JAWAHARLAL NEHRU
TECHNOLOGICAL UNIVERSITY ANANTAPUR

Course structure for B.Tech. (Regular) I year (2009-10) for affiliated Engineering Colleges.

MECHANICAL ENGINEERING (MECHATRONICS)
(Common for Branches: M.E., C.E, Bio-Tech., Aero.E.)

S.No	Course code	Subject	Th	Tu/Drg./Lab.	Credits
1.	9ABS101	English	2		4
2.	9ABS102	Engineering Physics	2		4
3.	9ABS103	Engineering Chemistry	2		4
4.	9ABS104	Mathematics – I	3	1 - -	6
5.	9A05101	Programming in C and Data Structures	3	1 - -	6
6.	9A03101	Engineering Drawing *		- 6 -	6
7.	9A01101	Engineering Mechanics	3	1 - -	6
8.	9A05102	C Programming & Data Structures Lab		- - 3	4
9.	9A03102	Engineering & I.T. Workshop #		- - 3	4
10.	9ABS106	Engineering Physics and Engineering Chemistry Lab **		- - 3	4
11.	9ABS107	English Language & Communication Skills Lab		- - 3	4
		contact periods/week	15	3 6 12	52
			Total contact periods/week	36	

Th = Theory; Tu = Tutorial; Drg = Drawing & Lab = Laboratory:

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* Engineering Drawing will have University External Exam.

** The Students attend the Physics lab and Chemistry lab. in alternate week that is 3/2 per week. The end exam shall be conducted separately and average of the two exams will be recorded by the exam section

The Students attend Engineering and IT work shop as a single lab. every week and the end exam is conducted as a single lab. sharing the Maximum marks and time for one task from Engineering workshop and one from IT workshop. The sum of the marks awarded will be recorded

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MECHANICAL ENGINEERING (MECHATRONICS)

B.Tech II - I Semester

S. No	Course code	Subject	Theory		Lab.	Credits
1.	9ABS401	Probability and Statistics	4			4
2.	9A14301	Electrical Engineering	4			4
3.	9A01301	Mechanics of Solids	4			4
4.	9A04301	Electronics Devices and Circuits	4			4
5.	9A14302	Engineering Thermodynamics	4			4
6.	9A03301	Materials Science and Engineering	4			4
7.	9A03304	Material Science Lab and Mechanics of Solids Lab*			3	2
8.	9A02402	Electrical Engineering Lab			3	2
		contact periods/week	24		6	28
			Total	30		

***NOTE:** The Students attend the Material Science Lab and Mechanics of Solids in alternate weeks that is 3/2 per week.

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MECHANICAL ENGINEERING (MECHATRONICS)

B.Tech II - II Semester

S. No	Course code	Subject	Theory	T	Lab	Credits
1.	9A14401	Production Technology	4			4
2.	9A14402	Theory of Machines	4			4
3.	9ABS303	Environmental Science	4			4
4.	9A04404	Pulse and Digital Circuits	4			4
5.	9A03303	Machine Drawing		6		4
6.	9A14403	Fluid Mechanics and Heat Transfer #	4			4
7.	9A04302	Electronic Devices and Circuits Lab			3	2
8.	9A14404	Fluid Mechanics and Thermal Engineering -Lab*			3	2
		contact periods/week	20	6	6	28
			Total	32		

***NOTE:** The Students attend the Fluid Mechanics and Thermal Engineering lab in alternate weeks that is 3/2 per week.

Two questions from each part.

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MECHANICAL ENGINEERING (MECHATRONICS)
COURSE STRUCTURE

III B. Tech. – I Semester

S. No	Course code	Subject	Theory	P/ D	Lab.	Credits
1.	9AHS401	Managerial Economics and Financial Analysis	4	0		4
2.	9A14501	Numerical Methods	4	0		4
3.	9A02503	Control Systems	4	0		4
4.	9A04401	Switching Theory & Logic Design	4	0		4
5.	9A14502	Machine tools and Metrology	4	0		4
6.	9A14503	Principles of Machine Design	4	0		4
7.	9A03607	Metrology Lab and Machine tools Lab*	0	3		2
8.	9AHS601	Advanced English Communication Skills-Lab	0	3		2
		contact periods/week	24	6		28
			Total	30		

***NOTE:** The Students attend the Metrology Lab and Machine tools lab in alternate week that is 3/2 per week.

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III B. Tech. – II Semester (Mechatronics)

S. No	Course code	Subject	Theory	**P/D**		Lab.	Credits
1.	9A03601	Industrial Management	4	0			4
2.	9A03602	CAD/CAM	4	0			4
3.	9A03703	Finite Element Methods	4	0			4
4.	9A10504	Linear and Digital I.C. Applications	4	0			4
5.	9A14601	Signal Processing Techniques	4	0			4
6.	9A14602	MEMS and Nanotechnology	4	0			4
7.	9A03712	CAD/CAM- Lab*	0	3/2 (each)			2
8.	9A04505	Linear and Digital I.C. Applications Lab	0	3			2
		contact periods/week	**24**	**6**			**28**

***NOTE:** The Students attend the CAD and CAM lab in alternate week that is 3/2 per week.

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IV B. Tech. – I Semester (Mechatronics)

S. No	Course code	Subject	Theory	P/D		Lab.	Credits
1.	9A05605	Artificial Intelligence	4	0			4
2.	9A04602	Microprocessors and Micro Controllers	4	0			4
3.	9A03702	Automation & Robotics	4	0			4
4.	9A14701	Mechtronic systems	4	0			4
5.	9A14702 9A03807 9A03606	**ELECTIVE I** 1. Quality and Reliability Engineering 2. Composite Materials 3. Automobile Engineering	4	0			4
6.	9A02806 9A10805 9A02504	**ELECTIVE II** 1. Embedded Systems 2. Artificial Neural Networks 3. Power Electronics	4	0			4
7.	9A02710	Microprocessors and Micro Controllers-Lab	0	3			2
8.	9A14703	Mechatronics -Lab	0	3			2
		TOTAL	24	6			28

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IV B. Tech. – II Semester (Mechatronics)

S. No	Course code	Subject	Theory	P/D		Lab.	Credits
1.	9A03701	Operations Research	4	0			4
2.	9A04604	Electronic Measurements & Instrumentation	4	0			4
3.	9A14801 9A14802 9A03709	**ELECTIVE III** 1. Flexible Manufacturing Systems 2 System Simulation 3Tool Design	4	0			4
4.	9A03705 9A14803 9A04802	**ELECTIVE IV** 1.Entreprenuership 2. Microcontroller Applications. 3. Digital Image Processing	4	0			4
5.		Seminar	--	--			2
6.		Project Work	--	--			10
		TOTAL	14	0			28

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Detailed Syllabus

B.Tech. I Year (Mechatronics) **T P C**
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(9ABS101) ENGLISH

1. INTRODUCTION :

The sweeping changes in the world have elevated English to the status of a tool of global communication and transformed it into e-English. The syllabus has been drafted to improve the competence of students in communication in general and language skills in particular. The books prescribed serve as students' handbooks.

The teacher should focus on the skills of reading, writing, listening and speaking while using the prescribed text and exercises. The classes should be interactive. The students should be encouraged to participate in the classroom proceedings and also to write short paragraphs and essays. The main aim is to encourage two way communications in place of the one-sided lecture.

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The text for non-detailed study is meant for extensive reading by the students. They may be encouraged to read some select topics on their own, which could lead into a classroom discussion. In addition to the exercises from the texts done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements etc.

2. OBJECTIVES:

a. To improve the language proficiency of the students in English with an emphasis on LSRW skills.
b. To equip the students to study academic subjects with greater facility through theoretical and practical components of the syllabus.
c. To develop study skills as well as communication skills in formal and informal situations.

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3. SYLLABUS :

Listening Skills:

Objectives

1. To enable students to develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and dialects.

Students should be given practice in listening and identifying the sounds of English language and to mark stress , right intonation in connected speech.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills :

Objectives

1. To make students aware of the role of ability to speak fluent English and its contribution totheir success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions.

(Using exercises from all units of the prescribed text)

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence

- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences

The students shall be trained in reading skills using the prescribed text for detailed study. They shalll be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as articles from magazines/newspapers

Writing Skills:

Objectives

1. To develop an awareness in the students the skill to write exact and formal writing
2. To equip them with the components of different forms of writing.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Editing a passage

4. TEXTBOOKS PRESCRIBED:

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content are prescribed and divided into Eight Units:

For Detailed study: **ENJOYING EVERYDAY ENGLISH**, Sangam Books (India) Pvt Ltd, Hyderabad, 2009

For Non-detailed study: **INSPIRING LIVES**, Maruti Publications, Guntur, 2009

Unit -I

a. Heaven's Gate from **ENJOYING EVERYDAY ENGLISH**
b. Mokshagundam Visvesaraya from **INSPIRING LIVES**

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Unit -II

a. Sir C.V.Raman from **ENJOYING EVERYDAY ENGLISH**
b. Mother Teresa from **INSPIRING LIVES**

Unit -III

a. The Connoisseur from **ENJOYING EVERYDAY ENGLISH**
b. Dr. Amartya Kumar Sen from **INSPIRING LIVES**

Unit -IV

a. The Cuddalore Experience from **ENJOYING EVERYDAY ENGLISH**
b. Gertrude Elion from **INSPIRING LIVES**

Unit -V

a. Bubbling Well Road from **ENJOYING EVERYDAY ENGLISH**
b. Vishwanathan Anand from **INSPIRING LIVES**

Unit-VI

a. Odds Against Us from **ENJOYING EVERYDAY ENGLISH**
b. Charlie Chaplin from **INSPIRING LIVES**

Unit – VII

Exercises on
Reading and Writing Skills
Reading Comprehension
Letter writing
Report writing

Unit – VIII

Exercises on Remedial Grammar covering Common errors in English, Subject-Verb agreement, Use of Articles and Prepositions, Active/Passive Voice, Reported speech, Tenses Vocabulary development covering Synonyms & Antonyms, one-word substitutes, prefixes & suffixes, Idioms & phrases, words often confused.

Evaluation: The question paper shall contain two parts, Part A containing questions from Units I- VI and Part B containing questions from units VII & VIII. The student is required to answer five full questions choosing at least one from Part B.

REFERENCES:

1. Technical Communication , Principle and Practice, Meenakshi Raman and Sangita Sharma, OUP, 2009
2. Essential Grammar in Use, (with CD) 3/e, Cambridge University Press, 2009
3. Resumes and Interviews, M.Ashraf Rizvi, Tata – McGraw Hill, 2009
4. Everyday Dialogues in English by Robert J. Dixson, Prentice-Hall of India Ltd., 2006.
5. Communication Skills for Technical Students, Farhathullah, T.M., Orient Blackswan, 2008
6. Developing Communication Skills, 2/e. by Krishna Mohan & Meera Banerji , Macmillan, 2009
7. English for Technical Communication, Vol. 1 & 2, by K. R. Lakshmi Narayanan, Sci tech. Publications.
8. Basic Communication Skills For Technology, Andrea J Ruthurford, Pearson Education , Asia.
9. Longman Dictionary of Contemporary English with DVD, Pearson Longman

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B.Tech. I Year (Mechatronics)

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2	0	4

(9ABS102) ENGINEERING PHYSICS

UNIT I- OPTICS: Interference - Interference in thin films by reflection - Newton's rings - Diffraction - Fraunhofer diffraction at a single slit - Fraunhofer diffraction at a double slit - Diffraction grating - Grating spectrum - polarization - Nicol prism -Theory of circular and elliptical polarized light - Quarter and half wave plates.

UNIT II- CRYSTAL STRUCTURES AND X-RAY DIFFRACTION: Introduction -Space lattice - Basis - Unit cell - Lattice parameter - Bravais lattices - Crystal systems - Structure Simple cubic - Body Centered Cubic – Face Centered Cubic crystals - Miller indices of planes and directions in crystals – Separation between successive (h k l) planes - X-ray diffraction by crystal planes - Bragg's law – Laue and Powder methods.

UNIT III- PRINCIPLES OF QUANTUM MECHANICS & ELECTRON THEORY: Waves and Particles - de- Broglie's hypothesis – Heisenberg's uncertainty principle - Schroedinger's one dimensional wave equation (Time Independent) - Particle in a one dimensional potential box – Energy levels - Fermi-Dirac distribution and effect of Temperature (qualitative treatment only) – Scattering - Source of electrical resistance - Kronig-Penney model (qualitative treatment only) - energy bands – metals, semi conductors & insulators.

UNIT IV- SEMICONDUCTORS: Intrinsic and extrinsic semiconductors – Law of mass action – Continuity equation – Drift & diffusion - Einstein's relation – Hall effect – Direct & indirect band gap semiconductors – p-n junction - Band diagram of p-n junction diode – Diode Equation-LED, LCD & Photo diode.

UNIT V- MAGNETIC PROPERTIES: Introduction - Origin of magnetic moment – Classification of magnetic materials - Dia, Para , Ferro, anti-Ferro and Ferri magnetism - Hysteresis - Soft and hard magnetic materials – Magnetic bubbles memory.

DIELECTRIC PROPERTIES: Introduction - Dielectric constant - Electronic, Ionic and Orientation polarizations (qualitative treatment only) - Local field - Clausius-Mossotti equation –Frequency dependence of polarisability (qualitative treatment only) – Ferro electricity- $BaTio_3$.

UNIT VI- SUPERCONDUCTIVITY: General properties - Meissner effect - Penetration depth - Type I and Type II superconductors - Flux quantization – Josephson effects – BCS theory - Applications of superconductors.

LASERS: Introduction – Characteristics of laser - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby Laser - Helium-Neon Laser – GaAs Laser - Applications of Lasers in Industry, Scientific and Medical fields.

UNIT VII- FIBER OPTICS: Introduction - Principle of optical fiber - Acceptance angle and Acceptance cone - Numerical aperture – Types of Optical fibers and refractive index profiles – Optical fiber communication systems - Application of optical fibers.

UNIT VIII- NANOMATERIALS : Introduction - Basic principles of nano materials – Fabrication of nano materials - ball milling –plasma arching – Chemical vapour deposition method – sol-gel methods – properties of nano materials – carbon nanotubes – properties and applications of carbon nano tubes - Applications of nano materials.

TEXT BOOKS:

1. Engineering Physics by P.K.Palanisamy, Scitech Publications
2. Engineering Physics by V. Rajendran & K.Thyagarajan, Tata McGraw-Hill Publishing Co. Ltd.
3. Engineering Physics by M.R.Srinivasan New Age Publications

REFERENCES:

1. Physics Volume 2, by Halliday, Resnick and Krane; John Wiley India
2. Solid State Physics by C.Kittel, Wiley India
3. Engineering Physics by Mittal, I.K.International
4. Introduction to Nanoscience & Nano Technology by K.K Chattopadhyay & A.N. Banarjee , Prentice – Hall of India Pvt. Ltd

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2	0	4

(9ABS103) ENGINEERING CHEMISTRY

UNIT I: Water: Sources of Water, Types of impurities in Water, Hardness of Water – Temporary and Permanent hardness. Units. Estimation of hardness by EDTA Method. Analysis of Water - Dissolved Oxygen. Disadvantages of Hard Water. Problems on hardness of water. Methods of Treatment of Water for Domestic Purpose – Sterilisation: Chlorination, Ozonisation.
Water for Industrial purpose - Water for Steam Making, Boiler Troubles – Carry Over (Priming and Foaming), Boiler Corrosion, Scales and Sludge, Caustic Embrittlement. Water Treatment: - Internal Treatment – Colloidal, Phosphate, Calgon, Carbonate, Sodium aluminates Conditioning of Water. External Treatment - Ion- Exchange Process; Demineralization of Brakish Water – Reverse Osmosis.

UNIT II: **Science of Corrosion:** Definition, Types of corrosion: Dry Corrosion, (Direct Chemical attack), Wet Corrosion, Theories of Corrosion and Mechanism, Electro Chemical Theory of Corrosion. Galvanic Series, Galvanic Corrosion, Concentration Cell Corrosion, Oxygen absorption type. Factors Influencing Corrosion. Control of Corrosion – Cathodic Protection – Sacrificial anode and Impressed Current. Uses of Inhibitors. Electro Plating, and Electro less plating (copper and nickel)

UNIT III: **Polymers:** Polymerization Reactions – Basic concepts. Types of Polymerization – Addition and Condensation Polymerization. Plastics –Thermosetting and Thermoplastics. Composition, Properties and Engineering Uses of the Following: Teflon, Bakelite, Nylon. Rubber – Processing of Natural Rubber and Compounding. Elastomers – Buna S, Buna N, Polyurethane Rubber; Silicone Rubber. Conducting Polymers, Synthesis and applications of Polyacetylene and Poly aniline
Liquid Crystals definition, properties, suitable examples and Engineering Applications

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UNIT IV: **Chemistry of nano materials:** Nano materials definition, properties and applications;
Explosives and Propellants: Explosives, Classification, precautions during storage, blasting fuses, important explosives. Rocket propellants, classification of propellants**.**
Lubricants : Principles and function of lubricants - Classification and properties of lubricants – Viscosity, flash and fire points, cloud and pour points, aniline point, Neutralisation Number and Mechanical Strength.

UNIT V: Electro Chemistry: Conductance – Equivalent Conductance – Molecular Conductance, Conductometric Titrations – Applications of Conductivity Measurements.
Electrochemical Cells: Measurement of EMF, Standard electrode potential, concentration cells, batteries (Ni–Cd cell), Lithium batteries. Fuel cell: hydrogen oxygen fuel cell and methanol fuel cell
Insulators – Definition, Properties and Characteristics of Insulating Materials; Engineering Applications.

UNIT VI: Phase rule: Definition, Terms involved in Phase Rule and Phase rule equation. Phase diagrams – one component system (water system), two component system (lead- silver system) Eutectics, heat treatment based on iron-carbon phase diagram, hardening, annealing.

UNIT VII: Fuels and Combustion: Definition and Classification of fuels. Solid, liquid & gaseous fuels, Characteristics of a good fuel. Metallurgical Coke – Characteristics & Manufacture (Otto-Halfmann). Petroleum – Refining – Synthetic Petrol. Calorific Value & its determination (Bomb Calorimeter – Junker's Gas Calorimeter). Combustion: Flue gas analysis by Orsat's apparatus.

UNIT VIII: Building Materials: Cement: composition of Portland cement, analysis, setting and hardening of cement (reactions).
Refractories : Definition, Classification With Examples; Criteria of a Good Refractory Material; Causes for the failure of a Refractory Material

TEXT BOOKS:

1. Engineering Chemistry Prof. K.N.Jayaveera, Dr.G.V.Subba Reddy and Dr.C. Ramachandraiah, McGraw Hill Higher Education Hyd., 2009
2. A text book of Engineering Chemistry by S.S. Dara, S.Chand & Co, New Delhi (2008)
3. Text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, 15th edition New Delhi (2008).

REFERENCES:

1. Engineering Chemistry Dr. K. B. Chandrasekhar, Dr. U.N. Dash, Dr. Sujatha Mishra, Scitech Publications(India) Pvt. Limted, Hyderabad. 2009
2. Fuel Cells principles and applications by B.Viswanath, M.Aulice Scibioh-Universities press
3. Chemistry of Engineering Materials by C.V. Agarwal, Tara Publication, Varanasi.20084. Physical Chemistry - Glasston & Lewis.
4. 5. Engineering Chemistry (Vol.1&2) by J C Kuriacose and J. Rajaram, Tata McGraw-Hill Co, New Delhi (2004)
5. 6. Applied Chemistry: A Text Book for chemistry for Engineers & Technologists, G.D. Gesser, Springer, 2000

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B.Tech. I Year (Mechatronics)	**Th**	**Tu**	**C**
	3	**1**	**6**

(9ABS104) MATHEMATICS – I

UNIT I– Differential equations of first order and first degree – Exact, linear and Bernoulli equations. Applications: to Newton's law of cooling, law of natural growth and decay, orthogonal trajectories.

UNIT II– Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x), method of variation of parameters.

UNIT III– Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Simple examples of Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrangian method of Multipliers with three variables only.

UNIT – IV

Raidus of Curvature – Curve tracing – Cartesian, polar and parametric curves. Applications of integration to lengths, volume and surface area of solids of revolution in Cartesian and polar coordinates

UNIT V– Multiple integral: – Double and triple integrals – Change of Variables – Change of order of integration.

UNIT VI– Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

UNIT VII– Differentiation and integration of Laplace transform – Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT VIII– Vector Calculus: Gradient – Divergence – Curl and Their properties; Vector integration – Line integral - Potential function – Area , Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (excluding their proof). Verification of Green's–Stoke's and Gauss's Theorems.

TEXT BOOKS:

1. A Text Book of Engineering Mathematics, Vol – 1, T.K.V. Iyengar, B. Krishna Gandhi and Others, S. Chand & Company.
2. A Text Book of Engineering Mathematics, C. Sankaraiah, V.G.S. Book Links.
3. A Text Book of Engineering Mathematics-1,E. Rukmangadachari, E. Keshava Reddy, Pearson Education.

REFERENCES:

1. A Text Book of Engineering Mathematics, B.V. Ramana, Tata Mc Graw Hill.
2. A Text Book of Engineering Mathematics, Thomson Book Collection.
3. A Text Book of Advanced Engineering Mathematics – A Computer Approach, N.Bail, M.Goyal & C. Watkins.
4. Engineering Mathematics, Sarveswara Rao Koneru, Universities Press.

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	3	**1**	**6**

(9A05101) PROGRAMMING IN C AND DATA STRUCTURES

Unit I- Overview of Computers and Programming - Electronic Computers then and Now, Computer Hardware, Computer Software, Algorithm, Flowcharts, Software Development Method, Applying the Software Development Method.

Unit II- Introduction to C Language - C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Expressions, Precedence and Associativity, Expression Evaluation, Operators and Expressions, Type Conversions, Decision Statements - If and Switch Statements, Loop Control Statements - while, for, do-while Statements, Nested for Loops, Other Related Statements -break, continue, goto.

Unit III- Functions - Library Functions, Top-Down Design and Structure Charts, Functions with and without Arguments, Communications Among Functions, Scope, Storage Classes - Auto, Register, Static, Extern, Scope rules, Type Qualifiers, Recursion - Recursive Functions, Preprocessor Commands.
Arrays - Declaring and Referencing Arrays, Array Subscripts, Using For Loops for Sequential Access, Using Array Elements as Function Arguments, Arrays Arguments, Multidimensional Arrays.

Unit IV- Pointers - Introduction, Features of Pointers, Pointer Declaration, Arithmetic Operations With Pointers, Pointers and Arrays, Pointers and Two-Dimensional Arrays, Array of Pointers, Pointers to Pointers, Void Pointers, Memory Allocation Functions, Programming Applications, Pointer to Functions, Command- Line Arguments.
Strings - String Basics, String Library Functions, Longer Strings, String Comparison, Arrays of Pointers, Character operations, String-To-Number and Number-To- String Conversions, Pointers and Strings.

Unit V- Structure and Union – Introduction, Features of Structures, Declaration and Initialization of Structures, Structure within Structure,

Array of Structures, Pointer to Structure, Structure and Functions, typedef, Bit Fields, Enumerated Data Type, Union, Union of Structures.

Unit VI- Files - Introduction, Streams and File Types, Steps for File Operations, File I/O Structures, Read and Write,_Other File function, Searching Errors in Reading/Writing of Files, Low Level Disk I/O, Command Line Arguments, Application of Command Line Arguments, File Status functions (error handling).

Unit VII- Data Structures - Overview of Data Structure, Representation of a Stack, Stack Related Terms, Operation on a Stack, Implementation of a Stack, Representation of Arithmetic Expressions, Infix, Prefix, and Postfix Notations, Evaluation of Postfix Expression, Conversion of Expression from Infix to Postfix, Recursion, Queues - Various Positions of Queue, Representation of Queue, Insertion, Deletion, Searching Operations.
Linked List - Singly Linked List, Linked List with and without header, Insertion, Deletion and Searching Operations.

Unit VIII- Searching and Sorting - Exchange (Bubble) Sort, Selection Sort, Quick Sort, Insertion Sort, Merge Sort. Searching- Linear and Binary Search Methods.

TEXT BOOKS :

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education
2. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

REFERENCES :

1. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. C and Data Structures, a snapshot oriented treatise with live engineering examples, Dr. N.B.Venkateswarlu, Dr. E.V.Prasad, S. Chand
4. C and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill
5. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI, Eighth Edition.

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B.Tech. I Year (Mechatronics)	**T**	**P**	**C**
	0	**6**	**6**

(9A03101) ENGINEERING DRAWING

UNIT I– INTRODUCTION TO ENGINEERING DRAWING: Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice:
a) Conic Sections including the Rectangular Hyperbola – General method only.
b) Cycloid, Epicycloids and Hypocycloid
c) Involutes.
d) Helices

UNIT II– PROJECTION OF POINTS AND LINES: Principles of Orthographic Projection – Conventions – First and Third Angle Projections. Projections of Points, Lines inclined to one or both planes, Problems on projections, Finding True lengths & traces only.

UNIT III– PROJECTIONS OF PLANES: Projections of regular Plane surfaces/figures, Projection of lines and planes using auxiliary planes.

UNIT IV– PROJECTIONS OF SOLIDS: Projections of Regular Solids inclined to one or both planes – Auxiliary Views.

UNIT V– SECTIONS AND DEVELOPMENTS OF SOLIDS: Section Planes and Sectional views of Right Regular Solids–Prism, Cylinder, Pyramid and Cone. True shapes of the sections.

Development of Surfaces of Right Regular Solids – Prisms, Cylinder, Pyramid, Cone and their Sectional parts.

UNIT VI– ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS: Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non-isometric lines. Isometric projections of spherical parts.

Conversion of Isometric projections/views to Orthographic Views – Conventions.

UNIT VII– INTERPENETRATION OF RIGHT REGULAR SOLIDS: Projections of curves of Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Square Prism Vs Square Prism.

UNIT VIII– PERSPECTIVE PROJECTIONS: Perspective View of Plane Figures and Simple Solids.Vanishing Point Method (General Methods only).

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat, Charotar Publishers
2. Engineering Drawing, Johle, Tata McGraw-Hill
3. Engineering Drawing, Shah and Rana, 2/e, Pearson Education

REFERENCES:

1. Engineering Drawing and Graphics, Venugopal/ New age
2. Engineering Drawing, B.V.R. Guptha, J.K. Publishesrs
3. Engineering Drawing, K.L. Narayana, P. Khanniah, Scitech Pub.
4. Engineering Drawing, Venkata Reddy, B.S.Publishers.

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JAWAHARLAL NEHRU
TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech. I Year(Mechatronics)	**Th**	**Tu**	**C**
	3	**1**	**6**

(9A01101) ENGINEERING MECHANICS

UNIT I– BASIC CONCEPTS - System of forces– Moment of forces and its Application – Couples and Resultant of Force System
EQUILIBRIUM OF SYSTEM OF FORCES: Free body diagrams – Types of Supports – Support reactions for beams with different types of loading – concentrated, uniformly distributed and uniformly varying loading.

UNIT II– ANALYSIS OF PERFECT FRAMES: Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, Tension Coefficient method and methods of sections for vertical loads, horizontal loads and inclined loads.

UNIT III– FRICTION: Types of friction– laws of Friction–Limiting friction–Cone of limiting friction– static and Dynamic Frictions – Motion of bodies – Wedge, Screw jack and differential Screw jack.

UNIT IV– CENTROID AND CENTER OF GRAVITY: Centroids of simple figures – Centroids of Composite figures – Centre of Gravity of bodies – Centre of Gravity of Composite figures.
(Simple problems only).

UNIT V– AREA MOMENT OF INERTIA - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures
MASS MOMENT OF INERTIA: Moment of Inertia of Simple solids, Moment of Inertia of composite masses.(Simple problems only)

UNIT VI– KINEMATICS : Rectilinear and Curve linear motion – Velocity and Acceleration – Motion of A Rigid Body – Types and their Analysis in Planar Motion.

UNIT VII– KINETICS : Analysis as particles and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies – Work Energy Method – Equation for Translation – Work – Energy application to Particle Motion, Connection System – Fixed axis Rotation and Plane Motion.

UNIT VIII– MECHANICAL VIBRATIONS: Definitions, Concepts. Simple harmonic motion. Free vibrations. Simple, Compound and Torsional pendulums- Numerical problems

TEXT BOOKS:

1. Engineering Mechanics, Shames & Rao – Pearson Education.
2. Engineering Mechanics, Fedrinand L.Singer – B.S. Publishers.
3. Engineering Mechanics, Bhavikatti and Rajasekharappa

REFERENCES:

1. Engineering Mechanics-Statics and dynamics, A.Nelson, Tata McGraw-Hill Company
2. Mechanics of Materials by Timoshenko & Gere, CBS
3. Engineering Mechanics – B. Bhathacharya- Oxford University Publications
4. Mechanics of Materials - Dr. B. C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publication
5. Engineering Mechanics –Arthur P. Boresi and Richard J. Schmidt. – Brooks/Cole – Cengage Learning

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B.Tech. I Year (Mechatronics)	**T**	**P**	**C**
	0	**3**	**4**

(9A05102) C PROGRAMMING AND DATA STRUCTURES LAB

Objectives:

- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To introduce the student to simple linear data structures such as lists, stacks, queues.

Recommended Systems/Software Requirements:

- Intel based desktop PC with ANSI C Compiler and Supporting Editors

Exercise l.

a) Write a C program to find the sum of individual digits of a positive integer.

b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

c) Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 2.

a) Write a C program to calculate the following Sum:

$$Sum=1- x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$

b) Write a C program to find the roots of a quadratic equation.

Exercise 3

a) Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.
ii) To find the GCD (greatest common divisor) of two given integers.
iii) To solve Towers of Hanoi problem.

Exercise 4

a) The total distance travelled by vehicle in 't' seconds is given by distance $S = ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2) respectively. Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

b) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Exercise 5

a) Write a C program to find both the largest and smallest number in a list of integers.

b) Write a C program that uses functions to perform the following:

i) Addition of Two Matrices ii) Multiplication of Two Matrices

Exercise 6

a) Write a C program that uses functions to perform the following operations:

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

Exercise 7

a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

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b) Write a C program to count the lines, words and characters in a given text.

Exercise 8

a) Write a C program to generate Pascal's triangle.

b) Write a C program to construct a pyramid of numbers.

Exercise 9

Write a C program to read in two numbers, x and n, and then compute the sum of the geometric progression:

$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Find if any values of x are also illegal ? If so, test for them too.

Exercise 10

a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

b) Write a C program to convert a Roman numeral to its decimal equivalent.

Exercise 11

Write a C program that uses functions to perform the following operations:

i) Reading a complex number ii) Writing a complex number

iii) Addition of two complex numbers iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

Exercise 12

a) Write a C program which copies one file to another.

b) Write a C program to reverse the first n characters in a file.

(Note: The file name and n are specified on the command line.)

Exercise 13

a) Write a C programme to display the contents of a file.

b) Write a C programme to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Exercise 14

Write a C program that uses functions to perform the following operations on singly linked list.:

i) Creation ii) Insertion iii) Deletion iv) Traversal

Exercise 15

Write C programs that implement stack (its operations) using

i) Arrays ii) Pointers

Exercise 16

Write C programs that implement Queue (its operations) using

i) Arrays ii) Pointers

Exercise 17

Write a C program that uses Stack operations to perform the following:

i) Converting infix expression into postfix expression

ii) Evaluating the postfix expression

Exercise 18

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

i) Bubble sort ii) Selection sort

Exercise 19

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:

i) Linear search ii) Binary search

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Exercise 20
Write C program that implements the Quick sort method to sort a given list of integers in ascending order.

Exercise 21
Write C program that implement the Merge sort method to sort a given list of integers in ascending order.

Exercise 22
Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

Exercise 23
Write C programs to implement the linear regression and polynomial regression algorithms.

Exercise 24
Write C programs to implement Trapezoidal and Simpson methods.

REFERENCE BOOKS

1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education
2. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
3. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
4. Computer Basics and C Programming, V. Rajaraman, PHI Publications.

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B.Tech. I Year (Mechatronics)	**T**	**P**	**C**
	0	**3**	**4**

(9A03102) ENGINEERING AND I.T. WORKSHOP

ENGINEERING WORKSHOP

Objectives: The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.

1. TRADES FOR EXERCISES:

a. Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
b. Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
c. Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
d. House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
e. Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint

2. TRADES FOR DEMONSTRATION:

a. Plumbing
b. Machine Shop
c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

REFERENCE BOOKS:

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House.

I.T. WORKSHOP

Objectives:

The IT Workshop for engineers is a training lab course. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on a working PC (PIV or higher)to disassemble and assemble back to working condition and install**

Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.
Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace for usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX. (**It is recommended to use Microsoft office 2007 in place of MS Office 2003)**

PC Hardware
Exercise 1 – Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Exercise 2 – Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video shall be given as part of the course content.

Exercise 3 – Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Exercise 4 – Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Exercise 5 – Task 5: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective

peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

Exercise 6 – Task 6: Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

OFFICE TOOLS
LaTeX and Word

Exercise 7 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1 : Using LaTeX and Word to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Excel

Exercise 8 - Excel Orientation: The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

LaTeX and MS/equivalent (FOSS) tool Power Point

Exercise 9 - Task1: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Powerpoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Exercise 10 - Task 2 : Second Exercise helps students in making their presentations interactive. Topic covered during this Exercise includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

Internet & World Wide Web
2 Exercises

Exercise 11 - Task 1: **Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.
Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.

Exercise 12 - Task 2: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated by the student to the satisfaction of instructors.

Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer.

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REFERENCES :

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech
6. IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

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JAWAHARLAL NEHRU
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B.Tech. I Year (Mechatronics)	**T**	**P**	**C**
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(9ABS106) ENGINEERING PHYSICS LAB and ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

Any TEN of the following experiments are to be performed during the Academic year.

Sl.No. Name of the Experiment

1. Determination of wavelength of given source – spectrometer – normal incidence method.
2. Dispersive power of the prism – Spectrometer.
3. Determination of wavelength of a laser source - Diffraction Grating.
4. Determination of particle size by using a laser source.
5. Determination of thickness of a thin wire using parallel fringes.
6. Newton's Rings.
7. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
8. Numerical aperture of an optical fiber.
9. Hall effect.
10. B – H Curve.
11. Energy gap of a material of p-n junction
12. Determination of rigidity modulus of a wire material – Torsional pendulum
13. Determination of dielectric constant.
14. Verification of laws of stretched string – Sonometer.
15. Melde's experiment – Transverse & Longitudinal modes.

Equipment required:

Spectrometer, Grating, Prism, Mercury vapour lamp, Sodium vapour lamp, Travelling Microscope, Wedge arrangement, Newton rings setup, Stewart-Gee's apparatus, He-Ne laser source, Optical fiber, Hall effect kit, B-H loop kit, Energy gap kit (four probe method), Torsional pendulum, Dielectric constant kit, Sonometer, Melde's apparatus

ENGINEERING CHEMISTRY LAB

1. Preparation of Standard Potassium Dichromate and Estimation of Ferrous Iron.
2. Preparation of Standard Potassium Dichromate and Estimation of Copper, by Iodometry.
3. Preparation of Standard EDTA solution and Estimation of Hardness of Water.
4. Preparation of Standard EDTA and Estimation of Copper
5. Determination of Manganese in Steel and Iron in Cement.
6. Determination of strength of the given Hydrochloric acid against standard sodium hydroxide solution by Conducto metric titration
7. Determination of viscosity of the oils through Redwood viscometer
8. Determination of calorific value of fuel using Bomb calorimeter
9. Estimation of dissolved oxygen
10. Determination of Eutectic Temperature of binary system (Urea – Benzoic Acid)

BOOKS:

1. Chemistry-lab manual by Dr K.N.Jayaveera and K.B. Chandra Sekhar, S.M. Enterprizes Ltd.
2. Vogel's Book of Quantitative Inorganic Analysis, ELBS Edition.

Equipment Required:

1. Glass ware: Pipettes, Burettes, Volumetric Flasks, Beakers, Standard flasks, Measuring jars, Boiling Test tubes, reagent bottles, (Borosil)
2. Analytical balance (keroy) (15 Nos)
3. Calorimeter
4. Bomb Calorimeter
5. Redwood viscometer No.1& No.2
6. Conductometer/ Conductivity bridge
7. Wash bottles, test tube stands, burette stands
8. Gas cylinders with Bunsen burners
9. Chemicals: Hydrochloric acid, sodiumhydroxide, EDTA, EBT indicator, fast sulfon black-f, urea, benzoic acid, methanol, Mohr's salt, copper sulphate, magnesium sulphate, ammonia, ammonium sulphate, calcium sulphate etc.,

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B.Tech. I Year (Mechatronics)

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(9ABS107) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

The **Language Lab** focuses on the production and practice of sounds of language and equips students with the use of English in everyday situations and contexts.

Objectives:

1. To train students to use language effectively in everyday conversations, to participate in group discussions, to help them face interviews, and sharpen public speaking skills
2. To expose the students to a varied blend of self-instructional, learner-friendly modes of language learning
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm
4. To initiate them into greater use of the computer in resume preparation, report- writing, format-making etc.
5. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such GRE, TOEFL, GMAT etc.

SYLLABUS :

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues (giving directions etc.)
4. Speaking on the mobiles and telephone conversation

5. Role Play.
6. Oral Presentations- Prepared and Extempore.
7. 'Just A Minute' Sessions (JAM).
8. Describing Objects / Situations / People.
9. Information Transfer
10.Debate

Minimum Requirement:

The English Language Lab shall have two parts:

i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.

ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with Lan with minimum 60 multimedia systems with the following specifications:

i) P – IV Processor
a) Speed – 2.8 GHZ
b) RAM – 512 MB Minimum
c) Hard Disk – 80 GB
ii) Headphones of High quality

PRESCRIBED SOFTWARE: GLOBARENA

Suggested Software:

• Cambridge Advanced Learners' English Dictionary with CD.
• The Rosetta Stone English Library
• Clarity Pronunciation Power – Part I
• Mastering English in Vocabulary, Grammar, Spellings, Composition
• Dorling Kindersley series of Grammar, Punctuation, Composition etc.
• Language in Use, Foundation Books Pvt Ltd with CD
• Learning to Speak English - 4 CDs
• Microsoft Encarta with CD
• Murphy's English Grammar, Cambridge with CD
▪ English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

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Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **English Pronouncing Dictionary,** Daniel Jones Current Edition with CD.
2. **Spoken English**, R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn.
3. **Speaking English Effectively,** Krishna Mohan & NP Singh (Macmillan)
4. **A Practical Course in English Pronunciation**, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
5. **Body Language- Your Success Mantra , Dr Shalini Verma, S.Chand & Co, 2008**
6. **English Dictionary for Advanced Learners,** (with CD) International edn. Macmillan 2009
7. **A Handbook for Englsih language Laboratories,** E.Sureshkumar, P.Sreehari, Foundation Books, 2009
8. **DELTA's key to the Next Generation TOEFL Test,** 6 audio CDS, New Age International Publishers, 2007

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B.Tech II-I Sem (Mechatronics).

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(9ABS401) PROBABILITY AND STATISTICS
(Common to CSE, IT, ECC, CSS)

UNIT – I
Probability: Sample space and events – Probability – The axioms of probability – Some Elementary theorems – Conditional probability – Baye's theorem.

UNIT – II
Random variables – Discrete and continuous Distributions – Distribution functions.

UNIT – III
Binomial and poison distributions Normal distribution – Related properties.

UNIT – IV
Sampling distribution: Populations and samples – Sampling distribution of mean (known and unknown) proportions, sums and differences.

UNIT – V
Estimation: Point estimation – Interval estimation – Bayesian estimation

UNIT – VI
Test of Hypothesis – Means – Hypothesis concerning one and two means – Type I and Type II errors. One tail, two-tail tests.

UNIT – VII
Tests of significance – Student's t-test, F-test, Ψ^2 test, Estimation of proportions.

UNIT – VIII
Queuing Theory: Pure Birth and Death process, M/M/1 model and simple problems.

TEXT BOOKS:

Probability & Statistics, T.K.V. Iyengar, B. Krishan Gandhi and Others, S. Chand & Company.
Probability & Statistics, Ravindranath, B.S.R. Murthy, I.K. International Pvt. Ltd.
Probability & Statistics, Walpore, Myers, Ye 8th edition, - Pearson Education.

REFERENCES:

Probability & Statistics, Amold O. Allen, Academic Press.
Probability & Statistics, D.K. Murugesan & P. Guru Swamy, Anuradha Publications.
Introduction to Probability, Charles M. Grinstead, J. Laurie Snell, University Press.
Probability & Statistical inference : Hogg, Tanis, Rao – 7th edition, Pearson education.

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B.Tech II-I Sem (Mechatronics).	**T**	**P**	**C**
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(9A14301) ELECTRICAL ENGINEERING

UNIT - I

Introduction to Electrical Engineering : ohm's law, basic circuit components, Kirchhoff's laws. Simple problems.

UNIT-II

Network Analysis: Basic definitions, types of elements , types of sources, resistive networks, inductive networks, capacitive networks, series parallel circuits, star delta and delta star transformation. Network theorems- Superposition , Thevenins's, Maximum power transfer theorems and simple problems.

UNIT-III

Alternating Quantities: Principle of ac voltages , waveforms and basic definitions, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits.

UNIT-IV

Transformers : Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems).

UNIT-VI

D.C Generators: Principle of operation of dc machines, types of D.C generators, e.m.f equation in D.C generator.

UNIT-V

D.C motors: Principle of operation of dc motors, types of D.C motors, losses and torque equation, losses and efficiency calculation in D.C generator

UNIT-VII

A.C Machines: Three phase induction motor, principle of operation, slip and rotor frequency, torque (simple problems.

UNIT VIII

Basic Instruments: Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) instruments, Moving Iron of Ammeters
And Voltmeters (elementary Treatment only)

TEXT BOOKS:

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshiah – TMH.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.
3. Electrical and Electronic Technology-By Hughes – Pearson Education.

REFERENCES:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson.

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B.Tech II-I Sem (Mechatronics).	**T**	**P**	**C**
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(9A01301) MECHANICS OF SOLIDS

UNIT – I

SIMPLE STRESSES & STRAINS : Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio
& volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses.Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

FLEXURAL STRESSES : Theory of simple bending – Assumptions – Derivation of bending equation: M/ I = f/y = E/R Neutral axis –Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.

UNIT – IV

SHEAR STRESSES : Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – V

TORSION OF CIRCULAR SHAFTS- Theory of pure torsion- Derivation of torsion equations; $T/J=q/r=N_\theta/l$ – Assumptions made in the theory of pure torsion- torsional moment of resistance- polar section modulus.

SPRINGS- Introduction- types of Springs – deflection of closed and open coil helical springs under axial pull and axial couple – Springs in series and parallel- carriage or leaf springs

UNIT – VI

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

UNIT – VII

THIN CYLINDERS : Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin
cylinders – Riveted boiler shells – Thin spherical shells.

UNIT – VIII

Thick cylinders–lame's equation – cylinders subjected to inside & out side pressures – compound cylinders.

TEXT BOOKS :

1. Strength of materials by Bhavikatti, Lakshmi publications.
2. Solid Mechanics, by Popov

REFERENCES :

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timshenko
5. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

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(9A04301) ELECTRONIC DEVICES AND CIRCUITS (Common to CSE, CSSE, IT, ECE, E Con E, ECM, EIE, EEE)

UNIT- I

PN JUNCTION DIODE:

PN Junction Diode Equation, Volt-Ampere (V-I) Characteristics, Temperature Dependence of V-I Characteristics, Ideal Versus Practical, Static and Dynamic Resistances, Diode Equivalent circuits, Break down Mechanisms in semiconductor Diodes, Zener Diode Characteristics.

UNIT- II

RECTIFIERS AND FILTERS : PN Junction as a Rectifier, Half wave rectifier, ripple factor, full wave rectifier, Bridge Rectifier, Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- □section filter, Π- section filter, Use of Zener Diode as a Regulator, Problems on rectifier circuits, and voltage regulator.

UNIT- III

TRANSISTOR: Transistor construction, BJT Operation, BJT Symbol, Transistor as an Amplifier, Common Emitter, Common Base and Common Collector Configurations, Limits of Operation, BJT Specifications.

UNIT-IV

TRANSISTOR BIASING AND STABILISATION: Operating Point, DC and AC Load Lines, Importance of Biasing, Fixed Bias, Emitter Feedback Bias, Collector to Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization against

Variations in V_{BE} and β, Bias Compensation Using Diodes and Transistors, Thermal Runaway, Condition for Thermal Stability in CE configuration, Problems on biasing circuits.

UNIT- V

FIELD EFFECT TRANSISTOR:

The Junction Field Effect Transistor (Construction, Principle of Operation, Symbol) - Pinch-Off Voltage – Volt-Ampere Characteristics, Small Signal Model of JFET & MOSFET, MOSFET Characteristics in Enhancement and Depletion Modes.

UNIT- VI

FET AMPLIFIERS:

Common Source, and Common Drain Amplifiers using FET, Generalized FET Amplifier, Biasing of FET, FET as Voltage Variable Resistor, Comparison between BJT and FET.

UNIT-VII

SMALL SIGNAL ANALYSIS OF BJT AMPLIFIERS:

BJT Modeling, Hybrid Modeling, Determination of h-Parameters from Transistor Characteristics, Measurement of h-Parameters, Analysis of CE, CB and CC configurations using h-Parameters, Comparision of CB, CE and CC configurations, Simplified Hybrid Model, Millers Theorem, Dual of Millers Theorem.

UNIT-VIII

SPECIAL PURPOSE ELECTRONIC DEVICES:

Principle of Operation, and Characteristics of Tunnel Diode (With help of Energy Band Diagram) and Varactor Diode, Principle of Operations of Schottky Barrier Diode, Thermistor, Silicon Control Rectifier, and Uni-Junction Transistor (UJT).

TEXT BOOKS:

1. Electronic Devices and Circuits - J. Millman, Christos C. Halkias, 1991 edition, 2008, TMH.

2. Electronic Devices and Circuits- R.L. Boylestad and Louis Nashelsky, 9th edition, 2006, PHI.
3. Electronic Devices and Circuits – David A. Bell, Fifth Edition, 2008, Oxford University press.

REFERENCES:

1. Integrated Electronic - J.Millman and C.C.Halkias, Satyabratajit, 2nd edition, 1998, TMH.
2. Electronic Devices and Circuits - K. Lal kishore, 2nd edition, 2005, BSP.
3. Introduction to Electronic Devices and Circuits – Rober T. Paynter, PE
4. Electronic Devices and Circuits – S. Salivahana, N.Suresh Kumar, A. Vallavaraj, 2nd Edition, 2008, TMH.

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(9A14302) ENGINEERING THERMODYNAMICS

UNIT – I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process Work and Heat, Point and Path function.

UNIT II

Zeroth Law of Thermodynamics – Concept of quality of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale – PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation. Limitations of the First Law

UNIT – III

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Elementary Treatment of the Third Law of Thermodynamics.

UNIT- IV

Power Cycles : Otto, Diesel, Dual Combustion cycles, – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison with Ideal and Actual Cycles.

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UNIT V

Joule and Rankine cycles- Description and representation on P–V and T-S diagram, Thermal Efficiency - Performance , Evaluation – combined cycles

Refrigeration Cycles:

Brayton and Rankine cycles – Performance Evaluation – combined cycles, Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

UNIT- VI

I.C. ENGINES:

Classification – Two & Four Stroke Engines , Working principles, Valve and Port Timing Diagrams, - Engine systems.

Fuel system: Fuels used , Modes of fuel Admission to engine cylinder, Induction and injection , chemically correct fuel- air ratios. Fuel carburetor, Fuel Injection System, Ignition, Cooling and Lubrication.

UNIT – VII

S.I. Engines – Mixture requirements, Simple carburetor, Limitations, need of auxiliary systems and their working, problems faced in S.I Engine operation.

C.I. Engines : Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock. Fuel pump and Injector , Types of Fuel injection systems and their working, Nozzles, Introduction of cooling, Lubrication and super charging systems.

UNIT VIII

Gas Turbine: Introduction , thermodynamic cycles, schematic Layout ,open, closed and semi closed cycles, Parameters of performance and methods of improving performance- Inter cooling Reheating and Regeneration, applications of Gas turbines.

TEXT BOOKS :

1. Thermal Engineering / Rajput / Lakshmi Publications
2. Engineering Thermodynamics – P.K Nag, TMH
3. Thermal Engineering - Yadav, Lakshmi Publications
4. I.C. Engines – V. Ganesan, TMH

5. Thermal Sciences – Merle C. Potter, Elaine P. Scott, Cengage Learning

REFERENCE BOOKS:

1. Engineering Thermodynamics – Jones & Dugan
2. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
3. Thermodynamics – J.P.Holman / McGrawHill
4. An introduction to Thermodynamics / YVC Rao / University Press
5. I.C. Engies – K.K. Ramalingam – Sci.Tech. Publications

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

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(9A03301) MATERIALS SCIENCE AND ENGINEERING

UNIT – I

Structure of Metals : Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

UNIT - II

Constitution of Alloys : Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT -III

Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, and Fe-Fe_3C.

UNIT -IV

Cast Irons and Steels : Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – V

Heat treatment of Alloys: Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering , Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT - VI

Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – VII

Ceramic materials : Crystalline ceramics, glasses, cermets.

UNIT - VIII

Composite materials : Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and Carbon – Carbon composites.

TEXT BOOKS :

1. Introduction to Physical Metallurgy, Sidney H. Avener.
2. Essential of Materials Science and Engineering, Donald R.Askeland, Thomson.

REFERENCES :

1. Material Science and Metallurgy, kodgire.
2. Science of Engineering Materials, Agarwal
3. Materials Science and Engineering, William and collister.
4. Elements of Material science, V. Rahghavan
5. Engineering Materials and Their Applications – R. A Flinn and P K Trojan, Jaico Books.

Engineering materials and metallurgy, R.K.Rajput, S.Chand.

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(9A03304) MATERIAL SCIENCE LAB AND MECHANICS OF SOLIDS LAB

(A) MATERIAL SCIENCE LAB :

Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.
Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
Study of the Micro Structures of Cast Irons.
Study of the Micro Structures of Non-Ferrous alloys.
Study of the Micro structures of Heat treated steels.
Hardeneability of steels by Jominy End Quench Test.
To find out the hardness of various treated and untreated steels.

(B) MECHNICS OF SOLIDS LAB :

Direct tension test been
Bending test on
a) Simple supported beam
b) Cantilever beam
Torsion test
Hardness test
Brinells hardness test
Rockwell hardness test
Test on springs
Compression test on cube
Impact test
Punch shear test

Note: Internal and End examinations will be conducted separately in Material Science Lab and Mechanics of solids lab for 25 marks each and the total of the two will be the final marks.

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(9A02402) ELECTRICAL ENGINEERING LAB
(Common to ECE, E Con E, EIE, ECM)

PART – A

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
3. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
4. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
5. Two port network parameters – ABCD and h-Parameters.
6. Verification of Superposition and Reciprocity theorems.
7. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
8. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
9. Constant – k Low Pass Filter and High Pass Filter – Design and Test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.

4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Load test on Single Phase transformer.

Note: Any **12** of the above experiments are to be conducted.

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(9A14401) PRODUCTION TECHNOLOGY

UNIT – I

CASTING: Steps involved in making a casting– Types of patterns - Patterns and Pattern making — Materials used for patterns, pattern allowances and their Construction, Principles of Gating, Gating ratio and design of Gating systems

UNIT – II

Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, special casting processes 1) Centrifugal 2) Die, 3) Investment.

Methods of Melting: Crucible melting and cupola operation, steel making processes.

UNIT – III

A) Welding : Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding.

B) Cutting of Metals: Oxy – Acetylene Gas cutting, water plasma. Cutting of ferrous, non-ferrous metals.

UNIT – IV

Inert Gas welding, TIG & MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding; welding defects – causes and remedies – destructive nondestructive testing of welds.

UNIT – V

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, Rolling fundamentals – theory of

rolling, types of Rolling mills and products. Forces in rolling and power requirements, plastic blow and injection moulding.

UNIT - VI

Stamping, forming and other cold working processes: Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.

UNIT- VII

EXTRUSION OF METALS : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion.

UNIT - VIII

Forging processes: Principles of forging – Tools and dies – Types Forging – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects.

TEXT BOOKS:

1. Manufacturing Technology, P.N. Rao,TMH
2. Manufacturing Technology, Kalpak Jian, Pearson education

REFERENCES:

1. Production Technology, R.K. Jain
2. Process and materials of manufacturing –Lindberg, PE
3. Principles of Metal Castings, Rosenthal.
4. Welding Process, Parmar
5. Manufacturing Technology, R.K. Rajput, Laxmi Pub
6. Rapid Prototyping Principles and Applications, Rafiq Noorani, Wiely Pub.
7. Unconventional Machining Processes, V.K. Jain, Allied Pub.
8. Production Technology, K.L Narayana, I.K. International Pub

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(9A14402) THEORY OF MACHINES

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and
open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained.

MACHINES : Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

UNIT - II

STRAIGHT LINE MOTION MECHANISMS : Exact and approximate copiers and generated types –Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

UNIT – III

KINEMATICS : Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

Analysis of Mechanisms : Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Plane motion of body : Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of

instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

STEERING Mechanisms : Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio.

HOOKE'S JOINT : Single and double Hooke's joint – Universial coupling – application – problems.

UNIT – V

CAMS : Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers : Roller follower – circular cam with straight, concave and convex flanks.

UNIT – VI

Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

UNIT – VII

GEAR TRAINS: Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

UNIT – VIII

GOVERNORS: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung governors with auxiliary springs.

Sensitiveness, isochronism and hunting –effort and power of a governor.

TEXT BOOKS :

1. Theory of Machines and Mechanisms-S.S.Rattan, Tata McGraw Hill Publishers
2. Theory of Machines R.S Khurmi & J.K Gupta

REFERENCES :

1. Theory of Machines by Thomas Bevan, CBS
2. Theory of Machines Sadhu Singh Pearson Edn.
3. Mechanism and Machine Theory, JS Rao and RV Dukkipati, New Age
4. The theory of Machines, Shiegley, Oxford.
5. Theory of machines – PL. Ballaney, Khanna Publishers.

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(9ABS303) ENVIRONMENTAL SCIENCE
(Common to ECE, E Con E, ECM, EIE, EEE, CSSE)

UNIT – I

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES : – Definition, Scope and Importance – Need for Public Awareness.

UNIT – II

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – III

ECOSYSTEMS : Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological sucession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.

b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT – IV

BIODIVERSITY AND ITS CONSERVATION : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-soports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – V

ENVIRONMENTAL POLLUTION : Definition, Cause, effects and control measures of :
a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT : Causes**,** effects and control measures of urban and industrial wates – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – VI

SOCIAL ISSUES AND THE ENVIRONMENT: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting,

watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – VII

HUMAN POPULATION AND THE ENVIRONMENT : Population growth, variation among nations. Population explosion – Family Welfare Proggramme. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

UNIT – VIII

FIELD WORK : Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – river, hill slopes, etc..

TEXT BOOKS :

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by R.Rajagopalan, Oxford University Press.
3. Environmental Studies by Benny Joseph,Mc.graHill Publications.

REFERENCES :

1. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.

2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
4. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela Printice hall of India Private limited.

Environmental Studies by Anindita Basak – Pearson Education.

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(9A04404) PULSE AND DIGITAL CIRCUITS
(Common to ECE, E Con E, EIE, ECM)

UNIT I
LINEAR WAVESHAPING
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. High Pass RC network as Differentiator, Low Pass RC network as integrator, attenuators and its applications as a CRO probe, RL and RLC circuits and their response for step input, Ringing circuit. Problem solving.

UNIT II
NON-LINEAR WAVE SHAPING
Diode clippers, Transistor clippers, Clipping at two independent levels, Comparators, applications of voltage comparators, clamping operation, clamping circuits taking source and Diode resistances into account, Clamping circuit theorem, practical clamping circuits, Effect of diode characteristics on clamping voltage, Synchronized Clamping.

UNIT III
SWITCHING CHARACTERISTICS OF DEVICES
Diode as a switch, piecewise linear diode characteristics, Diode Switching Times, Transistor as a switch, Break down voltages, transistor in saturation, temperature variations of Saturation Parameters, Transistor-Switching Times, Silicon- Controlled-Switch Circuits.

UNIT IV
MULTIVIBRATOR CIRCUITS
Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger circuit using BJT.

UNIT V

TIME BASE GENERATORS

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor Miller-time base generator, Transistor Bootstrap time base generator, Transistor Current time base generators, Methods of linearity Improvements.

UNIT VI

SAMPLING GATES

Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Four Diode Sampling Gate, Reduction of pedestal in gate circuits, Six Diode Gate, Application of Sampling Gates.

UNIT VII

SYNCHRONIZATION AND FREQUENCY DIVISION

Pulse Synchronization of relaxation Devices, Frequency division in sweep circuit, Stability of relaxation Devices, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit, A Sinusoidal Divider using Regeneration and Modulation.

UNIT VIII

REALIZATION OF LOGIC GATES USING DIODES & TRANSISTORS

AND, OR, & NOT gates using Diodes, and Transistors, DCTL, RTL. DTL, TTL, and CMOS Logic Families, and Comparison between the logic families.

TEXT BOOKS:

1. Millman's Pulse, Digital and Switching Waveforms – J.Millman, H.Taub and Mothiki S. Prakash Rao, 2nd Edition, 2008 TMH.
2. Solid State Pulse Circuits-David A. Bell, 4th edition, 2002 PHI.
3. Integrated Electronics – Jacob Millman, Christos C Halkias

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REFERENCES:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Fundamentals of Pulse and Digital Circuits – Ronald J. Tocci, 3rd edition, 2008.
3. Pulse Circuits – Michel
4. Wave Generation and Shaping - L. Strauss.

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(9A03303) MACHINE DRAWING

I. Machine Drawing Conventions :

Need for drawing conventions – introduction to IS conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
d) Title boxes, their size, location and details – common abbreviations & their liberal usage
e) Types of Drawings – working drawings for machine parts.

II. Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
b) Keys, cottered joints and knuckle joint.
c) Rivetted joints for plates
d) Shaft coupling, spigot and socket pipe joint.
e) Journal, pivot and collar and foot step bearings.

III. Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.
b) Other machine parts – Screws jacks, Machine Vices Plummer block, Tailstock.
c) Valves : Steam stop valve, spring loaded safety valve, feed check valve and air cock.

NOTE : First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS :

Machine Drawing – Dhawan, S.Chand Publications
Machine Drawing - K.L.Narayana, P.Kannaiah & K. Venkata Reddy, New Age Publishers

REFERENCES :

Machine Drawing – P.S.Gill.
Machine Drawing – Luzzader
Machine Drawing – Rajput
Textbook of Machine Drawing –K.C.John, 2009, PHI learning

Note: The End exam will be for 4 hrs in the following format.

All questions are to be answered

Q1 – 3 Questions are to be set on section I & II of the syllabus. 2 out of 3 questions are to be answered with can question carrying 4 marks – 2X10=8 marks.

Q2– 3 Questions are to be set on Section II of the syllabus. 2 out of 3 questions are to be answered with each question carrying 10 marks-2X10=20 marks.

Q3 – Drawing of assembled views Mentioned in Section III with a weightage of 42 marks

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Note: All answers should be on the drawing sheet only. Answers on the drawing sheet only will valued.

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(9A14403) FLUID MECHANICS AND HEAT TRANSFER

PART-A FLUID MECHANICS

Unit-I

Physical properties of fluids, Measurement of pressure. Introduction to fluid mechanics, static, kinematics and dynamics.

Unit-II

Fluid kinematics: Streamline, path line and streak lines and stream tube, classification of flows, steady, unsteady, uniform, non-uniform, laminar, turbulent. Rotational and irrotational flows – Equation of continuity for one dimensional flows – Stream and velocity potential functions – Flow net analysis.

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line. Momentum equation and its applications – Boundary layer along a thin flat plate – Separation of boundary layer – Drag and lift – Flow measurement by pitot tube Venturimeter and orifice meter.

Unit-III

Flow through closed conduit, Reynolds number laminate flow through circular tube, Hydraulic gradient and total energy lines, loss of head due to sudden enlargement and contraction.

Unit-IV

Hydraulic Turbines : Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design –draft tube theory-functions and efficiency.

PART-B HEAT TRANSFER

Unit-V

Introduction : Modes of heat transfer, Mechanism of heat transfer, Basic laws of heat transfer.

Conduction: Fourier heat conduction equation, general heat condition equation, initial and boundary conditions, conduction through homogeneous slab, cylinder and sphere.

Unit-VI

Convection: Dimensional analysis, Rayleigh and Buckingham methods applied to heat transfer, Non-dimensional members in heat transfer. Boundary layer concept, concept of stagnant film, Reference temperature for evaluation of fluid properties. Forced convection of laminar flow inside ducts and over bodies. Local and average heat transfer coefficients.

Unit-VII

Radiation: Emission characteristics and laws of Black body radiation. Incident radiation, total and Monochromatic quantities. Laws of black, Wien, Kirchoff, Lambart, Stephan and Boltzman. Heat exchange between two black bodies, concept of shape factor, Emissivity. Heat exchange between grey bodies.

Unit-VIII

Heat Exchangers**:**

Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods working Principles of Heat pipe.

TEXT BOOKS

1. Heat Transfer - PK Nag - TMH
2. Fluid Mechanics Hydraulics and Hydraulics Machines Modi & Seth, Standard publications, New Delhi.

REFERENCE TEXT BOOKS:

1. Heat Transfer / Sukhatme.
2. Heat Transfer – A Practical Approach – Yunus Cengel, Boles / TMH.

3. Fundamentals of Engineering Thermodynamics / Michael J Moran / John Wiley & Sons
4. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

Code/Data books: 1. Heat Transfer Databook/CP Kodandaraman
2. Steam Tables

Question Paper pattern:-

1. 4 Questions each will be set in each part.
2. Student has to answer 5 questions out of 8 by answering at least two questions in each part.

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(9A04302) ELECTRONIC DEVICES AND CIRCUITS LAB
(Common to ECE, E Con E, EIE, ECM, EEE)

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB s
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Lowpower JFETs, MOSFETs, Power Transistors, LEDs, LCDs, SCR, UJT.
3. Study and operation of
   - Multimeters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - Study and Operation of CRO.

(For Laboratory examination – Minimum of 10 experiments)

1. Forward and Reverse bias characteristics of PN Junction diode
2. Zener diode characteristics and Zener as Voltage Regulator.
3. Input and Output characteristics of Transistor in CB Configuration.
4. Input and Output characteristics of Transistor in CE Configuration.
5. Half Wave Rectifier With and without filter.
6. Full wave Rectifier With and without filter.
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations

9. Frequency response of CE Amplifier.
10. Frequency response of CC Amplifier.
11. Frequency response of Common Source FET Amplifier.
12. SCR Characteristics.
13. UJT Characteristics.

Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v.
2. CROs - 0-20M Hz.
3. Function Generators - 0-1 M Hz.
4. Multimeters -
5. Decade Resitance Boxes/Rheostats -
6. Decade Capacitance Boxes -
7. Micro Ammeters (Analog or Digital)- 0-20 µA, 0-50µA, 0-100µA, 0-200µA.
8. Voltmeters (Analog or Digital)- 0-50V, 0-100V, 0-250V.
9. Electronic Components -Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, Diodes (Ge& Si type), transistors] (NPN & PNP type)

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(9A14404) FLUID MECHANICS AND THERMAL ENGINEERING LAB

Any six experiments from each Lab.

(A) FLUID MECHANICS LAB

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Calibration of Venturimeter.
6. Calibration of Orifice meter.
7. Determination of friction factor for a given pipe line.
8. Determination of loss of head due to sudden contraction in a pipeline.

(B) THERMAL ENGG LAB

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test(4 -S Diesel Engines)
3. I.C. Engines Performance Test on 2-S, Petrol
4. I.C. Engines Heat Balance Test.
5. Measurement of Thermal Conductively in a spherical spring.
6. Heat transfer in found convection
7. Performance Test on Reciprocating Air – Compressor Unit
8. Heat transfer in natural convection
9. Measurement of Emissivity of a test plate
10. Demonstration of Heat pipe Heat exchanger

Note: Internal and End examinations will be conducted separately in Fluid Mechanics Lab and Thermal Engineering lab for 25 marks each and the total of the two will be the final marks.

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(9AHS401) MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS
(Common to BT, CE, ECM, EEE, ME)

UNIT I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definition, nature and scope of managerial economics- relation with other disciplines- Demand Analysis: Demand Determinants, Law of Demand and its exceptions

UNIT II: **ELASTICITY OF DEMAND**

Definition, Types, Measurement and Significance of Elasticity of Demand. Demand forecasting, factors governing demand forecasting, methods of demand forecasting (Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting)

UNIT III :THEORY OF PRODUCTION AND COST ANALYSIS

Production Function – Isoquants and Isocosts, MRTS, least cost combination of inputs, Cobb-Douglas production function, laws of returns, internal and external economies of scale.

Cost Analysis: Cost concepts, opportunity cost, fixed Vs variable costs, explicit costs Vs Implicit costs, out of pocket costs Vs Imputed costs. Break-Even Analysis (BEA) - Determination of Break Even Point (Simple Problems)- Managerial significance and limitations of BEA.

UNIT IV: INTRODUCTION TO MARKETS AND PRICING POLICIES

Market structures: Types of competition, features of perfect competition, monopoly- monopolistic competition. Price-Output determination under perfect competition and monopoly - Methods of Pricing-cost plus pricing, marginal cost, limit pricing, skimming pricing, bundling pricing, sealed bid pricing and peak load pricing.

UNIT V: BUSINESS ORGANISATIONS AND NEW ECONOMIC ENVIRONMENT

Characteristic features of business, features and evaluation of sole proprietorship, partnership, Joint Stock Company, public enterprises and their types, changing business environment in post-liberalization scenario.

UNIT VI: CAPITAL AND CAPITAL BUDGETING

Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposal, methods of capital budgeting – payback method, accounting rate of return (ARR) and Net present value method (Simple problems).

UNIT VII: INTRODUCTION TO FINANCIAL ACCOUNTING

Double-Entry Book Keeping, Journal, Ledger, Trial Balance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

UNIT VIII: FINANCIAL ANALYSIS THROUGH RATIOS

Computation, Analysis and Interpretation of financial statements through Liquidity Ratios (Current and Quick ratio), Activity ratios

(Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt- Equity Ratio, Interest Coverage Ratio) and Profitability ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratios and EPS), Du Pont Chart.

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, 4/e, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

REFERENCES

1. Premchand Babu, Madan Mohan:Financial Accounting and Analysis,Himalaya, 2009
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2009.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2009.
5. H.L.Ahuja: Managerial Economics, S.Chand, 3/e, 2009

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B.Tech III-I Sem (Mechatronics).	**T**	**P**	**C**
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(9A14501) NUMERICAL METHODS

UNIT-I: Roots of Non linear equations

. Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

UNIT-II: Solution of linear equations:

Existence of solution – Gauss Elimination method – Gauss elimination with Pivoting. Gauss Jordon Method- Ill conditioned systems – Jacobi iterative method – Gauss Seidel Method – Convergence of Iterative methods.

UNIT-III: Interpolation:

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences – Symbolic relations and separation of symbols- Difference Equations - Differences of a polynomial-Newton's formulae for interpolation –Interpolation with unevenly spaced points- Lagrange's Interpolation formula. - Cubic spline.

UNIT-IV: Least squares method:

Linear, Non linear and curvilinear curve fitting – Multiple linear regression

UNIT – V: Numerical differentiation and integration

Numerical differentiation and integration Trapezoidal rule, simpson's 1/3 rule and $3/8^{th}$ rule.

UNIT – VI : Numerical solution of Initional Value Problems in Ordinary Differential Equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods – Predictor-Corrector Methods- Adams- Bashforth Method.

UNIT-VII: Boundary values & Eigen value problems

Shooting method, Finite difference method and solving eigen values problems, power method.

UNIT-VIII: Solution of partial differential equations

Classification of partial differential equation –Finite difference methods for: Elliptic equations –Laplace equations – Leibmann's iterative method – Parabola equations – Solution of heat equation (One dimensional).

TEXT BOOKS:

1. Numerical Methods by E. Balaguruswamy by Tata – Mc Graw Hill.
2. An Introduction to Numerical Analysis by S.S.Sastry – PHI Learning
3. Numerical Methods by Jain, Iyengar & Jain.

REFERENCES:

1. Numerical Methods by S. Armugam & Others Scitech.
2. Introduction to Numerical Analysis by K.E. Aitkinson, Wiley Publications.
3. Numerical Analysis by Scarborough, Oxford IVH.
4. Elements of Numerical Analysis by Radha S.Gupta McMillan.
5. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.

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(9A02503) CONTROL SYSTEMS
(Common to EEE, ECE, E Con E, EIE)

Objective:

In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT I
INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

UNIT II
TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver -Block diagram algebra –Signal flow graph - Reduction using Mason's gain formula.

UNIT III
TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications –

Steady state response - Steady state errors and error constants – Effects of proportional, integral, derivative Controls.

UNIT IV

STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT V

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT VI

STABILITY ANALYSIS IN FREQUENCY DOMAIN

Polar Plots-Nyquist Plots-Stability Analysis.

UNIT VII

CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, P, PD, PI, PID Controllers.

UNIT VIII

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties.

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.

REFERENCES:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. by NISE 3rd Edition – John wiley.
4. "Modelling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

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(9A04401) SWITCHING THEORY AND LOGIC DESIGN
(Common to ECE, E Con E, EIE, ECM)

UNIT I
NUMBER SYSTEMS & CODES
Philosophy of number systems – complement representation of Negative numbers, Binary arithmetic, Binary codes, Error Detecting & Error Correcting codes, Hamming codes.

UNIT II
BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS
Fundamental postulates of Boolean Algebra, Basic theorems and properties, Switching Functions, Canonical and Standard forms, Algebraic simplification Digital Logic Gates, properties of XOR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT III
MINIMIZATION OF SWITCHING FUNCTIONS
Map Method, Prime Implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime–Implicant chart, Simplification Rules.

UNIT IV
COMBINATIONAL LOGIC DESIGN
Design using conventional Logic Gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT V

PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC

Basic PLD's-ROM, PROM, PLA, PAL Realization of Switching functions using PLD's. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

UNIT VI

SEQUENTIAL CIRCUITS - I

Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic Flip-Flops, Triggering and Excitation Tables. Steps in Synchronous Sequential Circuit Design. Design of modulo-N Ring & Shift counters, Serial Binary Adder, Sequence Detector.

UNIT VII

SEQUENTIAL CIRCUITS - II

Finite state machine-capabilities and Limitations, Mealy and Moore models, Minimization of completely Specified and Incompletely Specified Sequential Machines, Partition Techniques and Merger chart Methods Concept of Minimal cover table.

UNIT VIII

ALGOROTHIMIC STATE MACHINES : Salient features of the ASM chart, Simple examples, System design using data path and control subsystems, control Implementations, Examples of Weighing machine and Binary multiplier.

TEXTBOOKS:

1. Switching & Finite Automata theory – Zvi Kohavi, TMH,2nd Edition.
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
3. Switching Theory and Logic Design-A.Anand kumar, 2008, PHI

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REFERENCES:

1. An Engineering Approach to Digital Design – Fletcher, PHI.
2. Fundamentals of Logic Design – Charles H. Roth, 5th Edition, 2004, Thomson Publications.

Digital Logic Applications and Design – John M. Yarbrough, 2006, Thomson Publications.

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	4	**0**	**4**

(9A14502) MACHINE TOOLS AND METROLOGY

PART-A MACHINE TOOLS

UNIT – I

Elementary treatment of metal cutting theory – Elements of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability –economics- Tool materials.

UNIT – II

Engine lathe – Principle of working, specification of lathe – types of lathes – work holders, tool holders – Box
Tools, Taper turning, thread turning and attachments for Lathes.
Turret and capstan lathes –
Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes
Shaping, Slotting and Planning machines – their Principles of working – Principal parts – specification, classification,

UNIT – III

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool
holding devices – twist drill – Boring machines – Fine boring machines.
Milling machine – Principles of working – specifications – classifications of milling machines – Principal
features of horizontal, vertical and universal milling machines – machining operations.

UNIT –IV

Grinding machine –Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine Lapping, Honing and Broaching machines – comparison of grinding, lapping and honing. Lapping, Honing and Broaching machines: Constructional features, speed and feed Units, machining time calculations

PART-B METROLOGY

UNIT –V

LINEAR AND ANGULAR MEASREMENTS

Measurement of Engineering Components-Comparators, Slip gauges, Rollers, Limit gauges-Design and applications-Auto collimator-Angle dekkor – Alignment telescope-Sine bar-Bevel protractors-Types-Principle-Applications.

UNIT –VI

FORM MEASUREMENTS

Measurement of Screw thread and gears-Radius measurement-Surface finish measurement-Straightness, Flatness and roundness measurements-Principles-Application.

UNIT –VII

LASER METROLOGY

Precision instrument based on Laser-Use of Lasers-Principle-Laser Interferometer-Application in Linear and Angular measurements-Testing of machine tools using Laser Interferometer.

UNIT –VIII

ADVANCES IN METROLOGY

Co-ordinate measuring machine-Constructional features-Types-Applications of CMM-CNC CMM applications-Computer Aided inspection-Machine Vision-Applications in Metrology

TEXT BOOKS :

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Workshop Technology – B.S.Raghu Vamshi – Vol II
3. R.K.Jain, "Engineering Metrology" Khanna Publishers, 1994.

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REFERENCES:

1. Machine Tools – C.Elanchezhian and M. Vijayan / Anuradha Agencies Publishers.
2.Manufacturing Technology-Kalpakzian- Pearson
3. Production Technology by H.M.T. (Hindustan Machine Tools).

4. Gaylor, Shotbolt and Sharp, "Metrology for Engineers:, O.R. Cassel, London, 1993.
5. Thomas, "Engineering Metrology:, Butthinson & Co., 1984.
6. Books an Workshop Technology and Manufacturing Processes.

Question Paper pattern:-

1. 4 Questions each will be set in each part.
2. Student has to answer 5 questions out of 8 by answering at least two questions in each part.

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(9A14503) PRINCIPLES OF MACHINE DESIGN

UNIT – I

INTRODUCTION : General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design. Tolerances and fits – BIS codes of steels. **STRESSES IN MACHINE MEMBERS** : Simple stresses –Complex stresses – impact stresses – stress strain relations – static theories of failure – factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT – II

Fatigue Loading : Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Fatigue theories of failure – Goodman and Soderberg lines.

UNIT – III

RIVETED AND WELDED JOINTS:

Riveted joints: Modes of failure of riveted joints – Strength Equations – efficiency of riveted joints - Welded joints: Design of Fillet welds - axial loads -torsion.

UNIT – IV

DESIGN OF SHAFTS : Design of solid and hollow shafts for strength and rigidity sizes – BIS code.

UNIT – V

MECHANICAL SPRINGS :
Stresses and deflections of helical springs – Extension - compression springs – Springs for static and fatigue loading – Energy storage capacity – helical torsion springs – Co-axial springs.

UNIT – VI
POWER TRANSMISSIONS SYSTEMS, PULLEYS : Transmission of power by Belt drives Transmission efficiencies, Belts – Flat and V types.

UNIT – VII
SPUR and Helical GEAR DRIVES : Spur and helical gears - Load concentration factor – Dynamic load factor. Surface compressive strength – Bending strength – Design analysis of spur and helical gears – Estimation of centre distance, module and face width, check for plastic deformation. Check for dynamic and wear considerations.

UNIT – VIII
BEARINGS : Types of bearings – basic modes of Lubrication – Bearing construction - bearing design - bearing materials – Rolling contact bearings: Types of rolling contact bearings – selection of bearing type – selection of bearing life - Design for cyclic loads and speeds – Static and dynamic loading of ball & roller bearings.

TEXT BOOKS :
1. Mechanical Engineering Design by Bahl and Goel, Standard Publications
2. Design of machine elements by Kulakarni – Mc Graw Hill-3rd edition.

REFERENCES :
1. Machine Design by Timothy H, Wenzell PE, Cengage
2. Machine Design by R.L.Norton, Mc Graw Hill
3. Machine Design by V.Bandari, Tmh Publishers

4. Machine design / Schaum Series.
5. Machine design – Pandya & shah.
6. Machine Design, S MD Jalaludin, Anuradha Publishers

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(9A03607) METROLOGY LAB / MACHINE TOOLS LAB

Section A:

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Alignment test on the lathe.
5. Alignment test on milling machine.
6. Study of Tool makers microscope and its application
7. Angle and taper measurements by Bevel protractor, Sine bars, etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by Two wire/ Three wire method.
10. Surface roughness measurement by Talysurf instrument.
11. Surface Wear Resistances Test using Electro Spark Coating Device.

Section B:

1. Demonstration of construction & operations of general purpose machines: Lathe, Drilling machine, Milling machine, Shaper, Planning machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.
2. Job on Step turning and taper turning on lathe machine
3. Job on Thread cutting and knurling on -lathe machine.
4. Job on Drilling and Tapping
5. Job on Shaping and Planning
6. Job on Slotting
7. Job on Milling

8. Job on Cylindrical Surface Grinding
9. Job on Grinding of Tool angles.

Note: Internal and End examinations will be conducted separately in Metrology lab and Machine tools lab for 25 marks each and the total of the two will be the final marks.

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(9AHS601) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB
(Common to ECE, E Con E, ECM, EIE, EEE, ME, AE)

1. Introduction

The Advanced English Language Skills Lab introduced at the 3rd year B.Tech level is considered essential for the student for focusing on his/her career. At this stage it is imperative for the student to start preparing for the ever growing competition in the job market. In this scenario, in order to be on par with the best, he/she needs to improve his/her Communication and soft skills

This course focuses on the practical aspects of English incorporating all the four (LRSW) skills relevant to the requirements of the prospective employers in view of globalization. The proposed course will enable the students to perform the following:

- Intensive reading to improve comprehension and communication
- Attentive listening for better understanding
- Write project/research/technical reports
- Write Resume' to attract attention
- Discuss ideas / opinions for better solutions
- Face interviews confidently
- Gather information, organize ideas, and present them effectively before an audience
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the

required ability to face computer-based competitive exams such GRE, TOEFL,CAT, GMAT etc.

2. Objectives:

Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's proficiency in English at all levels. The lab intends t**o** train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public speaking skills and enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career

3 Syllabus

The following course content is prescribed for the Advanced Communication Skills Lab:

Reading Comprehension -- Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary(synonyms and antonyms, one word substitutes, prefixes and suffixes, idioms and phrases.)

Listening Comprehension-- Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.

Technical Report Writing—Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

Resume' Writing—Structure, format and style, planning, defining the career objective, projecting one's strengths, and skills, creative self marketing, cover letter

Group Discussion-- Communicating views and opinions, discussing, intervening. providing solutions on any given topic across a cross-section of individuals,(keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

Interview Skills—Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing

Technical Presentations (Oral)— Collection of data, planning, preparation, type, style and format ,use of props, attracting audience, voice modulation, clarity, body language, asking queries.

4. Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum,
Hard Disk-80 GB, Headphones

Prescribed Software: GLOBARENA

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Speaking about Science**, A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**
3. **Books on** TOEFL/GRE/GMAT/CAT/ IELTS **by Barron's/DELTA/Cambridge University Press.**
4. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
7. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
8. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008
9. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010
10. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
11. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010
12. **Business Communication** by John X Wang, CRC Press, Special Indian Edition,2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem (Mechatronics).	**T**	**P**	**C**
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(9A03601) INDUSTRIAL MANAGEMENT

UNIT I

Concepts of Management and Organization – Functions of Management – Evolution of Management Thought : Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Mayo's Hawthorne Experiments, Hertzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs – Systems Approach to Management.

UNIT II

Designing Organizational Structures : Basic concepts related to Organization - Departmentation and Decentralisation, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

UNIT III

Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods for selection of plant- Matrix approach. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.

UNIT IV

Work study - Definition, objectives, Method study - definition, objectives, steps involved- various types of associated charts-difference between micro-motion and memo-motion studies. Work measurement- definition, time study, steps involved-

equipment, different methods of performance rating- allowances, standard time calculation. Work Sampling – definition, steps involved, standard time calculations, differences with time study-Applications.

UNIT V

Materials Management-Objectives, Inventory – functions, types, associated costs, inventory classification techniques. Stores Management and Stores Records. Purchase management, duties of purchase manager, associated forms.

UNIT VI

PERT & CPM : Project management, network modeling-probabilistic model, various types of activity times estimation-programme evaluation review techniques- Critical Path-probability of completing the project, deterministic model, critical path method -critical path calculation-crashing of simple of networks.

UNIT VII

INSPECTION AND QUALITY CONTROL- types of inspections – Difference between inspection & quality control. Statistical Quality Control-techniques-variables and attributes-assignable and non assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans-OC curves. Introduction to TQM- Quality Circles, ISO 9000 series procedures.

UNIT VIII

HUMAN RESOURCE MANAGEMENT- Functions of HRM, Job Evaluation, different types of evaluation methods. Job description, Merit Rating.- difference with job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. Marketing, marketing vs selling, marketing mix, product life cycle.

TEXT BOOKS:

1. Manufacturing Organization and Management, Amrine/ Pearson, 2nd Edition, 2004.
2. Industrial Engineering and Management O.P. Khanna Dhanpat Rai.

REFERENCES:

1. Stoner, Freeman, Gilbert, *Management*, 6th Ed, Pearson Education, New Delhi, 2005.
2. Panner Selvam, Production and Operations Management, PHI, 2004.
3. Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Reliability Engineering & Quality Engineering, Galgotia Publications, Pvt., Limited.
4. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004.
5. Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003.
6. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.
7. Gary Dessler, Human Resource Management, Pearson Education Asia, 2002.
8. Phillip Kotler, Marketing Management, Pearson, 2004.
9. A.R.Aryasri, Management Science for JNTU (B.Tech), Tata McGraw-Hill, 2002

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem (Mechatronics). **T P C**
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(9A03602)CAD / CAM

UNIT – I

Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU,
Memory types, input devices, display devices, hard copy devices, storage devices.

UNIT – II

Computer Graphics & Drafting: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, Geometric commands , layers, display control commands, editing, dimensioning.

UNIT – III

Geometric modeling: Requirements, geometric models, geometric construction models, curve
representation methods, surface representation methods, modeling facilities desired.

UNIT –IV

Numerical control: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools,
features of Machining center, turning center, CNC Part Programming : fundamentals, manual part
programming methods, Computer Aided Part Programming.

UNIT – V

Group Tech: Part family, coding and classification, production flow analysis, advantages and limitations,
Computer Aided Processes Planning, Retrieval type and Generative type.

UNIT – VI

Types of manufacturing systems: FMS, Material handling systems, computer control systems, JIT, Human labor in manufacturing systems.

UNIT – VII

Computer integrated production planning: Capacity planning, shop floor control, MRP-I, MRP-II, CIMS benefits.

UNIT – VIII

Computer Aided Quality Control: Terminology in quality control, the computer in QC, contact inspection methods, non-contact inspection methods-optical non-contact inspection methods-non-optical computer aided testing, integration of CAQC with CAD/CAM.

TEXT BOOKS:

1. CAD / CAM A Zimmers & P.Groover/PE/PHI
2. CAD / CAM – Principles and applications / P.N. Rao/TMH

REFERENCES:

1. Automation, Production systems & Computer integrated Manufacturing/ Groover/P.E
2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
3. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
4. CAD/CAM Theory and Practice – R. Sivasubramaniam / TMH

5. Computer aided design and manufacturing - Lalit Narayan / PHI.
6. Computer aided manufacturing – T.C. Chang / Pearson
7. A text book of CAD/CAM/CSP Rao/Hitech Pub.

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(9A03703) FINITE ELEMENT METHODS

UNIT-I

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain - Displacement relations. Stress - strain relations.

UNIT-II

One Dimensional problems: Finite element modeling coordinates and shape functions. Potential Energy approach: Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions.

Development of Truss Equations: Derivation of stiffness matrix for a beam element in local coordinates, selecting approximation functions for displacement, global stiffness matrix, computation of stress for a bar in x-y Plane, solution of a plane truss, potential energy approach to derive bar element equations, comparison of finite element solution to exact solution for bar, Galerkin's residual method and its use to derive the one-dimensional bar element equation, other residual methods and their applications to a one-dimensional bar problem.

UNIT - III

Development of Beam Equations: Beam stiffness, example of assemblage of beam stiffness matrices, distributed loading, beam element with nodal hinge, potential energy approach to derive beam element equations. Galerkin's methods for deriving beam element equations.

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UNIT - IV

Frames, Plane stress and strain equations: Two-dimensional arbitrarily oriented beam element rigid plane frame examples, grid equations. Basic concepts of plane stress and plane strain, derivation of the constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, explicit expression for the constant strain triangle stiffness matrix, finite element solution of a plane stress problem.

UNIT - V

Development of a linear strain and axisymmetric elements: Introduction, derivation of the linear strain triangular element stiffness matrix and equations, example LST stiffness determination, comparison of elements, derivation of the stiffness matrix, solution of an axisymmetric pressure vessels

Isoparametric formulation: Isoparametric formulation of the bar element stiffness matrix, rectangular plane stress element, Isoparametric formulation of the plane element stiffness matrix, evaluation of the stiffness matrix and stress matrix by Gaussian quadrature.

UNIT - VI

Heat and Mass Transfer analysis: Derivation of the basic differential equation, heat transfer with convection, typical units thermal conductivities, K: and heat transfer coefficients, h, one-dimensional finite element formulation using a variational method, two-dimensional finite element formulation, line or point sources, one-dimensional heat transfer with mass transport, finite element formulation of heat transfer with mass transport by Galerkin's method, flow chart and examples of a heat transfer program

UNIT - VII

Fluid flow and thermal stress analysis: Derivation of the basic differential equations, one-dimensional finite element formulation, two-dimensional finite element formulation, flow chart and examples of a fluid flow program. Formulation of the thermal stress problem and examples.

UNIT - VIII

Structural Dynamic and Time Dependent Heat Transfer: Dynamics of a spring mass system, direct derivation of the bar element equations, numerical integration in time, natural frequencies of a one-dimensional bar, time dependent one dimensional bar analysis, beam element mass matrices and natural frequencies, truss, plane frame, plane stress/strain, axisymmetric, solid element mass matrices, time-dependent heat transfer.

TEXT BOOK:

1. A first course in Finite Element Method/Daryl L Logan/Cengage Learning

2. The Finite Element Methods in Engineering / SS Rao / Pergamon.

3. Introduction to Finite Elements in Engineering / Chandraputla, Ashok and Belegundu / Prentice –

Hall.

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(9A10504) LINEAR & DIGITAL IC APPLICATIONS

UNIT I
INTEGRATED CIRCUITS:
Classification, chip size and circuit complexity, basic information of Opamp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

UNIT II
OP-AMP APPLICATIONS:
Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723.

UNIT III
ACTIVE FILTERS & OSCILLATORS:
Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters. Oscillator types and principle of operation – RC, Wien and quadrature type, waveform generators – triangular, sawtooth, square wave and VCO.

UNIT IV
TIMERS & PHASE LOCKED LOOPS:
Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

UNIT V

D-A AND A- D CONVERTERS:

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC specifications.

UNIT VI

Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate- Analysis& characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL.

UNIT VII

Design using TTL-74XX & CMOS 40XX series, code converters, decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority Encoder, multiplexers & their applications, priority generators/checker circuits. Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's, Complement system. Digital comparator circuits.

UNIT VIII

SEQUENTIAL CIRCUITS:

Flip-flops & their conversions. Design of synchronous counters, Decade counter, shift registers & applications, familiarities with commonly available 74XX & CMOS 40XX series of IC counters.

MEMORIES: ROM architecture, types & applications, RAM architecture, Static & Dynamic RAMs, synchronous DRAMs.

TEXT BOOKS:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.

REFERENCES:

1. Operational Amplifiers & Linear Integrated Circuits – R.F. Coughlin & Fredrick F. Driscoll, PHI, 1977.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications –Denton J. Daibey, TMH.
3. Design with Operational Amplifiers&Analog Integrated Circuits-Sergio Franco, McGraw Hill, 3rd Ed., 2002.
4. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.

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B.Tech III-II Sem (Mechatronics).

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(9A14601) SIGNAL PROCESSING TECHNQUES

Unit I-CONTINUEOUS TIME SIGNALS AND SYSTEMS:

Signals and Systems. Classification of continuous signals and systems with examples. Concepts of signal processing – typical applications - advantages of digital signal processing compared with analog processing.

Unit II- DIGITAL PROCESSING OF CONTINUOUS SIGNALS:

Sampling of continuous signals - analog filter design - anti aliasing filters -sample and hold circuit - reconstructing filters - analog to digital and digital to analog converters.

Unit III- DISCRETE TIME SIGNALS AND SYSTEMS:

Representations - classifications of discrete signals and systems with examples- time domain and frequency domain characterization - transfer functions – Z transform and applications.

Unit IV- FREQUENCY ANALYSIS OF SIGNALS:

Analysis of analog and discrete signals - using Fourier series, Fourier transform, Fourier transform of discrete sequence and discrete Fourier transform -properties of transforms -computation of discrete Fourier transforms - Radix 2.FFT algorithms.

Unit V- CONVOLUTION AND CORRELATION OF SIGNALS:

Concept of convolution in time domain and Frequency domain for both continuous and discrete signals, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function, Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

Unit-VI- REALIZATION OF DIGITAL FILTERS

Review of Z-transforms, applications of Z-Transforms, solution of difference equations of digital filters, block diagram representation of linear constant-coefficient difference equations, basic structures of IIR systems, transposed forms, basic structures of FIR systems, system function.

Unit-VII- IIR DIGITAL FILTERS

Analog filter approximations-Butterworth and chebyshev, design of IIR digital filters from analog filters, design examples: analog-digital transformations, Illustrative Problems.

Unit-VIII- FIR DIGITAL FILTERS

Characteristics of FIR digital filters, frequency response. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters, Illustrative Problems.

TEXT BOOKS:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2007.
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata Mcgraw Hill, 3rd edition, 2009.

3. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.

REFERENCES:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.
2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publisthing House Pvt. Ltd.
3. Digital signal processing: M H Hayes, Schaum's outlines, TATA Mc-Graw Hill, 2007.

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(9A14602) MEMS AND NANOTECHNOLOGY

PART(A) MEMS:

UNIT – I

Introduction, Integrated circuits, MEMS, Microsensors, Microactuators, Microelectronics Fabrication, Micromachining, Mechanical MEMS, Thermal MEMS, MOEMS, Magnetic MEMS, RF MEMS, Microfluid systems, Bio and Chemo-devices, Nanotechnology, Modelling and Simulation.

UNIT – II

Micromachining: Introduction, Photolithography, Structural and Sacrificial Materials, Other Lithography methods, Thin film deposition, Impurity doping, Etching, Problems with Bulk Micro Machining, Surface Micro machining, Bulk vs. Surface micromachining.

UNIT – III

System Modeling and Properties of Material: Introduction, Need for modeling, System types, Basic modeling elements in mechanical systems, Electrical systems, Fluid systems and Thermal systems, Translational pure mechanical system with spring, damper and mass- Rotational pure mechanical system with spring, damper and mass.

UNIT – IV

Passive Components and Systems: Introduction, System-On-A-Chip, Passive electronic systems, Passive mechanical systems

PART(A) NANOTECHNOLOGY:

UNIT-V

General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids,

Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

UNIT-VI

Silicon Carbide: Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,

Nano particles of Alumina and Zirconia: Nano materials preparation, Characterization, Wear materials and nano composites,

UNIT-VII

Mechanical properties: Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

Unit -VIII

Electrical properties: Switching glasses with nanoparticles,Electronic conduction with nano particles

Optical properties: Optical properties, special properties and the coloured glasses

TEXT BOOKS :

1. MEMS, Nitaigour Premchand Mahalik, TMH.
2. Nano Essentials- T.Pradeep/TMH

REFERENCES:

1. Mechatronics Systems Fundamevntals – Rolf Isermann – Sprnger international Edition
2. Introductory MEMS : Fabrication and Applications by **Adams**, Thomas M., **Layton**, Richard A., 1st Edition., 2010, ISBN: 978-0-387-09510-3, Springer
3. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.

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Question Paper pattern:-

1. 4 Questions each will be set in each part.
2. Student has to answer 5 questions out of 8 by answering at least two questions in each part.

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B.Tech III-II Sem (Mechatronics). **T 0** **P 3/2** **C 2**

(9A03712) CAD / CAM LAB

1. **Drafting:** Development of part drawings for various components in the form of orthographic and

isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script,

DXE AND IGES FILES.

2. **Part Modeling:** Generation of various 3D Models through Protrusion, revolve, shell sweep.

Creation of various features. Study of parent child relation. Feature based and Boolean based

modeling surface and Assembly Modeling. Study of various standard Translators. Design simple

components.

3. a). Determination of deflection and stresses in 2D and 3D trusses and beams.

b). Determination of deflections component and principal and Von-mises stresses in plane

stress, plane strain and Axisymmetric components.

c). Determination of stresses in 3D and shell structures (at least one example in each case)

d). Estimation of natural frequencies and mode shapes, Harmonic response of 2D beam.

e). Steady state heat transfer Analysis of plane and Axisymmetric components.

4. a). Development of process sheets for various components based on tooling Machines.

b). Development of manufacturing and tool management systems.

c). Study of various post processors used in NC Machines.

d). Development of NC code for free form and sculptured surfaces using CAM packages.

e). Machining of simple components on NC lathe and Mill by transferring NC Code / from a

CAM package. Through RS 232.

f) Quality Control and inspection.

Any Six Software Packages from the following:

Use of Auto CAD, Micro Station, CATIA, Pro-E, I-DEAS, ANSYS, NISA, CAEFEM, Gibbs CAM, Master CAM etc,

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B.Tech III-II Sem (Mechatronics). **T P C**
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(9A04505) LINEAR & DIGITAL IC APPLICATIONS LAB
(Common to ECE, ECM)

Minimum Twelve Experiments to be conducted:

Part A (IC Application Lab):

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Active Filter Applications – LPF, HPF (first order).
3. Function Generator using OP AMPs.
4. IC 555 Timer – Monostable and Astable Operation Circuit.
5. IC 566 – VCO Applications.
6. Voltage Regulator using IC 723.
7. 4 bit DAC using OP AMP.

Part B (ECAD Lab):

Simulate the internal structure of the following Digital IC's using VHDL / VERILOG and verify the operations of the Digital IC's (Hardware) in the Laboratory

1. Logic Gates- 74XX.
2. Half Adder, Half Subtractor, Full Adder, Full Subtractor & Ripple Carry Adder.
3. 3-8 Decoder -74138 & 8-3 Encoder- 74X148.
4. 8 x 1 Multiplexer -74X151 and 2x4 Demultiplexer-74X155.
5. 4 bit Comparator-74X85.
6. D Flip-Flop 74X74.
7. JK Flip-Flop 74X109.
8. Decade counter-74X90.
9. Universal shift register -74X194.

Equipment required for Laboratories:

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1. RPS
2. CRO
3. Function Generator
4. Multi Meters
5. IC Trainer Kits (Optional)
6. Bread Boards
7. Components: - IC741, IC555, IC566, 7805, 7809, 7912 and other essential components.
8. Analog IC Tester

For Software Simulation

1. Computer Systems
2. LAN Connections (Optional)
3. Operating Systems
4. VHDL/ VERILOG

FPGAS/CPLDS (Download Tools)

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(9A05605) ARTIFICIAL INTELLIGENCE

UNIT I

What is Artificial Intelligence: The AI Problems, The Underlying Assumption, What is an AI Technique?, The Levels of the Model, Criteria of Success, Some General References, One Final Word and Beyond. Problems, Problem Spaces, and Search: Defining the Problem as a State Space Search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in the Design of Search Programs.

UNIT II

Problem-Solving**:** Uninformed Search Strategies, Avoiding Repeated States. Informed Search and Exploration: Informed (Heuristic) Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Backtracking Search for CSPs.

UNIT III

Knowledge and Reasoning: Logical Agents, Knowledge–Based Agents, The Wumpus World, Logic, Propositional Logic a Very Simple Logic, Reasoning Patterns in Propositional Logic, Effective Propositional Inference, Agents Based on Propositional Logic.

UNIT IV

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First-Order Logic: Representation Revisited, Syntax and Semantic of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

UNIT V

Knowledge Representation: Ontological Engineering, Categories and Objects, Actions, Situations, and Events, Mental Events and Mental Objects, The Internet Shopping World, Reasoning Systems for Categories, Reasoning with Default Information, Truth Maintenance Systems.

UNIT VI

Uncertain Knowledge and Reasoning: Uncertainty, Acting Under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use.

UNIT VII

Learning: Learning from Observations, Forms of Learning, Inductive Learning, Learning Decision Trees, Ensemble Learning, Why Learning Works: Computational Learning Theory, Knowledge in Learning: A Logical Formulation of Learning, Knowledge in Learning.

UNIT VIII

Statistical Learning Methods: Neural Networks. Fuzzy Logic Systems: Introduction, Crisp Sets, Fuzzy Sets, Some Fuzzy Terminology, Fuzzy Logic Control, Sugeno Style of Fuzzy Inference Processing, Fuzzy Hedges, α Cut Threshold.

TEXT BOOKS:

1. Artificial Intelligence, Third Edition, Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill.
2. Artificial Intelligence A Modern Approach, 2nd Edition, Stuart Russell and Peter Norvig Pearson Education.

REFERNCES:

1. Artificial Intelligence and Intelligent Systems, N.P.Padhy, Oxford University Press.
2. Artificial Intelligence-Structures and Strategies for Complex Problem Solving, 4th Edition, George F. Luger, Pearson Education.

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B.Tech IV-I Sem (Mechatronics).	**T**	**P**	**C**
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(9A04602) MICROPROCESSORS & MICROCONTROLLERS
(Common to CSE, ECE, E Con E, EIE, EEE)

UNIT-I

INTRODUCTION

Architecture of 8086 microprocessor, special functions of general purpose registers.8086 flag register and function of 8086 flags, addressing modes of 8086,instruction set of 8086.assembler directives, simple programs, procedures and macros.

UNIT-II

ASSEMBLY LANGUAGE PROGRAMMING

Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation.

UNIT-III

ARCHITECTURE OF 8086 & INTERFACING

Pin diagram of 8086-Minimum mode and maximum mode of operation, Timing diagram, memory interfacing to 8086(static RAM and EPROM). Need for DMA. DMA data transfer method. Interfacing with 8237/8257.

UNIT-IV

PROGRAMMABLE INTERFACING DEVICES

8255 PPI-various modes of operation and interfacing to 8086.interfacing keyboard and display controller- 8279, stepper motor and actuators. D/A and A/D converter interfacing, Interrupt structure of 8086, Vector interrupt table. Interrupt service routines. Introduction to DOS and BIOS interrupts. 8259 PIC architecture and interfacing cascading of interrupt controller and its importance.

UNIT-V

SERIAL DATA TRANSFER SCHEMES

Asynchronous and synchronous data transfer schemes.8251 USART architecture and interfacing.TTL to RS232C and RS232C to TTL conversion. Sample program of serial data transfer. Introduction to high-speed serial communications standards, USB.

UNIT-VI

PROGRAMMABLE INTERRUPT CONTROLLERS

PIC 8259, Programming with 8259, Programmable interval timer 8253, Modes of 8253, Programming examples with 8253.

UNIT-VII

8051 MICROCONTROLLER AND ITS PROGRAMMING

Architecture of micro controller-8051 Microcontroller-internal and external memories-counters and timers-synchronous serial-cum asynchronous serial communication-interrupts. Addressing modes of 8051, Instructor set of 8051, Assembly Language Programming examples using 8051.

UNIT-VIII

ADVANCED MICROCONTROLLERS

MCS – 96 Microcontrollers: Important Features, Pin Diagram, Internal Architecture, Memory Map, Addressing Modes, Instruction set. ARM Microcontrollers: ARM Core Architecture, Versions of ARM, Important Features.

TEXT BOOKS:

1. Advanced microprocessor and peripherals-A.K. Ray and K.M.Bhurchandi, 2nd edition, TMH, 2000.
2. Microcontrollers-Deshmukh, Tata Mc-Graw Hill Edition, 2004.
3. Microcontrollers Architecture, programming, interfacing and system Design-Raj kamal, Pearson Education, 2005.

REFERENCES:

1. Microprocessors Interfacing-Douglas V.Hall, 2nd edition, 2007.

2. The 8088 and 8086 Microprocessors- Walter A. Triebel, Avtar Singh, PHI, 4th Edition, 2003.
3. Micro computer system 8066/8088 family Architecture, programming and Design-By Liu and GA Gibson, PHI, 2nd Ed.
4. 8051 Microcontroller-Internals, Instructions, Programming and Interfacing by Subrata Ghoshal, Pearson, 2010.

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B.Tech IV-I Sem (Mechatronics).

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(9A03702) AUTOMATION & ROBOTICS

UNIT – I

Introduction to Automation: Need , Types, Basic elements of an automated system, levels of automation, hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

UNIT – II

Automated flow lines: Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, qualitative analysis.

UNIT – III

Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT – IV

Introduction to Industrial Robots: Classification. Robot configurations, Functional line diagram, Degrees of Freedom. Components, common types of arms, joints, grippers.

UNIT – V

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Manipulator Kinematics: Homogeneous transformations as applicable to rotation and translation - D-H notation, Forward and inverse kinematics.

Manipulator Dynamics: Differential transformation, Jacobians . Lagrange – Euler and Newton – Euler formations.

UNIT VI

Trajectory Planning: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion .

Robot programming-Types – features of languages and software packages.

UNIT VII

Robot actuators and Feed back components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison. Position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile sensors, Proximity sensors.

UNIT VIII

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Automation , Production systems and CIM/M.P. Groover/Pearson Edu.

2. Industrial Robotics - M.P. Groover/ TMH.

REFERENCES:

1. Robotics / Fu K S/ McGraw Hill.
2. An Introduction to Robot Technology / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
3. Robotic Engineering / Richard D. Klafter, Prentice Hall
4. Robotics, Fundamental Concepts and analysis – Ashitave Ghosal/Oxford Press
5. Robotics and Control / Mittal R K & Nagrath I J / TMH.
6. Introduction to Robotics – John J. Craig/Pearson Edu

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(9A14701) MECHTRONIC SYSTEMS

UNIT – I

Introduction to Mechatronics, Mechatronics key elements, Mechatronics design process, approaches in Mechatronics, objectives of Mechatronics, Examples of Mechatronic systems

Unit – II

Transmission mechanics – linear – lead screw, timing belt, conveyor – Rotary – gearing – spur gears, planetary transmission, harmonic transmission.

Unit – III

Motors – DC servo motors with encoded feedback – Brushless DC servo motors with hall effect sensor, encoder feedback stepper motors – full step, half step, microstep AC induction motors – gearheads.

Unit – IV

Control system in Motion control : programmable motion control, closed loop PID control – feed forward control – velocity, acceleration – fundamental concept for adaptive control and fuzzy logic.

Unit – V

Programmable logic controllers: Basic PLC structure, Input/ Output processing, Ladder programming, Latching and internal relays, Sequencing, Timers and counters, Shift registers, Master and jump controls

Unit – VI

INDUSTRIAL HYDRAULICS: Introduction, Merits of Fluid power and its utility for increase in productivity, symbolic representation of hydraulic element – Hydraulic control valves – Hydraulic accessories – various pumps used in hydraulic system – Hydraulic fluids – Hydraulic circuits and servo control systems.

UNIT – VII

INDUSTRIAL PNEUMATICS : Introduction, Symbolic representations of Pneumatic elements – Compressor and air installation – Pneumatic circuits using Pneumatic cylinders and other elements – Applications to fluidics

UNIT – VIII

Pneumatic and Hydraulic Actuation Systems: Actuation systems, Pneumatic and hydraulic systems, Directional control valves, Pressure control valves, Cylinders, Servo and proportional control valves, Process control valves and Rotary actuators

TEXT BOOKS :

1. Mechatronics – W. Bolton, Pearson, 2010.
2. Pneumatic systems- Principles and Maintenance, SR Majumdar, TMH

REFERENCE BOOKS :

1. Hydraulic systems- Principles and Maintenance, SR Majumdar, TMH
2. Mechatronics system design- Devdas Shetty & Richard A. Kolk, Thomson, 2007
3. Introduction to Mechatronics and Measurement Systems, Alciatore, 2009, 3e, TMH
4. Principles of Machine Tools – Sen & Bhattacharya
5. Introduction to Mechatronics, Appuu Kuttan KK, Oxford Universities Press
6. Mechatronic systems: Fundamentals, Isermann, Springer

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(9A14702) QUALITY AND RELIABILITY ENGINEERING

(Elective -I)

Unit –I
Introduction, Historical development, Scope of Reliability Engineering, Concept of Reliability, Types of Failures, Bath Tub Curve, Component's Reliability and Hazard Function, MTTF, Hazard models, reliability, Design for Reliability.

Unit-II
System Reliability, Series System, Parallel System, k out of m system Reliability Decrement, Redundancy Techniques, Reliability Vs Cost; Maintenance function.

Unit-III
Reliability of a single element system, reliability analysis of a two unit system active, active redundant system, standby redundant system, reliability and availability of hybrid systems.

Unit-IV
Redundancy optimization, search technique, optimal level of equipment reliability, Dynamic programming, Recursive relations in D.P, Applications of DP for optimization of redundancy, logic diagram, fault tree techniques etc.

Unit-V
Basic principles of control chart, sample size and sampling frequency, average run length, analysis patterns of control chart,

rational sub grouping, check sheet, pereto analysis, lshikawa diagram, scatter diagram.

Unit-VI

Control charts for variables X and R charts, analysis for nonrandom patterns (interpretation of patterns) on X and R charts; X and S charts, operating characteristic curve/function, numerical problems.

Unit-VII

Control charts for attributes. P-chart, development and analysis, P-chart with variable sample size, Design of P-chart, operating characteristic function for P-chart, numerical problems, control charts for defects (Non-conformities) viz C-chart, U-chart, U-chart with variable sample size.

Unit-VIII

Acceptance sampling for attributes, Acceptance Sampling-Advantages & disadvantages of sampling, random sampling, types of sampling plans, O.C Curve for SSP, specific points on OC curve, design of sampling plans viz SSP, DSP using nomograph, trial and error method. Total Quality Methods – principles and philosophies.

TEXT BOOKS:

1. Reliability engineering and quality engineering by Dr. C. Nadhamuni Reddy & Dr. K. Vijaya Kumar Reddy, First Edition, Galgotia publications pvt. Ltd.
2. Reliability Engineering L.S. Srinath Affiliated East west press-1975.

REFERENCE

1. Reliability Evaluation of Engineering Systems by Roy Billinton and Ronald N. Allan, Pitman
Advanced Publishing Program, 1998.(Second Edition)
2. Reliability Engineering by E. Balagurusamy, Tata McGraw Hill, 2003.
3. Reliability and Maintainability Engineering by Charles E. Ebeling, Tata McGraw Hill, 2000.
4. Jain K.C. & Chitale. A.K., Quality Assurance and TQM- Khanna Publisher, 1998.
5. Sharma S.C., Inspection, Quality control and Reliability- Khanna Publishers, 1998.

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(9A03807) COMPOSITE MATERIALS

(Elective – I)

Unit-I

Introduction to Composite Materials: Introduction, Classification: Polymer Matrix Composites. Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber. Reinforced Composites and nature-made composites, and applications

Unit-II

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide. Fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

Unit-III

Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM.

Unit-IV

Macromechanical Analysis of a Lamina: Introduction ,Definitions: Stress, Strain ,Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two Dimensional Unidirectional Lamina, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina.

Unit-V

Hooke's Law for a Two-Dimensional Angle Lamina, Engineering Constants of an Angle Lamina. Invariant Form of Stiffness and Compliance Matrices for an Angle Lamina Strength Failure. Envelopes, Maximum Strain Failure Theory ,Tsai–Hill Failure Theory, Tsai–Wu Failure Theory Comparison of Experimental Results with Failure Theories. Hygrothermal Stresses and Strains in a Lamina: Hygrothermal Stress–Strain Relationships for a Unidirectional Lamina, Hygrothermal Stress–Strain Relationships for an Angle Lamina

Unit-VI

Micromechanical Analysis of a Lamina: Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi Empirical Models ,Elasticity Approach. Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion

UNIT-VII

Macromechanical Analysis of Laminates: Introduction, Laminate Code, Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate , Hygrothermal Effects in a Laminate, Warpage of Laminates

UNIT-VIII

Failure Analysis and Design of Laminates: Introduction , Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite, Other Mechanical Design Issues

Text Books:

1. Engineering Mechanics of Composite Materials- Isaac and M Daniel, Oxford University Press, 1994.
2. Mechanics of Composite Materials, R. M. Jones, Mc Graw Hill Company, New York, 1975.

References:

1. Analysis and performance of fibre Composites, B. D. Agarwal and L. J. Broutman Wiley- Interscience, New York, 1980.
2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering)- Autar K. Kaw, Publisher: CRC
3. Finite Element Analysis of Composite Materials, Ever J. Barbero , CRC Press, 2007.
4. Analysis of Laminated Composite Structures, L. R. Calcote, Van Nostrand Rainfold, New York, 1969.
5. Mechanics of Composite Materials and Structures, Madhujit Mukhopadhyay University Press, 2009.
6. Composite Materials Science and Engineering, Krishan K. Chawla, Springer, 2009, Ed.

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B.Tech IV-I Sem (Mechatronics).

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(9A03606) AUTOMOBILE ENGINEERING (Elective-I)

UNIT – I

Introduction : Components of a four wheeler automobile – chassis and body – power unit –power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – oil filters, oil pumps – crank case ventilation.

UNIT – II

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters– 161arburetor – types – air filters – Gasoline injection.

C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle spray formation, injection timing, testing of fuel pumps.

UNIT – III

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and
Forced Circulation System – Radiators – Types – Cooling Fan – water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Unit – IV

Emissions from Automobiles – Pollution standards National and international – Pollution Control– Techniques – Multipoint fuel injection for SI Engines- Common rail diesel injection Emissions from alternative energy sources– hydrogen, Biomass, alcohols, LPG, CNG – their merits and demerits.

UNIT – V

Electrical System : Charging circuit, generator, current – voltage regulator – starting system, Bendix drive, mechanism of Solenoid switch, Lighting systems, Horn, wiper, Fuel gauge – oil pressure gauge, Engine temperature indicator.

UNIT – VI

Transmission System: Clutches- Principle- types: cone clutch, single plate clutch, multi plate
clutch, magnetic and centrifugal clutches, fluid fly wheel – gear box- types: sliding mesh,
constant mesh, synchromesh, epi-cyclic, over drive, torque converter.
Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential, rear axles.

UNIT – VII

Steering System: Steering geometry – camber, castor, king pin rake, combined angle toe-in,
center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis
steering mechanism, steering gears – types, steering linkages.

UNIT – VIII

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

Braking System: Mechanical brake system, Hydraulic brake system, Pneumatic and vacuum brake systems.

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TEXT BOOKS:

1. Automotive Mechanics – Vol. 1 & Vol. 2 / Kirpal SingH.
2. Automobile Engineering / William Crouse

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REFERENCE BOOKS:

1. Automobile Engineering / R.K.RAJPUT/Laxmi Pub
2. Automobile Engineering by K.K.Ramalingam/Scitech Pub.
3. Automotive engines by Newton, Steeds & Garret.

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(9A02806) EMBEDDED SYSTEMS
(Elective – II)

UNIT- I OVERVIEW OF EMBEDDED SYSTEM
Embedded System, types of Embedded System, Requirements of Embedded System, Issues in Embedded software development, Applications.

UNIT-II PROCESSOR & MEMORY ORGANIZATION
Structural units in a processor, Processor selection, Memory devices, Memory selection, Memory Allocation & Map; Interfacing

UNIT-III DEVICES & BUSES FOR DEVICE NETWORKS
I/O devices, Timer & Counter devices, Serial Communication, Communication between devices using different buses.

UNIT-IV DEVICE DRIVERS AND INTERRUPT SERVICING MECHANISM
Device drives, Parallel and serial port device drives in a system, Interrupt servicing mechanism, context and periods for context switching, Deadline and Interrupt Latency.

UNIT V PROGRAM MODELING CONCEPTS
Program elements, Modeling Processes for Software Analysis, Programming Models, Modeling of Multiprocessor Systems.

UNIT VI SOFTWARE ENGINEERING PRACTICES
Software algorithm Concepts, design, implementation, testing, validating, debugging, Software Management and maintenance.

UNIT-VII HARDWARE AND SOFTWARE CO-DESIGN

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Embedded system design and co design issues in software development, design cycle in development phase for Embedded System, Use of ICE & Software tools for development of ES, Issues in embedded system design.

UNIT VIII RTOS

OS Services, I/O Sub Systems, Real Time and Embedded Systems OS, Interrupt routines in RTOS Environment, RTOS Task Scheduling Models.

TEXT BOOKS:

1. Embedded Systems : Architecture, Programming and Design – Rajkamal, TMH, 2003.
2. Programming for Embedded System: DreamTech Software Team-John Wiley -2002

REFERENCES:

1. Embedded Systems & Robots by Subrata Ghoshal, CENGAGE Learning.

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B.Tech IV-I Sem (Mechatronics).	**T**	**P**	**C**
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(9A10805) ARTIFICIAL NEURAL NETWORKS (ELECTIVE – II)

UNIT I

INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS:

Introduction, Artificial Neural Networks, Historical Development of Neural Networks, Biological Neural Networks, Comparison Between Brain and the Computer, Comparison Between Artificial and Biological Neural Networks, Network Architecture, Setting the Weights, Activation Functions, Learning Methods.

UNIT II

FUNDAMENTAL MODELS OF ARTIFICIAL NEURAL NETWORKS:

Introduction, McCulloch – Pitts Neuron Model, Architecture, Learning Rules, Hebbian Learning Rule, Perceptron Learning Rule, Delta Learning Rule (Widrow-Hoff Rule or Leastmean Squre (LMS) rule, Competitive Learning Rule, Out Star Learning Rule, Boltzmann Learning, Memory Based Learning.

UNIT III

FEED FORWARD NETWORKS:

Introduction, Single Layer Perceptron Architecture, Algorithm, Application Procedure, Perception Algorithm for Several Output Classes, Perceptron Convergence Theorem, Brief Introduction to Multilayer Perceptron networks, Back Propagation Network (BPN), Generalized Delta Learning Rule, Back Propagation rule, Architecture, Training Algorithm, Selection of Parameters, Learning in Back Propagation, Application Algorithm, Local Minima and Global Minima, Merits and Demerits of Back Propagation Network, Applications, Radial Basis Function

Network (RBFN), Architecture, Training Algorithm for an RBFN with Fixed Centers.

UNIT IV

ADALINE AND MADALINE NETWORKS:

Introduction, Adaline Architecture, Algorithm, Applications, Madaline, Architecture, MRI Algorithm, MRII Algorithm.

UNIT V

COUNTER PROPAGATION NETWORKS:

Winner Take – all learning, out star learning, Kohonen Self organizing network, Grossberg layer Network, Full Counter Propagation Network (Full CPN), Architecture, Training Phases of Full CPN, Training Algorithm, Application Procedure, Forward Only counter Propagation Network, Architecture, Training Algorithm, Applications, Learning Vector Quantizer (LVQ).

UNIT VI

ASSOCIATIVE MEMORY NETWORKS – I:

Types, Architecture, Continuous and Discrete Hopfield Networks, Energy Analysis, Storage and Retrival Algorithms, Problems with Hopfield Networks.

UNIT VII

ASSOCIATIVE MEMORY NETWORKS – II:

Boltzman Machine, Bidirectional Associative Memory, Adaptive Resonance Theory Networks Introduction, Architecture, Algorithm.

UNIT VIII

APPLICATIONS OF NEURAL NETWORKS:

Implementation of A/D Converter using Hopfield Network, Solving Optimization Problems, Solving Simultaneous Linear Equation, Solving Traveling Salesman Problems using Hopfield Networks, Application in Pattern Recognition, Image Processing.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems – J.M.Zurada, Jaico Publishers, 3rd Edition.
2. Introduction to Neural Networks Using MATLAB 6.0 – S.N. Shivanandam, S. Sumati, S. N. Deepa, TMH.

REFERENCES:

1. Elements of Artificial Neural Networks – Kishan Mehrotra, Chelkuri K. Mohan, and Sanjay Ranka, Penram International.
2. Artificial Neural Network – Simon Haykin, Pearson Education, 2nd Ed.
3. Fundamental of Neural Networks – Laurene Fausett, Pearson, 1st Ed.
4. Artificial Neural Networks – B. Yegnanarayana, PHI.

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(9A02504) POWER ELECTRONICS
(ELECTIVE – II)

Objective :
With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

UNIT – I POWER SEMI CONDUCTOR DEVICES
Thyristors – Silicon Controlled Rectifiers (SCR's) – BJT – Power MOSFET – Power IGBT and their characteristics and other thyristors – Basic theory of operation of SCR – Static characteristics – Turn on and turn off methods- Dynamic characteristics of SCR – Turn on and Turn off times –Salient points

UNIT – II DEVICES AND COMMUTATION CIRCUITS
Two transistor analogy – SCR – R and RC Triggering – UJT firing circuit –– Series and parallel connections of SCR's – Snubber circuit details – Specifications and Ratings of SCR's, BJT, IGBT – Numerical problems – Line Commutation and Forced Commutation circuits.

UNIT – III SINGLE PHASE HALF CONTROLLED CONVERTERS
Phase control technique – Single phase Line commutated converters – Mid point and Bridge connections – Half controlled converters with Resistive, RL loads and RLE load– Derivation of average load voltage

and current –Active and Reactive power inputs to the converters without and with Free wheeling Diode –Numerical problems

UNIT – IV SINGLE PHASE FULLY CONTROLLED CONVERTERS

Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads – Derivation of average load voltage and current – Line commutated inverters –Active and Reactive power inputs to the converters without and with Free wheeling Diode, Effect of source inductance – Derivation of load voltage and current – Numerical problems.

UNIT – V THREE PHASE LINE COMMUTATED CONVERTERS

Three phase converters – Three pulse and six pulse converters – Mid point and bridge connections average load voltage With R and RL loads – Effect of Source inductance–Dual converters (both single phase and three phase) – Waveforms –Numerical Problems.

UNIT – VI AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

AC voltage controllers – Single phase two SCR's in anti parallel – With R and RL loads – modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor wave forms – Firing circuits –Numerical problems – Cyclo converters – Single phase mid point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only) – Waveforms

UNIT – VII CHOPPERS

Choppers – Time ratio control and Current limit control strategies – Step down choppers Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression

Morgan's chopper – Jones chopper and Oscillation chopper (Principle of operation only) Waveforms — AC Chopper – Problems.

UNIT – VIII INVERTERS

Inverters – Single phase inverter – Basic series inverter – Basic parallel Capacitor inverter bridge inverter – Waveforms – Simple forced commutation circuits for bridge inverters – Mc Murray and Mc Murray – Bedford inverters – Voltage control techniques for inverters Pulse width modulation techniques – Numerical problems.

TEXT BOOKS :

1. Power Electronics – by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company, 1998.
2. Power Electronics : Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
3. Power Electronics – by V.R.Murthy , OXFORD University Press, 1st edition -2005.
4. Power Electronics-by P.C.Sen,Tata Mc Graw-Hill Publishing.

REFERENCE BOOKS :

1. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, 3rd Edition.
2. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.
3. Principles of Power Electronics by John G. Kassakian, Martin F. Schlecht and George C. Verghese, Pearson.

Power Electronics – Essentials & Applications by L. Umanand, Wiley India Pvt. Ltd.

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(9A02710) MICROPROCESSORS AND MICROCONTROLLERS LAB

I . Microprocessor 8086:

Introduction to MASM/TASM.

Arithmetic operation – Multi byte addition and subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.

Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.

By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.

Modular Program: Procedure, Near and Far implementation, Recursion.

Dos/BIOS programming: Reading keyboard (Buffered with and without echo) – Display characters, Strings.

II. Interfacing

8259 – Interrrupt Controller.
8279 – Keyboard Disply.
8255 – PPI.
8251 – USART.

III. Mcrocontroller 8051:

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1. Reading and Writing on a parallel port.
2. Timer in different modes.
3. Serial communication implementation.
4. Understanding three memory areas of 00 – FF (Programs using above areas).
5. Using external interrupts
6. Programs using special instructions like swap, bit/byte, set/reset etc.
7. Programs based on short, page, absolute addressing.

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(9A14703) MECHATRONICS LAB

Note: Any six from each laboratory

MOTION CONTROL DESIGN LAB

1. Study the following valves :
   a. Relief Valve
   b. Flow Control Valves
   c. Directional Control Valves
   d. Pressure control Valves
2. Circuits for reciprocating motion of a single acting and double acting pneumatic cylinders.
3. Circuits for reciprocating motion of hydraulic cylinders
4. Circuits for speed control of a
   4 double acting pneumatic cylinder. (b) Double acting hydraulic Cylinder.
5. Circuits for semi automatic and automatic operation of a double acting pneumatic cylinders.
6. Circuits for semi automatic and automatic operation of a double acting hydraulic cylinders.
7. Circuits for sequencing motion of two pneumatic cylinder (a) by cascading (b) by using a sequence valve
8. Circuits for measurement of pressure of air/ oil in fluid power system
9. Design and simulation of pneumatic circuits using simulation software
10. Design and simulation of hydraulic circuits using simulation software

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CNC & ROBOTICS LAB

1. Study and Operation of CNC Lathe
2. Study and Operation of CNC Milling machine
3. Preparation of typical part programs on CNC trainer
4. Preparation of typical part programs on CNC milling machine
5. Exercises using CAM software
6. Communicating within Flexible manufacturing cell-cell computer to machine, cell computer to robot, Machine-to-machine interlinking
7. Part program generation through G & M codes for turning, contouring, drilling, reaming and milling
8. Development of tool path simulation by setting tool offsets for multi operations
9. Machining of various components by generation of CNC code by CAM software
10. Robot programming for a given path

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(9A03701) OPERATIONS RESEARCH

UNIT – I

Development – Definition– Characteristics and Phases – Types of models – operation Research models – applications.

ALLOCATION: Linear Programming Problem Formulation – Graphical solution – Simplex method – Artificial variables techniques –Two–phase method, Big-M method – Duality.

UNIT – II

TRANSPORTATION PROBLEM – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy. Assignment problem – Formulation – Optimal solution – Variants of Assignment Problem- Traveling Salesman problem.

SEQUENCING – Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

UNIT – III

REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not considered and considered – Replacement of items that fail completely, group replacement.

UNIT – IV

THEORY OF GAMES: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games

– dominance principle – m X 2 & 2 X n games –graphical method.

UNIT – V

WAITING LINES: Introduction – Single Channel – Poisson arrivals – exponential service times – with finite queue length and non finite queue length models– Multichannel – Poisson arrivals – exponential service times with finite queue length and queue length and non finite queue length models.

UNIT – VI

INVENTORY : Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

UNIT – VII

DYNAMIC PROGRAMMING: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

UNIT – VIII

SIMULATION: Definition – Types of simulation models – phases of simulation– applications of simulation – Inventory and Queuing problems – Advantages and Disadvantages – Features of Simulation Languages.

TEXT BOOK:

1. Introduction to operations Research/Taha/PHI
2. Introduction to O.R/Hiller & Libermann (TMH).

REFERENCES:

1. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
2. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman
3. Operations Research / R.Pannerselvam,PHI Publications.
4. Operations Research / Wagner/ PHI Publications.
5. Operation Research /J.K.Sharma/MacMilan.
6. O.R/Wayne L.Winston/Thomson Brooks/cole

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B.Tech IV-II Sem (Mechatronics).

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(9A04604) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

UNIT-I

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT-II

Signal generator-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).

UNIT-III

Wave analyzers, Harmonic distortion analyzers, FFT analyzers, and Logic analyzers.

UNIT-IV

Oscilloscopes: Standard specifications of CRO, CRT features, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector

circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method).

UNIT-V

Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counter, time and period measurement, Digital Multimeter (A to D converter used in DMM and its principle).

UNIT-VI

Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge. Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

UNIT-VII

Sensors and Transducers – Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

UNIT-VIII

Data Acquisition System, Analogue and digital data recording techniques, strip chart and XY recording methods .Over view of PC Based instrumentation. Bus standards for measuring instruments (GPIB, RS232, USB).

TEXT BOOKS:

1. Electronic instrumentation, second edition – H.S.Kalsi, Tata McGraw Hill, 2004.

2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
3. Electronic Instrumentation & Measurements – David A. Bell, PHI, 2nd Edition, 2003.

REFERENCES:

1. Measurement Systems Application and Design-Ernest O Doebelin and Dhanesh N Manik TMH, 5th Edition, 2009.
2. Electronic Measurement and Instrumentation, Oliver and Cage, TMH.
3. Electronic Test Instruments, Analog and Digital Measurements – Robert A.Witte, Pearson Education, 2nd Ed., 2004.

Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education – 2005.

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(9A14801) FLEXIBLE MANUFACTURING SYSTEM
(Elective –III)

UNIT – I

Introduction: Types of production, characteristics, applications, Flexibility in Machining systems, need for FMS, Flexible Automation, where to apply FMS technology.

UNIT – II

Flexible Manufacturing Cell: Characterstics, Flexible Machining systems, achieving flexibility in machining systems, Machine cell design, quantitative techniques.

UNIT – III

Group Technology(GT): Part classification and coding systems: Part families, Parts classification and coding, Optiz system, structure, MULTICODE, differences between Optiz and MULTICODE systems, relative benefits.

UNIT – IV

GT- production flow analysis: Composite part concept, numerical problems for parts clustering, advantages of GT in manufacturing and design.

UNIT – V

Components of FMS: FMS layout configurations, Planning the FMS, FMS's Work- stations, Material Handling systems, Automatic Guided vehicle systems, Automated storage and retrieval systems, and Computer control systems.

Unit – VI

Implementing FMS: FMS Layout configurations, Quantitative Analysis methods for FMS , Applications and benefits of FMS, problems in implementing FMS.

Unit – VII

Computer Aided Process planning: Importance, generative and retrieval systems, advantages and disadvantages, Generation of route sheets, selection of optimal machining parameters, methods.

Unit – VIII

Computer aided quality control and testing: Coordinate measuring machines, over view, contact and non contact inspection principles, Part programming coordinate measuring machines, In-cycle gauging.

TEXT BOOKS:

1. Automation, Production systems and Computer Integrated Manufacturing System – Mikell P. Groover
2. The design and operation of FMS –Dr. Paul Ranky Nort – Holland Publishers

REFERENCES:

1. Flexible Manufacturing systems in practice by Joseph talvage and roger G. Hannam, Marcel Dekker Inc., Newyork
2. Hand book of FMS – Nand Jha .K.
3. FMS and control of machine tools - V. Ratmirov, MIR publications
4. Flexible Manufacturing – David J. Parrish

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(9A14802) SYSTEM SIMULATION

(Elective –III)

Unit-I

Introduction to Modeling & Simulation: Simulation –Concept –Nature-Advantages and Disadvantages-Areas of application; Systems and System Environment-Components of a System-Discrete and Continuous Systems-Model of a System-Types of Models-Discrete-Event System Simulation-Steps in a Simulation Study.

Unit-II

System Simulation: Types of System Simulation, Monte Carlo Method, Comparision of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model.

Unit-III

Continuous System Simulation: Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, feedback systems, simulation of auto pilot, interactive systems, Real Time simulations.

Unit-IV

Random-Number Generation properties of Random Numbers – Generation of Pseudo-Random Numbers-Techniques for Generating Random Numbers-Linear Congruential Method-Combined Linear COngruential Generators-Random-Number Streams-Tests for Random Numbers-Frequency Tests-Tests for Autocorrelation.

Unit-V

Random-Variate Generation

Inverse - Transform Technique - Exponential Distribution - Uniform Distribution - Weibull Distribution-Triangular Distribution-Empirical Continuous Distributions - Continuous Distributions without a Closed -From Inverse - Discrete Distributions - Acceptance-Rejection Technique.

Unit-VI

Simulation of Queuing Systems Poisson arrival patterns, Exponential distribution, Service times and the Service Mechanism, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system.

Unit-VII

Discrete System Simulation: Discrete Events, Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization, Recording Distributions and Transit times.

Unit-VIII

Simulation of Computer Systems

Introduction – Simulation Tools – Process Orientation – Event Orientation – Model input – Modulated Poisson Process – Virtual-Memory Referencing – High-Level Computer-System Simulation – CPU Simulation – Memory Simulation.

TEXT BOOKS & REFERENCE:

1. Gorden G., Systems simulation, Prentice Hall
2. Banks, J. et al. (2005) Discrete-Event System Simulation, 4th eds, Prentice Hall, new Jersey.

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(9A03709) TOOL DESIGN
(Elective –III)

UNIT-I

Tooling materials and heat treatment: Properties of materials, ferrous, nonferrous, non metallic, tooling materials, heat treating, Limits, tolerances; and FITS, Gauges and gauge design coated tools, ceramic tools.

UNIT -II

Design of single point cutting tools: Single point, cutting tools-various systems of specifications, geometry and their inter, relation, theories of formation of chip and their effect, design of broach.

UNIT - III

Design *of* multipoint cutting tools: Drill geometry, Design of Drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, Milling cutters, cutting speeds and feed-machining times-design-form cutters, combination tools, reamers etc.

UNIT -IV

Design of jigs and fixtures: Basic principles of location and clamping, locating, methods and devices, jigs, definitions, types, general consideration in the design of jigs, drills bushing, methods of construction, fixtures-vice fixtures milling, boring, and lathe grinding fixtures.

UNIT-V

Design of sheet metal blanking and piercing: Fundamentals of die cutting operating, power press types, General press information, Material handling equipment, cutting action in punch and die operation. Die clearance, and types of Die construction. Die design fundamentals-blanking and piercing die construction, pilots, striper and pressure pads presswork material, strip layout, short run tooling for piercing.

UNIT-VI

Design of sheet metal bending, forming and drawings die: Bending dies, drawing dies, forming dies, drawing operations, variables that effect metal flow during drawing. Determination of blank size, drawing force, single and double action draw dies.

UNIT -VII

Tool life and tool wear: theories of tool wear-adhesion, abrasive and diffusion wear mechanisms forms of wear, tool life criteria and Mach inability index, tool wear criterion, measurement of tool wear.

UNIT-VIII

Using plastics as tooling materials: introduction, plastics commonly used as tooling material application of epoxy plastic tools construction methods of plastic tooling metal forming operations with Urethane dies. Calculating forces for urethane pressure pads, economics of tooling.

TEXT BOOKS:

1. 'Tool Design, Donaldson, Leain and Goold, , Tata Me Graw Hill/ Lecain & Goold.

2. Principles of Metal cutting ,A Bhattacharya, , New Central Book Agency, Calcutta

REFERENCES:

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1. Production Engineering Design (Tool Design) , Surendra Kenav and Umesh 'Chandra, Satyaprakashan, New Delhi 1994..

2. Design of cutting Tools. Use of Metal Cutting Theory. ASTME publication Michigan USA, 1969.

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(9A03705) ENTREPRENEURSHIP
(Elective-IV)

UNIT 1: Introduction to Entrepreneurship Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur.

UNIT II : Creating and Starting the Venture, Sources of new Ideas, Methods of generating ideas, creating problem solving, product planning and development process.

UNIT III: The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.

UNIT IV: Financing and Managing the new venture, Sources of capital, venture capital , angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

UNIT V: New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.

UNIT VI: Choosing location and layout, Issues related to Selection of layout.

UNIT VII : Production and Marketing Management Thrust of production management, Selection of production Techniques, plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control.Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing.

UNIT VIII: Global aspects of Enterprenership.
This course replaces the course offered in earlier years as 'Entrepreneurship & Management'

Text Books:

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 5th Edition
2. Dollinger: Entrepreneurship,4/e, Pearson, 2004.

REFERENCES:

1. Vasant Desai: Dynamics of Entrepreneurial Development and management, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Robert J.Calvin: Entrepreneurial Management, TMH, 2004.
4. Gurmeet Naroola: The Entrepreneurial Connection, TMH, 2001.
5. Bolton & Thompson: Entrepeneurs- Talent, Temperament, Technique, Butterworth Heinemann, 2001.
6. Agarwal :Indian Economy, Wishwa Prakashan 2005.
7. Dutt & Sundaram: Indian Economy. S. Chand, 2005.
8. Srivastava: Industrial Relations & Labour Laws, Vikas, 2005.
9. Aruna Kaulgud: Entrepreneurship Management by. Vikas publishing house, 2003.
10. Thomas W. Zimmerer & Norman M. Scarborough: Essential of Entrepreneurship and small business management, PHI, 4/e, 2005.

11. Mary Coulter: Entrepreneurship in Action, PHI, 2/e, 2005.
12. .Kaplan: Patterns of Entrepreneurship, Willey, 2005.
13. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2005.

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B.Tech IV-II Sem (Mechatronics). **T P C**
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(9A14803) MICROCONTROLLER APPLICATIONS
(Elective-IV)

UNIT I

OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES : Architecture of a microcontroller – Microcontroller resources – Resources in advanced and next generation microcontrollers – 8051 microcontroller – Internal and External memories – Counters and Timers – Synchronous serial-cumasynchronous serial communication - Interrupts.

UNIT II

8051 FAMILY MICROCONTROLLERS INSTRUCTION SET : Basic assembly language programming – Data transfer instructions – Data and Bit-manipulation instructions – Arithmetic instructions – Instructions for Logical operations on the tes among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT III

REAL TIME CONTROL : INTERRUPTS : Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.

UNIT IV

REAL TIME CONTROL: TIMERS : Programmable Timers in the MCU's – Free running counter and real time control – Interrupt interval and density constraints.

UNIT V

SYSTEMS DESIGN : DIGITAL AND ANALOG INTERFACING METHODS : Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboard-cum-Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces – Printer interfaces – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces – Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing – Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments – Robotics and Embedded control – Digital Signal Processing and Digital Filters.

UNIT VI

REAL TIME OPERATING SYSTEM FOR MICROCONTROLLERS : Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design – Software development tools for Microcontrollers.

UNIT VII

16-BIT MICROCONTROLLERS : Hardware – Memory map in Intel 80196 family MCU system – IO ports – Progammable Timers and High-speed outputs and input captures – Interrupts – instructions.

UNIT VIII

ARM 32 Bit MCUs : Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set – Development tools.

TEXT BOOKS :

1. Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal, Pearson Education, 2005.
2. The 8051 Microcontroller and Embedded Systems – Mazidi and Mazidi, PHI, 2000.

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REFERENCES :

1. Microcontrollers (Theory & Applications) – A.V. Deshmuk, WTMH, 2005.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.

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(9A04802) DIGITAL IMAGE PROCESSING (Elective-IV)

UNIT-I

DIGITAL IMAGE FUNDAMENTALS:

Image Sensing and Acquisition, Image Sampling & quantization, some basic Relationships between pixels. Mathematical tools used in digital image processing – array Vs matrix operations, linear Vs non linear operations, arithmetic operations, set and logical operations, spatial operations, vector and matrix operations, Probabilistic methods.

UNIT-II

IMAGE TRANSFORMS:

2D-DFT and properties, Walsh Transform, Hadamard Transform, Discrete cosine Transform, Haar-Transform, Slant Transform, KL transform, comparison of different image transforms.

UNIT-III

IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN:

Basic Intensity transformations functions, histogram Processing, fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening spatial filters, Combining spatial enhancement methods.

UNIT-IV

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN:

Basics of filtering in frequency domain, additional characteristics of the frequency domain, correspondence between filtering in the

spatial and frequency domains. Image smoothing using frequency domain filters, image sharpening using frequency domain filters – Gaussian High pass filters, Laplacian in the frequency domain, Homomorphic filtering.

UNIT-V

IMAGE DEGRADATION / RESTORATION:

Noise models, Restoration in the presence of Noise only-spatial filtering, - mean, order- statistic and adaptive filters, Estimating the Degradation function, Inverse filtering, Weiner filtering, Constrained Least squares filtering.

UNIT-VI

IMAGE SEGMENTATION:

Point, line and edge Detection, Thresholding, Region based segmentation, the use of motion in segmentation.

UNIT-VII

IMAGE COMPRESSION:

Need for Image compression, Classification of Redundancy in Images, Image compression models, Classification of image compression schemes, Run length coding, arithmetic coding, Block truncation coding, Dictionary based compression, transform based compression, Image compression standards, Scalar quantization, vector quantization.

UNIT-VIII

COLOR IMAGE PROCESSING:

Color models, pseudo color image processing, color transformations, Smoothing and sharpening, image segmentation based on color.

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TEXT BOOKS:

1. Digital Image Processing-R. C .Gonzalez & R.E. Woods, Addison Wesley/Pearson education, 3rd Edition, 2010.
2. Digital Image processing– S jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill.

REFERENCES:

1. Digital Image processing using MATLAB-Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, Tata McGraw Hill, 2010.
2. Fundamentals of Digital Image processing-A .K. Jain, PHI.