,1990

Reference(s) :

1	Govindarajan.M. “Industrial marketing management”, Vikas Publishing Pvt Ltd, 2003
2	Philip Kolter, “Marketing Management”, Pearson Education 2001
3	Green Paul.E.and Donald Tull, “Research for marketing decisions”, Prentice Hall of India, 2008
4	Steven J.Skinner, “Marketing”, All India Publishers and Distributes Ltd. 1998

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Department	Mechanical Engineering	Programme Code & Name		11 : B.E. Mechanical Engineering				
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110873E	VIBRATION AND NOISE CONTROL	3	0	0	3	50	50	100
Objective(s)	The student will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components.							
1	BASICS OF VIBRATION				Total Hrs	9		
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.								
2	BASICS OF NOISE				Total Hrs	9		
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.								
3	AUTOMOTIVE NOISE SOURCES				Total Hrs	9		
Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, aerodynamic noise, tyre noise, brake noise.								
4	CONTROL TECHNIQUES				Total Hrs	9		
Vibration isolation, tuned absorbers, untuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.								
5	SOURCE OF NOISE AND CONTROL				Total Hrs	9		
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers.								
Total hours to be taught						45		
Text book (s) :								
1	Singiresu S.Rao, “Mechanical Vibrations” - Pearson Education, 2004							
2	Kewal Pujara, “Vibrations and Noise for Engineers, Dhanpat Rai & Sons, 1992							
Reference(s) :								
1	Bernard Challen and Rodica Baranescu, “Diesel Engine Reference Book” - Second edition - SAE International,1999							
2	Julian Happian-Smith, “An Introduction to Modern Vehicle Design”- Butterworth-Heinemann, 2004							
3	John Fenton, “Handbook of Automotive body Construction and Design Analysis - Professional Engineering Publishing, 1998							

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Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110874E	CRYOGENIC ENGINEERING	3	0	0	3	50	50	100
Objective(s)	To study about cryogenic fluid properties at cryogenic temperature and the low temperature refrigeration and to study about liquefaction and separation of gases.							
1	INTRODUCTION				Total Hrs	7		
Insight on Cryogenics, Properties of Cryogenic fluids, Material properties at Cryogenic Temperatures. Applications of Cryogenics in Space Programs, Superconductivity, Cryo Metallurgy, Medical applications.								
2	LIQUEFACTION CYCLES				Total Hrs	10		
Carnot Liquefaction Cycle, F.O.M. and Yield of Liquefaction Cycles. Inversion Curve - Joule Thomson Effect. Linde Hampson Cycle, Precooled Linde Hampson Cycle, Claudes Cycle Dual Cycle, Ortho-Para hydrogen conversion, Eollins cycle, Simpson cycle, Critical Components in Liquefaction Systems.								
3	SEPARATION OF CRYOGENIC GASES				Total Hrs	12		
Properties of mixtures- characteristics- Temperature composition diagrams-Enthalpy Composition diagrams, Enthalpy Composition diagrams, Principles of gas separation-Rectification principles-Flash calculations-Theoretical plate Calculations for columns-Minimum number of theoretical plates-Rectification column types. Air Separation systems, Hydrogen Separation, Helium Separation and Gas Purification systems								
4	CRYOGENIC REFRIGERATORS				Total Hrs	8		
J.T.Cryocoolers, Stirling Cycle Refrigerators, G.M.Cryocoolers, Pulse Tube Refrigerators Regenerators used in Cryogenic Refrigerators, Dilution refrigerators, Magnetic Refrigerators.								
5	HANDLING OF CRYOGENS				Total Hrs	8		
Cryogenic Dewar, Cryogenic Transfer Lines. Insulations used in Cryogenic Systems, Instrumentation to measure Flow, Level and Temperature								
Text Book:						45		
1	Randall F. Barron, Cryogenic Systems, McGraw-Hill, 1985.							
Reference(s) :								
1	Klaus D. Timmerhaus and Thomas M. Flynn, Cryogenic Process Engineering, Plenum Press, New York, 1989.							
2	Scott R.B., Cryogenic Engineering, Van Nostrand and Co., 1962.							
3	Herald Weinstock, Cryogenic Technology, 1969.							
4	Robert W. Vance, Cryogenic Technology, Johnwiley & Sons, Inc., New York, London.							

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110875E	QUALITY CONTROL AND RELIABILITY ENGINEERING	3	0	0	3	50	50	100
Objective(s)	To understand the Quality concepts and principles and the various tools available to achieve Quality, the statistical approach for quality control. Create awareness about reliability and its need for the industries.							

1	INTRODUCTION	Total Hrs	9
Definition of Quality- Method of control, chance, causes, assignable causes, SQC benefits and limitations. Quality assurance, Quality management, quality control, quality circles, fundamental concepts, 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.			
2	THEORY OF CONTROL CHARTS	Total Hrs	9
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.			
3	ACCEPTANCE SAMPLIING	Total Hrs	9
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 – A case study in an industry.			
4	INTRODUCTION TO RELIABILITY	Total Hrs	9
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.			
5	RELIABILITY IMPROVEMENT	Total Hrs	9
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.			
Total hours to be taught			45

Text book (s) :	
1	Grantt, Statistical Quality Control, Mc Graw Hill, ISE.,1998
2	Srinath L.S., Concepts in Reliability Engineering, Eastwest 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

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110876E	ADVANCED STRENGTH OF MATERIALS	3	0	0	3	50	50	100
Objective(s)	To learn about elasticity, shear center and unsymmetrical bending, explore curved flexible members and flat plates along with torsion on non circular sections and contact stresses.							

1	ELASTICITY	Total Hrs	9
Stress-Strain relations and general equations of elasticity in Cartesian, Polar and spherical coordinates differential equations of equilibrium-compatibility-boundary conditions-representation of three-dimensional stress of a tension generalized hook's law - St. Venant's principle-plane stress-Airy's stress function.			
2	SHEAR CENTER AND UNSYMMETRICAL BENDING	Total Hrs	9
Location of shear center for various sections -shear flows- Stresses and deflections in beams subjected to unsymmetrical loading-kern of a section.			
3	CURVED FLEXIBLE MEMBERS AND STRESSES IN FLAT PLATES	Total Hrs	9
Circumference and radial stresses-deflections-curved beam with restrained ends-closed ring subjected to concentrated load and uniform load-chain links and crane hooks. Stresses in circular and rectangular plates due to various types of loading and end conditions buckling of plates.			
4	TORSION OF NON-CIRCULAR SECTIONS	Total Hrs	9
Torsion of rectangular cross section - S.Venants theory - elastic membrane analogy Prandtl's stress function torsional stress in hollow thin walled tubes.			
5	STRESSES DUE TO ROTARY SECTIONS AND CONTACT STRESSES	Total Hrs	9
Radial and tangential stresses in solid disc and ring of uniform thickness and varying thickness allowable speeds. Methods of computing contact stress-deflection of bodies in point and line contact applications.			
Total hours to be taught			45

Text book(s):

1	Seely and Smith, "Advanced Mechanics of Materials", John Wiley International Edn, 1952.

References :

1	Rimoahwnko, "Strength of Materials", Van Nostrand
2	Timoshenko and Goodier, "Theory of Elasticity", McGraw Hill
3	Wang, "Applied Elasticity", McGraw Hill
4	Cas, "Strength of Materials", Edward Arnold, London 1957
5	Robert D. Cook, Warren C. Young, "Advanced Mechanics of Materials", Mc-millan pub. Co., 1985

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Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110881E	PROCESS PLANNING AND COST ESTIMATION	3	0	0	3	50	50	100
Objective(s)	To understand the process planning concepts and cost estimation for various products after process planning.							

1	WORK STUDY AND ERGONOMICS	Total Hrs	9
Method study-Definition - Objectives-Motion economy-Principles-Tools and Techniques-Applications-Work Measurements-Purpose-use-procedure-tools and techniques-standard time-Ergonomics-principles-applications.			
2	PROCESS PLANNING	Total Hrs	9
Definition-Objective-Scope-approaches to process planning-process planning activities-Finished part requirements-operating sequences-machine selection-material selection parameter-Set of documents for process planning-Developing manufacturing logic and knowledge-production time calculation-selection of cost optimal processes.			
3	INTRODUCTION TO COST ESTIMATION	Total Hrs	9
Objective of cost estimation-costing-cost accounting-classification of cost-Elements of cost.			
4	COST ESTIMATION	Total Hrs	9
Types of estimates-methods of estimates-data requirements and sources-collection of cost-allowances in estimation.			
5	PRODUCTION COST ESTIMATION	Total Hrs	9
Estimation of material cost, labour cost and over heads, allocation of overheads-Estimation for different types of jobs.			
Total hours to be taught			45

Text book (s) :

1. Sinha.B.P., “Mechanical Estimating and costing”, Tata McGraw-Hill, Publishing Co,1995

Reference(s) :

1. Phillip.F Ostwalal and jairo Munez,” Manufacturing Processes and systems”, John Wiley, 9th Edition,1998
2. Russell.R.S and Tailor, B.W,” Operations Management “, PHI,4th Edition,2003
3. Chitale.A.V.and Gupta.R.C., ”Product Design and Manufacturing”,PHI,2nd Edition,2002

K.S.Rangasamy College of Technology - Autonomous Regulation								R 2007
Department	Mechanical Engineering	Programme Code & Name			11 : B.E. Mechanical Engineering			
Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110882E	DESIGN OF HEAT EXCHANGERS	3	0	0	3	50	50	100
Objective(s)	To understand the concepts of heat transfer mechanism and heat exchanger design.							
1	INTRODUCTION AND CLASSIFICATION OF HEAT EXCHANGERS				Total Hrs	9		
Introduction, recuperation and regeneration, transfer process, Geometry construction of tubular heat exchanger, plate heat exchanger and extended surface heat exchanger, Heat transfer mechanism, flow arrangements, Applications.								
2	BASIC DESIGN METHODS OF HEAT EXCHANGERS				Total Hrs	9		
Introduction, Arrangement of flow path in heat exchangers, Basic equations in design, overall heat transfer coefficient, Log mean temperature difference method for heat exchanger analysis, the NTU- method for heat exchanger analysis, Heat exchanger design calculation, variable overall heat transfer coefficient, Heat exchanger design methodology								
3	HEAT EXCHANGER PRESSURE DROP AND PUMPING POWER				Total Hrs	9		
Introduction, Tube side pressure drop, Pressure drop in bundles in cross flow , Pressure drop in helical and spiral coils, pressure drop in bends and fittings, pressure drop for abrupt contraction, expansion momentum change, Heat transfer and pumping power relationship.								
4	COMPACT HEAT EXCHANGERS				Total Hrs	9		
Introduction, plat-fin heat exchangers, Tube-fin Heat exchangers, Heat Transfer and Pressure Drop: Heat transfer, pressure drop for finned-Tube exchangers, pressure drop for plate fin exchangers.								
5	CONDENSER AND EVAPORATORS				Total Hrs	9		
Introduction, Shell and Tube condensers, Steam turbine exhaust condensers, Plate condensers, Air cooled condenser, Direct contact condenser, Design and operational considerations, Condensers for refrigeration and air conditioning, Evaporators for refrigeration and air conditioning,								
Total hours to be taught						45		
Text book (s) :								
1	Sadik Kakac and Hongtan Liu, "Heat Exchangers", CRC Press, 1997.							
Reference(s) :								
1	Liley “Advanced heat and mass transfer” MGill Publication company 1998							
2	Samley and brown “ fundamentals of heat exchanger design” MGill Publication company 1998							

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Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110883E	INDUSTRIAL SAFETY ENGINEERING	3	0	0	3	50	50	100
Objective(s)	This Syllabus is framed to give a overview for the students to know about safety aspects and procedures. The objective is to provide them a exposure to industrial proves safety and also to gain knowledge regarding the legal requirement of safety.							

1	SAFETY MANAGEMENT	Total Hrs.	9
Evolution of modern safety concept – Safety policy – Safety Organization – Safety Committee – budgeting for safety.Safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign.			
2	ACCIDENT INVESTIGATION AND REPORTING	Total Hrs.	9
Concept of an accident, reportable and non reportable accidents, reporting to statutory authorities – principles of accident prevention – accident investigation and analysis – records for accidents, departmental accident reports, documentation of accidents – unsafe act and condition – domino sequence – supervisory role – cost of accident.			
3	SAFETY IN ENGINEERING INDUSTRY	Total Hrs.	9
Machine Guarding, Guarding of hazards, Machine Guarding types and its application – Safety in welding and Gas cutting – Safety in Manual and Mechanical material handling – Safety in use of electricity.			
4	CHEMICAL SAFETY AND HYGIENE	Total Hrs.	9
Toxicity – TLV – Types of Chemical Hazards – Occupational diseases caused by dust, fumes, gases, smoke and solvent hazards – control measures. Fire triangle – Types of fire – first aid firefighting equipment – flammability limit – LPG safety.			
5	SAFETY REGULATIONS AND CERTIFICATIONS	Total Hrs.	9
Overview of factories act 1948 – OHSAS 18000.			
Total hours to be taught			45

Text book(s) :

1. Accident Prevention Manual for Industrial Operations, N.S.Chicago, 1982

Reference(s):

1. Blake R.B., “Industrial Safety” Prentice Hall, Inc., New Jersey, 1973
2. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980
3. Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997
4. John Ridley, “Safety at Work”, Butterworth & Co., London, 1983

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Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110884E	NUCLEAR ENGINEERING	3	0	0	3	50	50	100
Objective(s)	To familiarize students with materials used in fission reactors , history of fission reactor fuel, behavior of fuel rod, radiation effects, fission reactors, radiation hazared , and environmental safety.							

1.	NUCLEAR REACTIONS	Total Hrs	9
Mechanism of Nuclear Fission - Nuclides - Radioactivity – Decay Chains - Neutron Reactions - the Fission Process - Reactors - Types of Fast Breeding Reactor - Design and Construction of Nuclear reactors - Heat Transfer Techniques in Nuclear Reactors - Reactor Shielding.			
2.	REACTOR MATERIALS	Total Hrs	9
Nuclear Fuel Cycles - Characteristics of Nuclear Fuels - Uranium - Production and Purification of Uranium - Conversion to UF4 and UF6 - Other Fuels like Zirconium, Thorium - Berylium.			
3.	REPROCESSIG	Total Hrs	9
Nuclear Fuel Cycles - Spent Fule Characteristics - Role of Solvent Extraction in Reprocssing - Solvent Extraction Equipment.			
4.	SEPARTION OF REACTOR PRODUCTS	Total Hrs	9
Processes to be Considered - 'Fuel Element' Dissolution - Precipitation Process – Ion Exchange - Redox - Purex - TTA - Chelation -U235 -Hexone - TBP and Thorax Processes - Oxidative Slaging and Electro - Refinng - Isotopes - Principles of Isotope Separation.			
5.	WASTE DISPOSAL AND RADIATION PROTECTION	Total Hrs	9
Types of Nuclear Wastes - Safety Control and Pollution Control and Abatement - International Convention on Safety Aspects - Radiation Hazards Prevention.			
Total No of periods:			45

Text book(s):

1	1. S.Glasstone and A.Sesonske, Nuclear Reactor Engineering (3 rd Edition), Von Nostrand, 1994

References :

1	J.R.Lamarsh, Introduction to Nuclear Reactor Theroy, Wesley, 2002
2	J.J.Duderstadt and L.J.Hamiition, Nuclear Reactor Analysis - John Wiley 1976
3	A.E.Walter and A.B.Reynolds Fast Breeder Reactor, Pergamon Press - 1981
4	R.H.S.Winterton, Thermal Design of Nuclear Reactors - Pergamon Press - 1981

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Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110885E	MODERN CONCEPTS OF ENGINEERING DESIGN	3	0	0	3	50	50	100
Objective(s)	To impart knowledge on design process, and its requirements, mathematical modeling, geometric modeling, material selection for design process, material processing, Environmental and safety issues.							

1	THE DESIGN PROCESS	Total Hrs	9
The Design Process - need identification – Design requirements – Product Life Cycle– Morphology of Design steps of Product Design – Conceptual Design, Embodiment Design, Detailed Design – Concurrent Engineering – CAD & CAM, Human factors in Design.			
2	TOOLS IN ENGINEERING DESIGN	Total Hrs	9
Creativity and problem solving, Decision Theory, Modeling – Role of models in Engineering Design, Mathematical modeling, Geometric modeling, Finite element modeling, Rapid Prototyping – Simulation Finite Difference method, Monte Carlo method – Optimization – Search methods, Geometric programming, Structural and Shape Optimization.			
3	MATERIAL SELECTION AND MATERIALS IN DESIGN	Total Hrs	9
The Classification and properties of Engineering materials- Material standards and Specifications – Methods of material selection – Ashby Chart and Method of Weight factors- Derivation of material indices- Use of material selection Chart-Pugh selection method- Selection with computed aided databases – Design for brittle fracture-Design for fatigue failure- Design for corrosion resistance- Designing with plastics.			
4	MATERIAL PROCESSING AND DESIGN	Total Hrs	9
Classification of manufacturing processes and their role in design- Factors determining the process selection-use of process selection chart and computerized database – Design for manufacturing- Design for forging and sheet metal forming-Design for casting-Design for Machining, Welding and Assembly- Design for residual stresses and heat treatment.			
5	LEGAL, ETHICAL ENVIRONMENTAL AND SAFETY ISSUES IN DESIGN AND QUALITY ENGINEERING	Total Hrs	9
The origin of laws- Contracts - Liability – Tort Law- Product Liability – Design aspects of product liability- Codes of ethics- Solving ethical conflicts- Design for environment – Life Cycle assessment – Material recycling and remanufacture- Design for safety – Potential Dangers and Guidelines for design for safety-Design for reliability failure mode effect analysis-robust Design.			
Total hours to be taught			45

Text book (s) :	
1	Dieter, George E, Engineering Design –"A materials and processing Approach,".Mc Graw Hill, International Edition, Singapore 2000.
2	Karl T. Vlrich and Steven D. Eppinger "Product design and Development", McGraw Hill, International Edition, 2000.
Reference(s) :	
1	Pahlgand Beitz W "Engineering Design" Springer – Verlag NY,3rd Edition,2007.
2	Ray M.S. "Elements of Engineering Design", Printice Hall Inc. 1985.
3	Suh. N. P. "The principles of design", Oxford University, Press NY 1990.

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Semester VIII								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
07110886E	TRIBOLOGY	3	0	0	3	50	50	100
Objective(s)	The course is aimed at developing the basic knowledge on tribological aspects of engineering fields. The topics introduced will serve as basic tools for specialized studies in many engineering fields, significantly in fluid mechanics.							

1	SURFACES, FRICTION AND WEAR	Total Hrs	8
Topography of Surfaces – Surface features – Surface interaction – Theory of Friction – Sliding and Rolling Friction, Friction properties of metallic and non-metallic materials – friction in extreme conditions – wear, types of wear – mechanism of wear – wear resistance materials – surface treatment – Surface modifications – surface coatings.			
2	LUBRICATION THEORY	Total Hrs	8
Lubricants and their physical properties lubricants standards – Lubrication Regimes Hydrodynamic lubrication – Reynolds Equation, Thermal, inertia and turbulent effects – Elasto hydrodynamic and plasto hydrodynamic and magneto hydrodynamic lubrication – Hydro static lubrication – Gas lubrication.			
3	DESIGN OF FLUID FILM BEARINGS	Total Hrs	12
Design and performance analysis of thrust and journal bearings – Full, partial, fixed and pivoted journal bearings design – lubricant flow and delivery – power loss, Heat and temperature rotating loads and dynamic loads in journal bearings – special bearings – Hydrostatic Bearing design.			
4	ROLLING ELEMENT BEARINGS	Total Hrs	10
Geometry and kinematics – Materials and manufacturing processes – contact stresses – Hertzian stress equation – Load divisions – Stresses and deflection – Axial loads and rotational effects, Bearing life capacity and variable loads – ISO standards – Oil films and their effects – Rolling Bearings Failures.			
5	TRIBO MEASUREMEN IN INSTRUMENTATION	Total Hrs	7
Surface Topography measurements – Electron microscope and friction and wear measurements – Laser method – instrumentation - International standards – bearings performance measurements – bearing vibration measurement.			
Total hours to be taught			45

Text book(s):

1	Hulling, J. (Editor) – “Principles of Tribology “, Macmillian – 1984

References :

1	Cameron, A. “Basic Lubrication Theory”, Ellis Herward Ltd., OK, 1981
2	Williams J.A. “ Engineering Tribology”, Oxford Univ. Press, 1994
3	Neale, M.J. “Tribology Hand Book”, Butterworth Heinemann, 1995