VINAYAKA MISSION'S RESEARCH FOUNDATION

(Deemed to be University)

SALEM, TAMILNADU, INDIA

FACULTY OF ENGINEERING AND TECHNOLOGY

REGULATIONS-2012

CURRICULUM AND SYLLABUS

FROM

I TO VIII SEMESTERS

FOR

B.E.BIO MEDICAL ENGINEERING [REGULAR)

I SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	English for Effective Communication	ENGLISH	2	1	0	3
2	Engineering Mathematics I	MATHS	3	1	0	4
3	Basic Mechanical Engineering & Basic Civil Engineering	MECH/ CIVIL	2	1	0	3
4	Engineering Physics	PHY	2	1	0	3
5	Computer Foundation Program	CSE	2	1	0	3
6	Environmental Science & Engineering	CHE	3	1	0	4
PRACTICAL						
7	Engineering Physics Lab	PHY	0	0	4	2
8	Workshop Practice	MECH	0	0	2	1
9	Computer Foundation Program Lab	CSE	0	0	4	2
TOTAL						25

II SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Business English	ENGLISH	2	1	0	3
2	Engineering Mathematics II	MATHS	3	1	0	4
3	Engineering Chemistry	CHEM	2	1	0	3
4	Basic Electrical Engineering & Basic Electronics Engineering	EEE/ECE	3	1	0	4
5	Circuit Theory	EEE	2	1	0	3
6	Programming in C	CSE	2	1	0	3
PRACTICAL						
7	Engineering Chemistry Lab	CHEM	0	0	4	2
8	Engineering Graphics	MECH	2	0	3	3
9	Basic Electrical & Electronics Engineering Lab	EEE/ECE	0	0	4	2
TOTAL						27

III SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Transforms and Random Processes	MATHS	3	1	0	4
2	Human Anatomy & Physiology	BIOTECH	3	1	0	4
3	Biosensors & Transducers	ECE	3	0	0	3
4	Electronic Devices	ECE	3	0	0	3
5	Digital Electronics	ECE	3	0	0	3
6	Object Oriented Programming	CSE	3	0	0	3
PRACTICAL						
7	Electronic Devices Lab	ECE	0	0	4	2
8	Bio Transducers Lab	ECE	0	0	4	2
9	Digital Electronics Lab	ECE	0	0	4	2
TOTAL						26

IV SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Bio Materials and Artificial Organs	BIOTECH	3	1	0	4
2	Biological Control Systems	ECE	3	0	0	3
3	Signals and Systems	ECE	3	1	0	4
4	Electronic Circuits	ECE	3	0	0	3
5	Pathology and Microbiology	BIOTECH	3	0	0	3
6	Medical Physics	PHY	3	0	0	3
PRACTICAL						
7	Professional Communication and Personality Development	MGMT	0	0	4	2
8	Electronic Circuits Lab	ECE	0	0	4	2
9	Pathology and Microbiology Lab	BIOTECH	0	0	4	2
TOTAL						26

V SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Biomedical Instrumentation	ECE	3	0	0	3
2	Diagnostic and Therapeutic Equipments - I	ECE	3	0	0	3
3	Linear Integrated Circuits	ECE	3	1	0	4
4	Microprocessors and Microcontrollers	ECE	3	0	0	3
5	Digital Signal Processing	ECE	3	1	0	4
6	Elective I		0	0	0	3
PRACTICAL						
7	Biomedical Instrumentation Lab	ECE	0	0	4	2
8	Microprocessors and Microcontrollers Lab	ECE	0	0	4	2
9	Digital Signal Processing Lab	ECE	0	0	4	2
TOTAL						26

VI SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Digital Image Processing	ECE	3	0	0	3
2	Diagnostic and Therapeutic Equipments - II	ECE	3	0	0	3
3	Radiological Equipments	ECE	3	1	0	4
4	Computers in Medicine	ECE	3	0	0	3
5	Data Structures	CSE	3	0	0	3
6	Elective - II		3	0	0	3
PRACTICAL						
7	Digital Image Processing Lab	ECE	0	0	4	2
8	Diagnostic and Therapeutic Equipments Lab	ECE	0	0	4	2
9	Data Structures & OOPS Lab	CSE	0	0	4	2
TOTAL						25

VII SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Hospital Management	ECE	3	0	0	3
2	Biotelemetry	ECE	3	0	0	3
3	Assist Devices	ECE	3	0	0	3
4	Medical Optics	PHY	3	1	0	4
5	Engineering Management and Ethics	MGMT	3	0	0	3
6	Elective - III		3	0	0	3
PRACTICAL						
7	Biosensors and Signal Conditioning Lab	ECE	0	0	4	2
8	Hospital Training	ECE	0	0	4	2
9	Comprehension	ECE	0	0	4	2
TOTAL						25

VIII SEMESTER

S.No.	Course Title	Offering Department	L	T	P	C
THEORY						
1	Elective - IV		3	0	0	3
2	Elective - V		3	0	0	3
3	Elective - VI		3	0	0	3
PRACTICAL						
4	Project Work & Viva Voce	ECE	0	0	12	6
TOTAL						15

ELECTIVES LIST

S.No.	Course Title	Offering Department	L	T	P	C
1	Tissue Engineering	BIOTECH	3	0	0	3
2	Bio Medical Informatics	ECE	3	0	0	3
3	Bio Fluids and Dynamics	ECE	3	0	0	3
4	Biomedical Signal Processing	ECE	3	0	0	3
5	Therapeutic and Surgical Equipments	ECE	3	0	0	3
6	Biomedical Robotics and Automation	ECE	3	0	0	3
7	Medical Imaging Techniques	ECE	3	0	0	3
8	Advanced Biomaterials	ECE	3	0	0	3
9	Quality Control in Medical Engineering	ECE	3	0	0	3
10	Advanced Digital Signal Processing	ECE	3	0	0	3
11	Nano Technology in Medicine	ECE	3	0	0	3
12	MEMS	ECE	3	0	0	3
13	Biometric Systems	ECE	3	0	0	3
14	Genetic Engineering and its Application	BIOTECH	3	0	0	3
15	Artificial Intelligence & Pattern Recognition	ECE	3	0	0	3
16	Bio Mechanics	ECE	3	0	0	3
17	Physiological Modeling	ECE	3	0	0	3
18	Nano Electronics	ECE	3	0	0	3
19	VLSI Design Techniques	ECE	3	0	0	3
20	Computer Hardware, Interfacing & Instrumentation	CSE	3	0	0	3
21	Rapid Prototyping	ECE	3	0	0	3
22	Entrepreneurial skills development for engineers	MECH	3	0	0	3
23	Information Security	CSE	3	0	0	3
INDUSTRIAL ELECTIVIES						
24	Learning IT Essentials by Doing	INFOSYS	3	0	0	3
25	Business Intelligence	INFOSYS	3	0	0	3

SEMESTER I

	ENGLISH FOR EFFECTIVE COMMUNICATION	L	T	P	C
		2	1	0	3

(COMMON TO ALL BRANCHES)

AIM

- To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

OUTCOMES:

Learners should be able to:

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents. Excel in academic and professional writing.

UNIT – I **9**

Word formation with prefixes and suffixes, Antonyms & Synonyms-Tense Forms - Different kinds of Nouns and Pronouns - Use of Verbs and Adverbs – Adjectives - Sentence Pattern (SVOCA) - Conditional Sentences - Auxiliary and Modal verbs – Articles.

UNIT – II **9**

Phonetics (Vowels, Consonants and Diphthongs) - Pronunciation Guidelines - Vocabulary (Homophones).

UNIT – III **9**

Principles of Communication - Defining and Describing Objects - Listening for Information and Making Inferences - Understanding Ideas and Making Inferences.

UNIT – IV **9**

How to write reports, report writing – Recommendations - Discussing data and coming to conclusions - Rearranging the jumbled sentences.

UNIT – V **9**

Skimming - Scanning – Flowcharts - Pie-charts - Formal and Informal letters - Resume Writing.

Total: 45 hours

TEXT BOOK

1. **English for Effective Communication,** Departments of English, VMKV & AVIT. Erode: SCM Publishers, 2009.

REFERENCE BOOKS

1. M.Ashraf Rizvi, **Effective Technical Communication.** New Delhi: Tata McGraw Hill Publications, 2007.

2. Pickett and Laster. **Technical English: Writing, Reading and Speaking.** New York: Harper and Row Publications, 2002.

3. Cutts, Martin. **The Plain English Guide – How to Write Clearly and Communicate Better.** New Delhi: Oxford University Press, 1995.

4. Narayanaswami.V.R. **Strengthen Your Writing.** Chennai: Orient Longman Ltd., 1996.

5. Prof.K.R.Lakshmi Narayanan & Dr.T.Murugavel, **Communication Skills for Engineers,** Chennai: SCI Publications, 2002.

SEMESTER I

	ENGINEERING MATHEMATICS – I	L	T	P	C
		3	1	0	4

(Common to MECH, ECE, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHTRONICS, AERONAUCTICAL, ETC & AUTOMOBILE)

AIM:

- To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/ she will be familiar with limitations of using infinite series 12 approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

OUTCOMES:

Learners should be able to:

- Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
- Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
- Read different genres of texts adopting various reading strategies.
- Listen/view and comprehend different spoken discourses/excerpts in different accents.

UNIT I - MATRICES **9**

Characteristic equation – Eigen values and eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors (Without proof) – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form.

UNIT II - DIFFERENTIAL CALCULUS **9**

Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature – Evolute

UNIT III - FUNCTIONS OF SEVERAL VARIABLES **9**

Partial Derivatives – Total Differential - Maxima and Minima – constrained Maxima and Minima by Lagrangian Multiplier Method.

UNIT IV - LAPLACE TRANSFORMS **9**

Laplace transform – transform of elementary functions – basic properties – derivatives and integrals of transforms – transforms of derivatives and integrals – initial and final value theorems – Transform of periodic functions.

UNIT V - APPLICATIONS OF LAPLACE TRANSFORMS **9**

Inverse Laplace transform – Convolution theorem – Initial and Final value theorem-Solution of linear ODE of second order with constant coefficients and first order simultaneous equation with constant coefficients using Laplace transforms.

Total Hours: 60
Lecture Hours: 45
Tutorial Hours: 15

TEXT BOOKS

1. **"**Engineering Mathematics**"** by Department of Mathematics, VMU
2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.
3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers, Delhi 2001.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics",
4. Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001.

SEMESTER I

	BASIC MECHANICAL ENGINEERING & BASIC CIVIL ENGINEERING	L	T	P	C
		3	0	0	3

(COMMON TO ECE, EIE, EEE, ETC, CSE, IT, CSSE, MECT& BME)

AIM

- To get exposed to the glimpses of Mechanical Engineering and Civil Engineering topics that is essential for an Engineer.

OBJECTIVES

- The motive is to impart basic knowledge on Civil and Mechanical Engineering.
- We Aim to explain the materials used for the construction of civilized structures.
- To make the students understand the fundamentals of construction of structure.
- Has to explain the component of power plant units and detailed explanation to IC engines their working principles.

OUTCOMES

- The main ability is to explain the usage of construction material and proper selection of construction materials.
- To create an ability to design building structures.
- Aim to identify the components use in power plant cycle.
- Ability to demonstrate working principles of petrol and diesel engine.
- Knowledge to explain the components of refrigeration and Air conditioning cycle.

a) CIVIL ENGINEERING

UNIT-I: SURVEYING AND CIVIL ENGINEERING MATERIALS 8

Surveying: Objects – types – classification – principles – measurements of distances – angles – Leveling – determination of areas – illustrative examples.
Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

UNIT-II: BUILDING COMPONENTS AND STRUCTURES 8

Foundations: Types, Bearing capacity – Requirement of good foundations.
Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering –
Types of Bridges and Dams – Basics of Interior Design and Landscaping.

UNIT-III: BASICS OF ENGINEERING MECHANICS 7

Mechanics – Internal and external forces – stress – strain – elasticity – Centroid – Centre of Gravity – Simple problems - Moment of Inertia – Simple Problems.

b) MECHANICAL ENGINEERING

UNIT-IV: POWER PLANT ENGINEERING **8**

] Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydroelectric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT-V: IC ENGINES **8**

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT-VI : REFRIGERATION AND AIR CONDITIONING SYSTEM **7**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL HOURS: 46

REFERENCES:

1. Shanmugam G and Palanichamy M S, “Basic Civil and MechanicalEngineering”, Tata McGraw Hill Publishing Co., New Delhi, (1996).

2. Ramamrutham. S, “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).

3. Seetharaman S. “Basic Civil Engineering”, Anuradha Agencies, (2005).

4. Venugopal K and Prahu Raja V, “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).

5. Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, (2000).

SEMESTER I

	ENGINEERING PHYSICS	L	T	P	C
		2	1	0	3

(COMMON TO ALL BRANCHES)

AIM

- To familiarize students with the basic concepts of Physics and their application in Engineering & Technology

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

OUTCOMES:

- The students will have knowledge on the basics of physics related to properties of matter, Optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

UNIT – I LASERS **9**

Einstein coefficients (A&B), Nd – YAG laser, CO2 laser, semiconductor laser (homojunction) – uses of lasers – Holography – construction and reconstruction of a hologram.

UNIT – II FIBRE OPTICS **9**

Principle and propagation of light in optical fibres – numerical aperture and acceptance angle – types of optical
fibres (material, refractive index, mode) – Applications: Fibre optic communication system (block diagram only) – fibre optic sensors (displacement sensor and pressure sensor).

UNIT – III CRYSTAL PHYSICS **9**

Lattice – unit cell – Bravais lattice – Lattice planes – Miller indices – „d‟ spacing in cubic lattice – calculation of number of atoms per unit cell – atomic radius – coordination number – packing factor for SC, BCC, FCC, HCP structures.

UNIT – IV ACOUSTICS **9**

Classification of sound – characteristics of musical sound – loudness – Weber-Fechner law – decibel – absorption coefficient – experimental determination – reverberation – reverberation time – Sabine‟s formula (no derivation) – factors affecting acoustics of buildings (reverberation time, loudness, focusing, echo, echolen effect, resonance and noise) and their remedies.

UNIT- V NON – DESTRUCTIVE TESTING **9**

Liquid penetrant method – ultrasonic flaw detection – ultrasonic flaw detector (block diagram) – X-ray Radiography: displacement method – X-ray Fluoroscopy – merits and demerits of each method.

Total Hours: 45

TEXT BOOK

1. Gaur R. K. and Gupta S. L., “Engineering Physics”, Dhanpat Rai publishers, New Delhi, 2001.
2. Rajendran. V, “Engineering Physics”, Tata Mc Graw Hill Publication and Co New Delhi, 2009.

REFERENCE BOOKS

1. Pillai S.O “Solid State Physics”, New Age International Publication, New Delhi, (2003).
2. Palanisamy P.K. “Physics for Engineers”, SciTech publications (India) Pvt. Ltd., Chennai (2005).
3. Rajendran V and Marikani “Physics for Engineers”, Tata McGraw Hill Publishing Company Ltd, New Delhi (2004).
4. Arumugam M, “Engineering Physics”, Anuradha Agencies, Kumbakonam, Second Edition (2005).

SEMESTER I

	COMPUTER FOUNDATION PROGRAM	L	T	P	C
		2	1	0	3

(COMMON TO ALL BRANCHES)

AIM

- To provide an awareness to the basics of computer and information technology.

OBJECTIVES:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

OUTCOMES:

- Design C Programs for problems.
- Write and execute C programs for simple applications

UNIT I - Basics of Computer and Information Technology **9**

Digital computer fundamentals-Block diagram of a computer-component of a computer system Hardware and software definitions-Categories of software-Booting-Installing and Uninstalling Software-Software piracy-Software terminologies-Application of Computer-Role of Information Technology-History of Internet-Internet Services.

UNIT II - Problem Solving Methodologies and Techniques **9**

Problems solving Techniques-Program development cycle-Algorithm-Design-Flow chart-Program control structures-Types and generation of programming languages-Development of algorithms for simple problems. Top down and Bottom up approaches of software development.

UNIT III - Basics of Computer Architecture and System Software **9**

Fundamentals of Computer Architecture-Introduction-Organization of a small computer Central Processing Unit-Execution cycle-Instruction categories – measure of CPU performance Memory-Input/output devices-BUS-addressing modes.

System Software-Assemblers-Loaders and linkers-Compilers and interpreters.

UNIT IV - Basics of Operating System and DBMS **9**

Introduction-Basics of memory management schemes-Scheduling-threads.

Introduction to File and Database systems- SQL-DDL statements-DML statements-DCL statements.

UNIT V - Software Applications **9**

Office Automation: Application Packages-word processing-Spread sheet Application and Basics of HTML.

Total: 45 hours

REFERENCES

1. Ashok N.Kamthane, programming with ANSI and TURBO C, Pearson Education (India) 2005.
2. V.Ramesh babu, fundamental of computing, VRB publisher, 2004.

3. Carl Hamacher, Zvonko Varnesie and Safwat Zaky, 5th Edition “Computer Organization”, McGraw-Hill, 2002.
4. Leland L.Beck, “System Software- An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2000.
5. Abraham Silberschatz, Peter Baer Galvin and Greg Gange, “Operating System Concepts”, Sixth Edition, John Wiley & Sons Pvt. Ltd,2003.
6. Abraham Silberschatz, Henry F.Korth and S.Sudarshan – “Database Systems Concepts”, Fourth Edition, McGraw-Hill, 2002.

SEMESTER I

	ENVIRONMENTAL SCIENCE & ENGINEERING	L	T	P	C
		3	1	0	4

(COMMON TO ALL BRANCHES)

AIM

- To provides a comprehensive knowledge in environmental science, environmental issues and the management.

OBJECTIVES:

- To the study of nature and the facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution
- control and waste management.

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions

Development and improvement in std. of living has lead to serious environmental disasters

UNIT – I - ENVIRONMENT AND NATURAL RESOURCES 9

Environment – Definition , scope & importance – Public awareness – Forest resources , mineral resources , water resources, food resources , energy resources (uses, over -exploitation & adverse effects in each case) – Scope & role
of environmental engineers in conservation of natural resources – Sustainability development.

UNIT – II - ECOSYSTEMS AND BIO – DIVERSITY 9

Ecosystem – Definition, structure and function – Energy flow – Ecological succession – food chain, food web, ecological pyramids – Introduction, types, characteristics, structure and function of forest, grassland, desert and Aquatic ecosystems - Bio – Diversity : values and uses, hotspots, threats and conservation.

UNIT – III - ENVIRONMENTAL POLLUTION 9

Pollution – Definition , man made impacts and control measures of air, water and land pollution – Water quality standards & characterization – Importance of sanitation -Nuclear hazards – Hazardous waste management : Solid waste, waste water and biomedical waste – Prevention of pollution and role of individual – Disasters management : Floods, earthquake, cyclone and land slides – Clean technology options.

UNIT – IV - SOCIAL ISSUES AND ENVIRONMENT **9**

Urban problems related to energy – Water conservation – Resettlement and rehabilitation of people – Environmental ethics – Climate change – Global warming – Acid rain – Ozone depletion- Waste land reclamation , Environment Protection Act for air, water , wild life and forests - Pollution Control Board.

UNIT – V - HUMAN POPULATION AND ENVIRONMENT **9**

Population growth – Population explosion – Family welfare programme – Environment & human health – Human rights – Value education – Women and child welfare, Role of information technology in environment and human health.

Total Hours: 45

TEXT BOOKS :

1. Environmental Science and Engineering by Dr. J. Meenambal , MJP Publication , Chennai Gilbert M. Masters : Introduction to Environmental Engineering and Science , Pearson Education Pvt Ltd., II Edition, ISBN 81-297-0277-0, 2004

2. Miller T.G. Jr Environmental Science Wadsworth Publishing Co.

3. Townsend C. Harper J. and Michael Begon, Essentials of Ecology, Blackwell Science.

REFERENCES :

1. Wager K.D. “Environmental Management”, W.B. Saunders Co. Philadelphia, USA, 1998.

2. Bharucha Erach “The Biodiversity of India” Mapin Publishing Pvt Ltd, Ahmedabad, India

3. Trivedi R.K. “ Handbook of Environmental Laws”, Rules, Guidelines, Compliances and Standards Vol I & II, Enviro media.

SEMESTER I

	ENGINEERING PHYSICS LAB	L	T	P	C
		0	0	4	2

(Common to all Branches)

AIM

- To understand the experiments through online virtual demonstration followed by real hands-on experience

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

OUTCOMES:

- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

List of Experiments

1. Young's modulus of a bar - Non-uniform bending
2. Rigidity modulus of a wire - Torsional Pendulum
3. Viscosity of a liquid - Poiseuille's method
4. Velocity of ultrasonic waves in liquids - Ultrasonic Interferometer
5. Particle size determination using Laser
6. Wavelength of spectral lines – grating - Spectrometer
7. Thickness of a wire - Air wedge Method
8. Thermal conductivity of a bad conductor - Lee's disc
9. Band gap determination of a thermistor - Post Office Box
10. Specific resistance of a wire – Potentiometer

SEMESTER I

	WORKSHOP PRACTICE	L	T	P	C
		0	0	2	1

(Common to MECH, ECE, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHTRONICS, AERONAUCTICAL, ETC & AUTOMOBILE)

AIM

- To provide the students with hands on experience on different trades of engineering like fitting, carpentry, smithy, welding and sheet metal.

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

OUTCOMES:

- Ability to fabricate carpentry components and pipe connections including plumbing works.
- Ability to use welding equipments to join the structures
- Ability to fabricate electrical and electronics circuits

FITTING

1. Vee Joint
2. Square Joint
3. Dove Tail Joint

CARPENTRY

1. Planning
2. Half lab
3. Dove Tail Joint

WELDING

1. Arc Welding of butt Joint.
2 Arc Welding of Lap Joint

DEMONSTRATION

1. Sheet Metal – Fabrication of tray and cone
2. Black Smithy – Round to square rod.
3. Foundry – Mould Preparation using single piece and split pattern

REFERENCE

1. “Basic Workshop Practice “, Department of Mechanical Engineering, VMKV Engineering College, 2008

SEMESTER I

	COMPUTER FOUNDATION PROGRAM LAB	L	T	P	C
		0	0	4	2

(Common to all Branches)

AIM

- To provide an awareness to office automation, SQL Queries and HTML.

OUTCOMES

- At the end of the course, the student should be able to:
- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

I. OFFICE AUTOMATION

1. Create a document with all formatting effects.
2. Create a document to send mails using mail merge option.
3. Create an Excel File to analyze the student‟s performance. Create a chart for the above data to depict it diagrammatically.
4. Create Excel sheet to maintain employee information and use this data to send mails using mail merge.
5. Create a Power Point presentation for your personal profile with varying animation effects with timer.

II. SQL QUERIES

1. Write SQL Commands for Data Definition, Table Creation with constraints.
2. Write SQL Commands for Insert, Select, Update and Delete operations.
3. Write SQL Commands for aggregate functions.

III. HTML

1. Write HTML code to develop a web page having the background in red and title “My First Page” in any other color.
2. Design a page having background color given text color red and using all the attributes of font tab.
3. Create a web page, when user clicks on the link it should go to the bottom of the page.
4. Create a web page, showing an ordered & unordered list of name of your five friends.
5. Create a web page with appropriate content and insert an image towards the left hand side of the page when user clicks on the image. It should open another web page.
6. Create a web page which should contain a table having two rows and two columns.

SEMESTER II

	BUSINESS ENGLISH	L	T	P	C
		2	1	0	3

(Common to all Branches)

AIM

- To help students achieve proficiency in English and develop their professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

OBJECTIVES:

- To make learners acquire listening and speaking skills in both formal and informal contexts.
- To help them develop their reading skills by familiarizing them with different types of reading strategies.
- To equip them with writing skills needed for academic as well as workplace contexts.
- To make them acquire language skills at their own pace by using e-materials and language lab components.

OUTCOMES:

Students should be able to

- Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
- Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.

UNIT – I **9**

Subject and Verb Agreement (Concord) - Active and Passive Voice, Impersonal Passive Voice – Preposition - Common Errors - Direct Speech and Indirect Speech - Cause and Effect - Phrasal Verbs and Idioms and Phrases - Question Tags – Vocabulary.

UNIT – II **9**

Stress (Word Stress and Sentence Stress) – Intonation - Differences in British and American English – Indianism.

UNIT – III **9**

Role Play - Telephonic Etiquettes - Interview Questions (Direct, Open-ended and Closed Questions) - E-mail Netiquette, Sample E-mails.

UNIT – IV **9**

Instruction - Check-list - Minutes of the Meeting and Writing Agenda - Note making.

UNIT – V **9**

Reading Comprehension - Interpreting Tables - Bar charts - Business Letters (Calling for Quotation, Placing Orders and Complaint Letters) - Essay Writing and Developing Hints.

Total: 45 hours

TEXT BOOK

1. **English for Effective Communication,** Departments of English, VMKV & AVIT. Erode: SCM Publishers, 2009.

REFERENCE BOOKS

1. M.Ashraf Rizvi, **Effective Technical Communication.** New Delhi: Tata McGraw Hill Publications, 2007.

2. Pickett and Laster. **Technical English: Writing, Reading and Speaking.** New York: Harper and Row Publications, 2002.

3. Cutts, Martin. **The Plain English Guide – How to Write Clearly and Communicate Better.** New Delhi: Oxford University Press, 1995.

4. Narayanaswami.V.R. **Strengthen Your Writing.** Chennai: Orient Longman Ltd., 1996.

5. Prof.K.R.Lakshmi Narayanan & Dr.T.Murugavel, **Communication Skills for Engineers,** Chennai: SCI Publications, 2002.

SEMESTER II

	ENGINEERING MATHEMATICS – II	L	T	P	C
		3	1	0	4

(Common to MECH, ECE, CSE, CSSE, EEE, EIE, CIVIL, IT, MECHTRONICS, AERONAUCTICAL, ETC & AUTOMOBILE)

AIM:

- To provide students with mathematical knowledge and skills needed to support their concurrent and subsequent engineering and science studies

OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

OUTCOMES:

- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions.
- Students will be able to solve problems related to engineering applications by using these techniques.

UNIT I - ORDINARY DIFFERENTIAL EQUATIONS **9**

Solutions of third and higher order linear ordinary differential equation with constant coefficients – Method of variation of parameters – Cauchy‟s and Legendre‟s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II - MULTIPLE INTEGRALS **9**

Double integration –change of order of integration- Cartesian and polar coordinates –Area as a double integral – Triple integration – volume as a triple integral.

UNIT III - VECTOR CALCULUS **9**

Directional derivatives – Gradient, Divergence and Curl – Irrotational and solenoidal- vector fields – vector integration – Green‟s theorem, Gauss divergence theorem and Stoke‟s theorem (excluding proof).

UNIT IV - ANALYTIC FUNCTIONS **9**

Function of a complex variable – Analytic function – Necessary conditions - Cauchy Riemann equations – Sufficient conditions (excluding proof) – Harmonic conjugate–Constructions of analytic functions-conformal mapping(w=z+c,w=z2,w=1/z)-bilinear transformation

UNIT V - COMPLEX ANALYSIS **9**

Statement and application of Cauchy‟s integral theorem and integral formula – Taylor‟s and Laurent‟s expansions –Residues – Cauchy‟s residue theorem-contour integration over unit circle.

Total hours: 60
Lecture Hours: 45
Tutorial Hours: 15

TEXT BOOKS

1. **"**Engineering Mathematics**"** by Department of Mathematics, VMU
2. Veerarajan, T., "Engineering Mathematics", Tata McGraw Hill Publishing Co., NewDelhi, 2006.
3. Dr.A .Singaravelu , Engineering Mathematics Volume I & Volume II by Meenakshi Publications.

REFERENCE BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics" (36th Edition), Khanna Publishers,Delhi 2001.
2. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2001.
3. Kandasamy .P., Thilagavathy. K., and Gunavathy. K., "Engineering Mathematics",Volumes I & II (4th edition), S.Chand & Co., New Delhi., 2001

SEMESTER II

	ENGINEERING CHEMISTRY	L	T	P	C
		2	1	0	3

(Common to all Branches)

AIM

- To impart basic principles of chemistry for engineers.

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosiion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

UNIT I - WATER TECHNOLOGY & CORROSION 9

Sources of water – impurities – Hardness and its determination (problems to be avoided) – boiler troubles – water softening (zeolite & Demineralisation) – Domestic water treatment – Desalination (Electrodialysis & Reverse Osmosis).

Corrosion – Types – principles – corrosion control methods (Sacrificial and Impressed current method).

UNIT II - ELECTROCHEMISTRY, BATTERIES AND FUEL CELLS 9

Ostwald Law and Debye Huckle‟s law - Cells – Electrode (SHE, Calomel and Glass) - Electrode potential – Nernst equation – EMF series.

Primary cells – secondary batteries – charging and discharging.

UNIT III - CHEMISTRY OF ADVANCED MATERIALS 9

Portland cement –setting and hardening – RCC – Special cements.

Organic electronic material, solid oxide materials, shape memory alloys, nanomaterials, polymers, fullerenes, ceramics, fibers, lubricants, refractories & composites (definition, classification and applications)

UNIT IV - PHASE EQUILIBRIA & NUCLEAR CHEMISTRY 9

Phase rule: statement and explanation of terms involved – One component system – Condensed phase rule – Two component system.

Nuclear Chemistry – Fission – Fusion – working of nuclear reactor – Radiations and harmful effects.

UNIT V - CHROMATOGRAPHY AND SPECTROSCOPY 9

Chromatography –– classification & principles (Paper, column, thin layer, gas, HPLC).

Spectroscopy – Electromagnetic radiation – Beer Lambert‟s law – UV – Visible – IR (Principle and Instrumentation, block diagram) – Atomic absorption spectroscopy.

Total: 45 hours

REFERENCES:

1. Engineering Chemistry by S.S. Dara
2. Engineering Chemistry by Jain & Jain.

SEMESTER II

	BASIC ELECTRICAL ENGINEERING & BASIC ELECTRONICS ENGINEERING	L	T	P	C
		3	1	0	4

(Common to ECE,ETCE,MECHT,BME,BT,BF,EEE,EIE,CSE,IT,CSSE AND CIVIL)

AIM

- To provide comprehensive idea about circuit analysis, working principles of machines and common measuring instruments**.**

OBJECTIVES:

- Be exposed to basic electronic devices
- Be familiar with the theory, construction, and operation of Basic electronic devices.

OUTCOMES: At the end of the course, the student should be able to:

- Explain the theory, construction, and operation of basic electronic devices.
- Use the basic electronic devices

a) ELECTRICAL ENGINEERING

UNIT I **8**

Electrical Circuits & Meters

Definition of electromotive force, current, power and energy-International System of units-Ohm‟s law and Kirchhoff‟s laws-solution of series and parallel Circuits.

Generation of alternating voltage-average and RMS values-solution of simple R,RL,RC and RLC circuits-Calculation of power and power factor in AC circuits.

Construction and principles of operation of moving coil, moving iron and dynamometer instruments.

UNIT II **8**

DC Machines (Qualitative Treatment Only)

Dc machines –parts-DC generator-EMF equation-Different types of DC generators and their applications-DC motors and their applications-different types -speed control-Starters.

UNIT III **7**

AC Machines (Qualitative Treatment Only)

Construction & principle of operation of transformers-Single phase & Three phase transformers-Construction and operation of AC motors-Single phase and three phase Induction motors-applications-construction, principles of operation and application of synchronous motors.

b) ELECTRONICS ENGINEERING

UNIT I: SEMICONDUCTOR DEVICES AND APPLICATIONS **8**

Passive and Active Components – Resistors, Inductors, Capacitors, Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configuration and Characteristics.

UNIT II: FUNDAMENTALS OF COMMUNICATION ENGINEERING **8**

Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude Modulation, Angle Modulation, Pulse Amplitude Modulation, Pulse Width Modulation and Pulse Code Modulation

Communication Systems: Radio, High DefinitionTV, MODEM, Fax, Microwave, Radar, Satellite and Optical Fibre, Mobile-Cellphones (block diagram description only).

UNIT III : STUDY OF ADVANCED ELECTRONIC GADGETS 7

High Definition Camera,High Definition Video Camera,Tablet PC,Android Phones,i pods,Video Game Consoles

Total Hours: 46

TEXT BOOKS

1. "Basic Electrical and Electronics Engineering", compiled by Department of EEE&ECE faculty of Engineering & technology, VMRFDU, Anuradha Agencies, 2006.

2. Edward Hughes, "Electrical and Electronics Technology", Pearson Education Limited, Ninth edition,2005.

3. "Basic Electrical and Electronics Engineering", Compiled by Department of EEE & ECE, Faculty of Engineering and Technology, VMRFDU, Anuradha agencies,2006.

REFERENCES

1. B.R. Guptha, "Principles of Electrical Engineering " ,S.Chand & Co,2002.
2. I.J.Nagrath, "Elements of Electrical Engineering", Tata McGraw Hill Publishing Co., 2002.
3. H.Cotton." Advanced Electrical Technology", Wheeler, 1983.
4. Anokh Singh, Principles of Communication Engineering, S.Chand & Co, 1994.
5. John Kennedy "Electronics Communication System" Tata McGraw Hill.
6. Millman and Halkias, "Electronic Devices and Circuits", Tata McGraw hill.
7. V.K.Mehta,"Principles of Electronics"S.Chand&Co,2002
8. http://en.wikipedia.org/wiki/cell-phone
9. http://en.wikipedia.org/wiki/high-definition-video
10. http://en.wikipedia.org/wiki/tablet-components
11. http://en.wikipedia.org/wiki/cell-phone
12. http://en.wikipedia.org/wiki/android-operating -system
13. http://www.apple.com/pad/
14. http://en.wikipedia.org/wiki/ipad
15. http://en.wikipedia.org/wiki/video-game-console

SEMESTER II

	CIRCUIT THEORY	L	T	P	C
		2	1	0	3

(Common to ECE, ETCE, BME and MECHTRONICS)

AIM

- To introduce electric *circuits* and its analysis and impart knowledge on solving *circuits* using network theorems

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To Phasor diagrams and analysis of three phase circuits

OUTCOMES:

- Ability analyze electrical circuits
- Ability to apply circuit theorems
- Ability to analyze AC and DC Circuits

UNIT I - BASIC CIRCUIT ANALYSIS **9**

Ohm‟s law, Kirchoff‟s laws. DC and AC circuits. Resistors in series and parallel circuits. Mesh current and node voltage method of analysis for DC and AC circuits (AC circuits at elementary level only)

UNIT II - NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS **9**

Network reduction : Voltage and current division-Source Transformation-Star, delta conversion, Thevenin‟s Theorem and Norton‟s Theorem-Superposition Theorem-Maximum power transfer Theorem.

UNIT III - RESONANCE AND COUPLED CIRCUITS **9**

Series and Parallel resonance- their frequency response - Quality factor and Bandwidth - Self and Mutual inductance- Co-efficient of coupling- Tuned circuits- Single Tuned circuits and double Tuned circuits.

UNIT IV - TRANSIENT RESPONSE OF DC AND AC CIRCUITS. **9**

Transient response of RL, RC, and RLC circuits using Laplace Transform for DC input and AC sinusoidal inputs only.

UNIT V - ANALYSIS OF THREE PHASE CIRCUITS **9**

Three phase balanced and unbalanced voltage sources- Analysis of three phase 3 wire and 4 wire circuits with star and delta connected loads- balanced and unbalanced phasor diagram of voltages and currents - Power and power factor measurements in three phase circuits.

Total: 45 hours

TEXT BOOKS:

1. Electric Circuit Analysis, Sudhakar.A and Shyam Mohan.SP, 2nd Edition,2009, Tata Mc-Graw Hill Publications, New Delhi.

2. Engineering Circuit Analysis, Gnanavadivel.J, Senthilkumar.C and Maruthupandi.P, 2nd Edition, 2010, Anuradha Publications, Kumbakonam.

REFERENCES:

1. Engineering Circuit Analysis, W.H.Hayt & J.K.Kemmerly and Steven M.Durbin, 7th Edition, 2007, Tata Mc-Graw Hill Publications, New Delhi.

2. Circuit Theory, A.Chakabarthi, 5th Edition, 2006, Dhanpatrai & Co, New Delhi.

SEMESTER II

	PROGRAMMING IN C	L	T	P	C
		2	1	0	3

(Common to all Branches)

AIM

- To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES:

The students should be made to:

- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

OUTCOMES:

At the end of the course, the student should be able to:

- Design C Programs for problems.
- Write and execute C programs for simple applications

UNIT I **9**

Introduction: Algorithms & flowcharts-Overview of C-Features of C-IDE of C Structure of C program-Compilation & execution of C program-Identifiers, variables, expression, keywords, data types, constants, scope and life of variables, local and global variables. Operators: arithmetic, logical, relational, conditional and bitwise operators- Special operators: size of () & comma (,) operator-Precedence and associativity of operators & Type conversion in expressions.

Basic input/output and library functions: Single character input/output i.e. getch(), getchar(), getche() & putchar()-Formatted input/output: printf() and scanf()-Library Functions: concepts, mathematical and character functions.

UNIT II **9**

Control structures: Conditional control-Loop control and Unconditional control structures.

Functions: The Need of a function-User defined and library function- Prototype of a function-Calling of a function-Function argument-Passing arguments to function- Return values-Nesting of function- main()-Command line arguments and recursion. Storage class specifier – auto, extern, static, & register.

UNIT III **9**

Arrays: Single and multidimensional arrays-Array declaration and initialization of arrays-Array as function arguments.

Strings: Declaration-Initialization and string handling functions.

Structure and Union: Defining structure-Declaration of structure variable-Accessing structure members-Nested structures-Array of structures-Structure assignment-Structure as function argument-Function that returns structure- Union.

UNIT IV **9**

Pointers: The „&‟ and * operators-Pointers expressions-Pointers vs arrays-Pointer to functions-Function returning pointers-Static and dynamic memory allocation in C.

DMA functions: malloc(), calloc(), sizeof(), free() and realloc()-Preprocessor directives.

UNIT V **9**

File management: Defining, opening & closing a file, text file and binary file- Functions for file handling: fopen,fclose, gets, puts, fprintf, fscan, getw, putw, fputs, fgets, fread, fwrite-Random access to files: fseek, ftell, rewind-File name as Command Line Argument.

Total Houra: 45

TEXT BOOKS :

1. Balaguruswami.E, „Programming in C‟, TMH Publications,1997

REFERENCE BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg, “Computer Science A Structured Programming using C”, Cengage Learning, 3rd Edition, 2007
2. Gottfried , „Programming with C‟, schaums outline series, TMH publications,1997
3. Mahapatra , „Thinking in C‟, PHI publications, 2nd Edition, 1998.
4. Stevens , „Graphics programming in C‟, BPB publication, 2006
5. Subbura.R , „Programming in C‟, Vikas publishing, 1st Edition,

SEMESTER II

	ENGINEERING CHEMISTRY LAB	L	T	P	C
		0	0	4	2

(Common to all Branches)

AIM

- To Impart hands-on training to the students on various methods in chemistry

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters

1. Estimation of total hardness of water sample by EDTA method.
2. Determination of alkalinity by indicator method.
3. Estimation of ferrous ion by Potentiometry.
4. Titration of strong acid with strong base by Conductometry.
5. Acid base reaction by pH metry.
6. Estimation of copper from its ore.
7. Estimation of iron by spectrophotometer.
8. Estimation of sodium by flame photometer.

SEMESTER II

	ENGINEERING GRAPHICS	L	T	P	C
		0	0	4	3

(Common to MECH, AUTOMOBILE, AERONAUTICAL, ECE, EIE, EEE, ETC& MECT)

AIM

- To develop graphical skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings.

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

OUTCOMES:

On Completion of the course the student will be able to:

- Perform free hand sketching of basic geometrical constructions and multiple views of objects.
- Do orthographic projection of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Prepare isometric and perspective sections of simple solids.
- Demonstrate computer aided drafting

UNIT I - PLANE CURVES AND FREE HAND SKETCHING 9

Curves used in engineering practices:

Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of squad and circle – Drawing of tangents and normal to the above curves.

UNIT II - PROJECTION OF POINTS, LINES AND PLANE SURFACES 9

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III - PROJECTION OF SOLIDS 9

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV - SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

UNIT V - ISOMETRIC AND PERSPECTIVE PROJECTIONS 9

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL HOURS: 45

TEXT BOOKS:

1. N.D. Bhatt, “Engineering Drawing” Charotar Publishing House, 46th Edition, (2003).

REFERENCES BOOKS

1. K. V. Natrajan, “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai (2006).
2. M.S. Kumar, “Engineering Graphics”, D.D. Publications, (2007).
3. K. Venugopal & V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Limited (2008).
4. M.B. Shah and B.C. Rana, “Engineering Drawing”, Pearson Education (2005).
5. K. R. Gopalakrishnana, “Engineering Drawing” (Vol.I&II), Subhas Publications (1998).
6. Dhananjay A.Jolhe, “Engineering Drawing with an introduction to AutoCAD”Tata McGraw Hill Publishing Company Limited (2008).
7. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, (2008).

SEMESTER II

	BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB	L	T	P	C
		0	0	4	2

(Common to ECE,ETCE,MECHT,BME,BT,BF,EEE,EIE,CSE,IT,CSSE AND CIVIL)

AIM

- To Impart hands-on training to the students on various electrical and electronics circuits.

OBJECTIVES:

- Be exposed to the characteristics of basic electronic devices
- Be exposed to RL and RC circuits
- Be familiar with Thevinin & Norton theorem KVL & KCL, and Super Position Theorems

OUTCOMES:

At the end of the course, the student should be able to:

- Analyze the characteristics of basic electronic devices
- Design RL and RC circuits
- Apply KVL, KCL, Thevinin, Norton and Super Position Theorems for circuit analysis

a) ELECTRICAL ENGINEERING LAB

LIST OF EXPERIMENTS

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

B) ELECTRONICS ENGINEERING LAB

1. Familiarization with Electronic Components like R, L, C and active devices.
2. Familiarization with Bread board, CRO, Power supply (RPS, FPS) and Soldering Practice.
3. Generation of lissajous patterns using CRO.
4. Measurement of amplitude and time period using CRO.
5. Study of the Characteristic of PN-Junction diode with its applications.
6. Study of the Characteristic of Zener diode with its applications
7. Study of the rectifier circuits (Half wave and Full Wave) with its applications.
8. Study of BJT Characteristics with its applications.
9. Study of AM/FM Receiver.
10. Study of advanced electronic gadgets.

SEMESTER III

	TRANSFORMS AND RANDOM PROCESSES	L	T	P	C
		3	1	0	4

AIM

- To provide the students, a basic understanding of the transforms random processes and basic statistics.

OBJECTIVES

- Transforms and Random Processes are used in the Electronic Devices.
- Fourier analysis is used in almost every aspect of the subject ranging from solving linear differential equations to developing computer models, to the processing and analysis of data.
- An application in the Health Sciences describes a number of new discrete distributions that arise in the statistical examination of real examples.
- Probability Theory is useful in investigating the important feature of Random Experiments.
- To study the Spectral density, the students may require the knowledge of Fourier and Inverse Fourier Transforms.

OUTCOMES

- The understanding of the mathematical principles on transforms and statistics would provide them the ability to formulate and solve some of the physical problems of engineering.

UNIT I – FOURIER TRANSFORMS: 9

Fourier transform pairs, Properties, Fourier Sine and Cosine transforms, Transforms of simple functions, Transforms of derivatives, Convolution Theorem, Evaluation of integrals using Fourier Transform.

UNIT II – Z - TRANSFORM: 9

Z-Transform , Elementary Properties , Inverse Z-Transform ,Convolution Theorem, Formation of Difference Equations , Solution of Difference Equations using Z-Transform.

UNIT III – PROBABILITY AND RANDOM VARIABLES: 9

Random variables, Functions of random variable, Marginal and Conditional distributions, Covariance, Correlation and Regression Analysis.

UNIT IV – STANDARD DISTRIBUTIONS: 9

Discrete Distributions: Binomial, Poisson, Geometric. Continuous Distributions: Uniform, Exponential and Gamma distributions.

UNIT V – RANDOM PROCESSES: 9

Classification, Stationary and Markov processes, Poisson Process, Sine – wave process Auto correlation and cross correlation functions, power spectral density, cross spectral density.

Tutorial : 15

Total hours: 60

TEXT BOOKS:

1. A. Singaravelu, Transforms and Partial Differential Equations, Meenakshi Agencies, Chennai.
2. Veerarajan. T, 'Probability statistics and Random Processes' Tata McGraw-Hill, New Delhi.2006.

REFERENCES:

1. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons, (Asia) Pvt Ltd., Singapore, 2000.
2. Johnson. R.A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson education, Delhi, 2000

SEMESTER III

	HUMAN ANATOMY AND PHYSIOLOGY	L	T	P	C
		3	0	0	3

AIM

- To provide the students, a basic understanding of the structure and function of the human body.

OBJECTIVE

- To relate basic human body functions and life processes.
- To name the major human body nervous systems, Cardiac cycle and relate their functions.
- To name the major components of musculo and respiratory system and describe briefly their anatomical locations and structures.
- To study the major components of digestive and excretory system, structure and its physiological functions.
- To study about the endocrine glands, special senses of human body and its mechanism.

OUTCOMES

By successfully completing this course, students will be able to:

- Describe and explain specific parts and key terms applied in anatomy and physiology
- Describe important physiological mechanisms involved in cell, tissue, and organ
- Understand organization and functions of each organs and systems in human body
- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue and organ functions in each system.

UNIT I : CELL **9**

Structure of Cell – Function of each Components of the cell – Membrane Potential – Action Potential – Generation and Conduction – Electrical Stimulation. Blood Cell – Composition – Origin of RBC – Blood Groups – Estimation of RBC, WBC and platelet.

UNIT II : CARDIOVASCULAR AND NERVOUS SYSTEM **9**

Cardiac Cycle – ECG – Blood Pressure – Feedback Control for Blood Pressure – Nervous control of Heart. Cardiac output – Coronary and Peripheral Circulation – Structure and function of Nervous tissue – Reflex action – Velocity of Conduction of Nerve Impulses. Electro Encephalograph – Autonomic Nervous System.

UNIT III : RESPIRATORY AND MUSCULO SKELETAL SYSTEM **9**

Physiological aspects of respiration. Exchange of gases – Regulation of Respiration. Disturbance of respirating function. Pulmonary function test- Muscles- Tissue-types-structure of skeletal muscle-types of muscle and joints.

UNIT IV : DIGESTIVE AND EXCRETORY SYSTEM **9**

Organization of GI system, Digestion and absorption – Movement of GI tract – Structure of Nephron – Mechanism of Urine formation – Urine Reflex – Skin and Sweat Gland – Temperature regulation.

UNIT V: SPECIAL SENSES AND ENDOCRINE GLANDS **9**

Optics of Eye – Retina - Photochemistry of Vision – Accommodation Neurophysiology of Vision – EOG. Physiology of Internal Ear - Mechanism of Hearing – Auditory pathway, Hearing Tests- Endocrine glands, ovary and testis.

Total Hours: 45

TEXT BOOKS

1. Sarada Subramanyam, K. Madhavan Kutty and H. D. Singh – "Text book of 'Human Physiology ", S. Chand & Company, 1996.
2. Guyton 'Text book of Medical Physiology", – WB Jaunder company Philadelphia - 10 edition 2002.

REFERENCE BOOKS

1. SujitK.Chaudhuri, "Concise Medical Physiology" – New Central Book agency, 1997.
2. Cyril A.Keele Eric Neil and Neil Norman Joels Samson Wrigths, "Applied Physiology" Oxford University Press, 1983.
3. Kathleen J .W Wilson, "Rose and Wilson, Anatomy and Physiology in Health and illness", ELBS edition.

SEMESTER III

	BIOSENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

AIM

- To provide the students, a basic understanding of the transducers, biosensors and its applications.

OBJECTIVE

- To understand the concepts of transducers and its classification.
- To study the various types of transducers and use of transducers in biomedical applications.
- To understand about the bio-potential electrodes and its types.
- To study about classification of bio-sensors and various technologies used in bio medical science.
- To know about the applications of bio sensors.

OUTCOMES

Upon completion of the course, the student should be able to:

- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications
- Remember and understand the concepts, types, working and practical applications of important biosensors.
- Explain different types of electrodes and their applications.
- Know some of the commonly used biomedical transducers

UNIT I: INTRODUCTION **9**

General measurement system – purpose, structure and elements-Transducers - Definition, Classification. Resistance type- strain gauges, thermometers, potentiometers. Capacitive type, Inductive type- variable reluctance and LVDT. Biomedical Applications.

UNIT II: TRANSDUCERS **9**

Temperature transducers, Piezoelectric transducers, Piezo resistive transducers, Photoelectric transducers, Pressure transducers. Biomedical applications.

UNIT III: BIO POTENTIAL ELECTRODES **9**

Half cell potential (or) Electrode potential, Types of Electrodes – Micro electrodes, Depth and needle electrodes, Surface electrodes, Chemical electrodes. Catheter type electrodes, stimulation electrodes, electrode paste, electrode material.

UNIT IV: BIOSENSORS **9**

Introduction, biological elements, immobilization of biological components. Micromachined biosensor – cantilever based chemical sensors - AFM, FAB. Biochip – introduction, gene chip & proteomic technologies in modern biomedical science.

UNIT V: APPLICATIONS OF BIOSENSORS **9**

ISFET for glucose and urea, IMFET, Bananatrode, Enzyme electrodes, PPG sensors, MOSFET biosensors, Ion exchange membrane electrodes.

Total Hours : 45

TEXT BOOKS:

1. H.S. Kalsi “Electronic Instrumentation & Measurement” Tata McGraw HILL, 1995 (Unit: I, II & III).
2. Brain R Eggins, “Biosensors: An Introduction”, John Wiley Publication, 1997 (Unit: IV & V).

REFERENCE BOOKS:

1. K.Sawhney “A course in Electronic Measurements and Instruments”, Dhapat Rai & sons, 1991.
2. John G Webster, “Medical Instrumentation: Application and design”, John Wiley Publications, 2001.
3. John P Bentley, “Principles of Measurement Systems”, 3rd Edition, Pearson Education Asia, (2000 Indian reprint).
4. Geddes and Baker, “Principles of Applied Biomedical Instrumentation”, 3rd Edition, John Wiley Publications, 2008.

SEMESTER III

	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EEE & EIE)

AIM

- The purpose of this course is to provide a basis for understanding the characteristics, operation and limitations of various semiconductor devices.

OBJECTIVES

1. To understand the basics of electrons and to find the motion of charges in electrostatic and magnetic fields.
2. To understand the basics and characteristics of a Semiconductor and its types in Equilibrium and Non-Equilibrium conditions.
3. To understand the working of PN junction diodes and special purpose diodes.
4. To understand the basic operations of BJT and its characteristics.
5. To understand the Constructional features working and characteristics of FET, UJT and SCR.

OUTCOMES

Upon Completion of the course, the students will be able to:

- Explain the structure of basic electronic devices.
- Design applications using basic electronic devices

UNIT I: ELECTRON BALLISTICS AND INTRINSIC SEMICONDUCTORS 9

Force on charge in electric field - Motion of Charge in uniform and time varying electric fields - Force on a moving charge in a magnetic field - calculation of cyclotron frequency - calculation of electrostatic and magnetic deflection sensitivity.

Energy band structure of conductors, semiconductors and insulators - Density distribution of available energy states in semiconductors – Fermi - Diac probability distribution function at different temperatures - Thermal generation of carriers - Calculation of electron and hole densities in intrinsic semiconductors - Intrinsic concentration - Mass Action Law.

UNIT II: EXTRINSIC SEMICONDUCTOR AND PN JUNCTIONS 9

N and P type semiconductors and their energy band structures - Law of electrical neutrality - Calculation of location of Fermi level and free electron and hole densities in extrinsic semiconductors - Mobility, drift current and conductivity - Diffusion current - Continuity equation - Hall effect. Band structure of PN Junction - Current Component in a PN Junction - Derivation of diode equation - Temperature dependence of diode characteristics.

UNIT III: SWITCHING CHARACTERISTICS OF PN JUNCTION AND SPECIAL DIODES 9

Calculation of transition and diffusion capacitance - Varactor diode - charge control description of diode - switching characteristics of diode - Mechanism of avalanche and Zener breakdown - Temperature dependence of breakdown voltages - Backward diode - Tunneling effect in thin barriers Tunnel diode - Photo diode - Light emitting diodes.

UNIT IV: BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTORS 9

Construction of PNP and NPN transistors - BJT current components - Emitter to collector and base to collector current gains - Base width modulation CB and CE characteristics - Breakdown characteristics - Ebers - Moll model - Transistor switching times.

Construction and Characteristics of JFET - Relation between Pinch off Voltage and drain current - Derivation. MOSFETS - Enhancement and depletion types.

UNIT V: METAL SEMICONDUCTOR CONTACTS AND POWER CONTROL DEVICES 9

Metal Semiconductor Contacts - Energy band diagram of metal semiconductor junction Schottky diode and ohmic contacts.Power control devices: Characteristics and equivalent circuit of UJT - intrinsic stand off ratio. PNPN diode - Two transistor model, SCR, Triac, Diac.

TOTAL HOURS: 45

TEXT BOOK:

1. Jacob Millman & Christos C.Halkias, "Electronic Devices and Circuits" 2nd Edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS:

1. Nandita Das Gupta and Amitava Das Gupta, Semiconductor Devices - Modelling and Technology, Prentice Hall of India, 2004.
2. Donald A.Neaman," Semiconductor Physics and Devices" 3rd Ed., Tata McGraw-Hill, 2002.
3. S.M.Sze, Semiconductor Devices - Physics and Technology, 2nd edn. John Wiley, 2002.
4. Ben G.Streetman and Sanjay Banerjee, Solid State Electronic Devices, Pearson Education 2000.

SEMESTER III

	DIGITAL ELECTRONICS	L	T	P	C
		3	0	0	3

(Common to ECE, BME, CSE, IT, EEE, EIE & MECHAT)

AIM

- The Aim of this course is to develop a strong foundation in analysis and design of digital electronics.

OBJECTIVES

- Understand the basic concepts.
- Understand concepts of logic gates constructional features.
- To understand the concepts of gate-level minimization & combinational logic.
- To analyze synchronous sequential logic.
- To realize the hazard free circuits and pulse mode sequential Circuits.

OUTCOMES

Upon completion of the course, the student should be able to:

- Know the basic concepts of digital electronic.
- Explain different types of logic gates and their applications.
- Know some of the commonly used circuits in biomedical application.

Unit – I: BASIC CONCEPTS AND BOOLEAN ALGEBRA **9**

Number systems - Binary, Octal, Decimal, Hexadecimal, conversion from one to another, complement arithmetic, Boolean theorems of Boolean algebra, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map, Tabulation method.

Unit – II: LOGIC GATES **9**

RTL, DTL, TTL, ECL, ICL, HTL, NMOS & CMOS logic gates, Circuit diagram and analysis characteristics and specifications, tri-state gates.

Unit – III: COMBINATIONAL CIRCUITS **9**

Problem formulation and design of combinational circuits, Adder / Subtractor, Encoder / decoder, Mux / Demux, Code-converters, Comparators, Implementation of combinational logic using standard ICs, ROM, EPROM, EEPROM, Basics of PLD, PAL, PLA and their use in combinational circuit design.

Unit – IV: SEQUENTIAL CIRCUITS **9**

Flip flops - SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis of clocked sequential circuits - their design, State minimization, state assignment, Circuit implementation, Registers-Shift registers, Ripple counters, Synchronous counters, Timing signal, RAM, Memory decoding, Semiconductor memories.

Unit – V: FUNDAMENTAL MODE SEQUENTIAL CIRCUITS **9**

Stable, Unstable states, Output specifications, Cycles and Races, Race free Assignments, Hazards, Essential hazards, Pulse mode sequential circuits.

TOTAL HOURS: 45

TEXT BOOKS:

1. Morris Mano, “Digital logic and Computer Design ", Prentice-Hall of India, 1998.

REFERENCE BOOKS:

1. William I. Fletcher, “An Engineering Approach to Digital Design ", Prentice-Hall of India, 1980
2. Floyd T.L., “Digital Fundamentals ", Charles E. Merrill publishing Company, 1982.
3. Tokheim R.L., “Digital Electronics - Principles and Applications ", Tata McGraw Hill, 1999.
4. Jain R.P., “Modern Digital Electronics ", Tata McGraw Hill, 1999.

SEMESTER III

	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

(Common to ECE, BME, CSE, IT, EEE & EIE)

AIM

To implement and manipulate object oriented programming concepts

OBJECTIVES

- To implement the concepts of object oriented programming.
- To implement oops structures using object oriented programming language.
- To use standard template library in the implementation oops data structures

OUTCOMES

Upon completion of the course, the student should be able to:

- Explain the concepts of Object oriented programming.
- Describe the object oriented programming language.
- Use standard template library in the implementation oops data structures

UNIT I **9**

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const and volatile functions - static members – Objects – pointers and objects – constant objects – nested classes – local classes

UNIT II **9**

Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor

UNIT III **9**

Function and class templates - Exception handling – try-catch-throw paradigm – Exception specification – terminate and unexpected functions – Uncaught exception.

UNIT IV **9**

Inheritance – public, private, and protected derivations – multiple inheritance - virtual base class – abstract class – composite objects Runtime polymorphism – virtual functions – pure virtual functions – RTTI – type id – dynamic casting – RTTI and templates – cross casting – down casting .

UNIT V **9**

Streams and formatted I/O – I/O manipulators - file handling – random access – object serialization – namespaces - std namespace – ANSI String Objects – standard template library.

Total Hours: 45

TEXT BOOKS

1. B. Trivedi, “Programming with ANSI C++”, Oxford University Press, 2007.

REFERENCES

1. Ira Pohl, “Object Oriented Programming using C++”, Pearson Education, Second Edition Reprint 2004..

2. S. B. Lippman, Josee Lajoie, Barbara E. Moo, “C++ Primer”, Fourth Edition, Pearson Education, 2005.
3. B. Stroustrup, “The C++ Programming language”, Third edition, Pearson Education, 2004.

SEMESTER III

	ELECTRONIC DEVICES LAB	L	T	P	C
		0	0	4	2

(Common to ECE & BME)

AIM

To verify practically, the fundamental characteristics of Electron Devices.

OBJECTIVES

- To study experimentally the characteristics of diodes, BJT's and FET's.
- To verify practically, the response of various special purpose electron devices.

OUTCOMES

- Upon completion of the course, the student should be able to handle various electronic devices.

LIST OF EXPERIMENTS

1. Diode Forward characteristics.
2. Zener Diode characteristics.
3. Input and Output characteristics of BJT.
4. Output characteristics of JFET.
5. Fixed Bias amplifier circuits using BJT.
6. Differential amplifier using BJT.
7. Power supply Full wave rectifier with simple capacitor filter.
8. Measurement of UJT Characteristics.
9. Measurement of SCR Characteristics.
10. Study of photo diodes and transistors

SEMESTER III

	BIO TRANSDUCERS LAB	L	T	P	C
		0	0	4	2

AIM

To gain knowledge on the characteristics and working of transducers.

OBJECTIVE

Students should be able to understand the working of bio transducers and plot their characteristics.

OUTCOMES

Upon completion of the course, the student should be able to know the working of bio transducers and plot their characteristics

List of Experiments:

1. Characteristics of Temperature Transducers.
2. Temperature Measurement using Thermistor and its Linearization characteristics.
3. Characteristics of Optical Transducer.
4. Characteristics of LVDT.
5. Characteristics of Hall effect Transducer.
6. Characteristics of Strain Gauge.
7. Characteristics of Potentiometer Transducer.
8. Characteristics of Pressure transducer
9. Characteristics of piezo electric transducers
10. Characteristics of piezo resistive transducers

SEMESTER III

	DIGITAL ELECTRONICS LAB	L	T	P	C
		0	0	4	2

(Common to ECE, BME, CSE, IT & MECHAT)

AIM

- To provide the knowledge of design and implementation of digital circuits using logic gates and flip flops.

OBJECTIVES

- Designing the basic digital circuits like adders, subtractors, code converters, magnitude converters using logic gates and counters using flip flops.

OUTCOMES

- Upon completion of the course, the student should be able to describe the working of basic digital circuits.

List of Experiments:

1. Design and implementation of Adders using logic gates
2. Design and implementation of Subtractors using logic gates
3. Design and implementation of BCD to Excess -3 code converter using logic gates
4. Design and implementation of Binary to Gray code converter using logic gates
5. Design and implementation of 4 bit BCD adder using IC 7483
6. Design and implementation of 2 Bit Magnitude comparator using logic gates
7. Design and implementation of Multiplexer and De-Multiplexer using logic gates
8. Design and implementation of encoder and decoder using logic gates
9. Design and implementation of 3 bit synchronous up/down counter
10. Implementation of SISO, SIPO, and PISO shift registers using flip flops

SEMESTER IV

	BIO MATERIALS AND ARTIFITIAL ORGANS	L	T	P	C
		3	1	0	4

AIM

- To understand the properties of the Bio-compatible materials and study its use in designing artificial organs.

OBJECTIVES

- To study the characteristics and classification of Biomaterials.
- To study the various Implant materials.
- To learn about various polymers.
- To learn about the techniques of tissue replacement.
- To learn about design of artificial organs.

OUTCOMES

Upon completion of the course, the student should be able to:

- Analyze different types of Biomaterials and its classification.
- Perform combinations of materials that could be used as a tissue replacement implant.
- Know about the various polymeric materials used for medical applications
- About bio-ceramics and its applications in medicine

UNIT I: STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY 12

Definition and classification of bio-materials, mechanical properties, visco elasticity, wound-healing process, bio compatibility, tissue response to biomaterials

UNIT II: IMPLANT MATERIALS 12

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyl apatite glass ceramics carbons, medical applications.

UNIT III: POLYMERIC IMPLANT MATERIALS 12

Polymerization, polyamides, Acryrilic polymers, rubbers, high strength thermoplastics, medical applications. Bio polymers: Collagen and Elastin.

UNIT IV: TISSUE REPLACEMENT IMPLANTS 12

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissues replacement implants, internal fracture fixation devices, joint replacements.

UNIT V: ARTIFICIAL ORGANS 12

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenateor), Artificial Kidney (Dialyser membrane), Dental Implants.

TOTAL HOURS: 60

TEXT BOOKS:

1. SUJATA V. BHATT, “Biomaterials” Second Edition, Publisher - Narosa Publishing House, 2005.
2. Jon B. Park Joseph D. Bronzino, “BIOMATERIALS - Principles and Applications”, CRC Press,2003.

SEMESTER IV

	BIOLOGICAL CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

AIM

By studying various control systems modeling technique, time response analysis and frequency response analysis, biological control systems can be analysed and understood.

OBJECTIVES

- To study concept and different mathematical techniques applied in analyzing any given system.
- To learn to do the analysis of given system in time domain.
- To study the techniques of plotting the responses in domain analysis.
- To learn to do the analysis of given system in frequency domain.
- To study techniques of modeling the Human physiological systems.

OUTCOMES

The learner will be able to:

- Analyze the time and frequency domains of the given system using different mathematical techniques

UNIT I: SYSTEM CONCEPTS **9**

Basic structure of control system -Types of systems - Open loop systems, closed loop systems, Effects of feedback, Block diagram & Signal flow graph, conversion of block diagram to signal flow graph, reduction of block diagram and signal flow graph.

UNIT II: TIME RESPONSE ANALYSIS OF CONTROL SYSTEMS **9**

Step and Impulse responses of first order and second order systems, Determination of time domain specifications of first and second order systems from its output responses.

UNIT III: THE CONCEPT OF STABILITY & ROOT LOCUS TECHNIQUE 9 Concept of stability, Routh stability criterion qualitative stability and conditional stability. The Root locus concept, Construction of root locus.

UNIT IV: FREQUENCY RESPONSE ANALYSIS **9**

Frequency response, Nyquist stability criterion, Nyquist plot and determination of closed loop stability, definition of gain margin and phase margin, Bode plot, Determination of gain margin and phase margin using Bode plot.

UNIT V: BIOMEDICAL APPLICATIONS **9**

Cardiovascular Control System, Endocrine Control Systems, Pupil Control System, Skeletal Muscle Servomechanism, Neuro muscular system, Respiratory system, occulomotor system.

TOTAL HOURS: 45

TEXT BOOKS:

1. J. Nagrath and Gopal, "Control Systems Engineering", New Age International (P) Limited, Publishers, 2nd Edition.
2. Michael C K Khoo, “Physiological control systems”, IEEE press, Prentice –Hall of India, 2001.

SEMESTER IV

	SIGNALS AND SYSTEMS	L	T	P	C
		3	1	0	4

(Common to ECE & BME)

AIM

- To introduce and analyse the continuous time signal and continuous time systems, discrete time signals and discrete time system.

OBJECTIVE

- To impart the knowledge of basic classifications of signals.
- To analyse the continuous time signals.
- To introduce linear time invariant continuous time systems.
- To impart knowledge on analysis of discrete time signals.
- To analyse linear time invariant discrete time systems.

OUTCOMES

Upon completion of the course, the student should be able to:

- Analyze the properties of signals & systems
- Apply Laplace transform, Fourier transform, Z transform and DTFT in signal analysis
- Analyze continuous time LTI systems using Fourier and Laplace Transforms
- Analyze discrete time LTI systems using Z transform and DTFT

UNIT I: CLASSIFICATION OF SIGNALS AND SYSTEMS **9**

Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, random signals, CT systems and DT systems, Classification of systems - Linear Time invariant Systems.

UNIT II: ANALYSIS OF C.T. SIGNALS **9**

Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis.

UNIT III: LTI-CT SYSTEMS **9**

Differential equation, Block diagram representation, Impulse response, Convolution integral, Frequency response, Fourier Methods and Laplace transforms in analysis, State equations and Matrix.

UNIT IV: ANALYSIS OF D.T. SIGNALS **9**

Z Transforms and Properties, Spectrum of D.T. signals, Discrete Time Fourier Transform (DTFT)

UNIT V: LTI-DT SYSTEMS **9**

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, FFT and Z-transform analysis, State variable equation and Matrix.

TUTORIAL: 15

TOTAL HOURS: 60

TEXT BOOK:

1. Allan V. Oppenheim et al, “Signals & Systems ", Prentice Hall of India Pvt. Ltd., 1997.

REFERENCE BOOKS:

1. Douglas K. Lindner, “Signals and Systems ", McGraw Hill International, 1999.

2. Simon Haykin and Barry Van Veen, “Signals and Systems ", John Wiley & Sons Inc., 1999.
3. Robert A. Gabel and Richard A. Roberts, “Signals & Linear Systems ", John Wiley, 3rd Edition, 1987.
4. Roger E. Zeimer et al, " Signals & Systems : Continuous and Discrete ", McMillan, 2nd Edition, 1990.

SEMESTER IV

	ELECTRONIC CIRCUITS	L	T	P	C
		3	0	0	3

(Common to BME, EEE &EIE)

AIM

- The aim of this course is to introduce to the students the rectifiers, power supplies, basics of biasing transistor circuits, low frequency amplifiers, multi stage amplifiers, power amplifiers, tuned amplifiers, feedback amplifiers and oscillators.

OBJECTIVES

- To understand the basic operation of rectifiers, filters and power Supplies
- To study the biasing circuits and anlayse the small signal BJT amplifiers
- To understand the working and to find the efficiency of different types of large signal amplifiers
- To understand the basic concept and working of various types of feedback amplifiers and oscillators.
- To understand the working of different types of tuned amplifiers and multivibrators and their analysis.

OUTCOMES

Upon completion of the course, the student should be able to:

- Know the basic operation of rectifiers, filters and power Supplies
- Describe the basic concept and working of various types of feedback amplifiers and oscillators.
- Know the working of different types of tuned amplifiers and multivibrators and their analysis

UNIT I: RECTIFIERS AND POWER SUPPLIES 9

Half Wave and Full Wave Rectifier-Bridge rectifier-performance measures of rectifiers-filters-Full Wave rectifier with inductive filter, capacitive filter, LC filter, π section filter, multiple LC Filter- Regulators-Shunt and series voltage regulators-Performance measures of regulators.

UNIT II: BIASING CIRCUITS AND ANALYSIS OF SMALL SIGNAL BJT AMPLIFIERS 9

Biasing circuit of BJT, DC equivalent circuit of BJT,DC and AC Load Lines, Stability factor analysis, Types of amplifiers-Small Signal Equivalent circuit-Calculation of gain, Input and Output Impedance of various amplifiers using h-Parameters.

UNIT III: MULTISTAGE AMPLIFIERS AND POWER AMPLIFIERS 9

Introduction-Two stage RC Coupled amplifier-Cascade amplifier-Darlington emitter follower amplifier-Bootstrap amplifier Introduction-Class A Power Amplifier-Push Pull Principle-Class B push pull amplifier and complementary symmetry amplifier-Class C amplifier-Distortion in amplifiers-Collector power dissipation-efficiency and figure of merit calculation-Maximum power dissipation hyperbola.

UNIT IV: FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Introduction - Performance analysis of feedback amplifiers-Voltage and current feedback amplifiers - Barkhausen Criterion for Oscillation-RC and Wein bridge oscillator, Hartley Oscillator, Colpitts Oscillator-Crystal Oscillator-Stabilization in Oscillator.

UNIT V: TUNED AMPLIFIERS AND MULTIVIBRATORS 9

Single tuned amplifier-Stagger tuned amplifier-Tuned amplifier instability-Neutralization and Unilateralization.

TOTAL HOURS: 45

TEXT BOOKS

1. Robert L. Boystead and Louis Nashelky, "Electronic Devices and Circuits", 8th Edition, PHI, 2005.

REFERNCE BOOKS

1. Theodore F. Bogart Jr., Jeffrey S. Beasley, Guillermo Rico, "Electronic devices and circuits", PPH, 2004.
2. Millman & Halkias, "Integrated Electronics", McGraw Hill International Edition. 1991
3. David A. Bell, "Electronic Devices and Circuits", PHI, 2004

SEMESTER IV

	PATHOLOGY AND MICTROBIOLOGY	L	T	P	C
		3	0	0	3

AIM

- Introducing the fundamentals of pathology and microbiology through the study of cell structure, inflammation tumors, different disease diagnosis, microscopy, characterisation of micro organism, diseases caused by them and their control.

OBJECTIVE

- To study the normal cell structure, cell degeneration, regeneration and neoplasia.
- To study different Haemodynamic disorders
- To study about the characteristics of micro organism.
- To study about genetic disorders due to bacteria, fungi, viruses and their control.
- To study various tissue processing and different staining techniques.

OUTCOMES

At the end of the course, the student should be able to:

- Analyze structural and functional aspects of living organisms.
- Explain the function of microscope
- Discuss the importance of public health.
- Describe methods involved in identification of disease producing organisms.

UNIT I: NORMAL CELL STRUCTURE 9

Cell Degeneration and regeneration-Inflammations , Pathologic Processes that occur in human body, Apoptosis, Degeneration, Hypertrophy, Neoplasia, Difference between benign and malignant tumors - Etiology of tumors - Spread of Tumors.

UNIT II: FLUID AND HEAMODYNAMIC DERANGEMENTS 9

Edema, normal Hemostasis, thrombosis, Hemorrhage – Thrombus – Embolism – Disseminated intra vascular Coagulation – Hematological disorders-Bleeding Disorders – Leukemia – lymphoma.

UNIT III: STRUCTURE OF BACTERIA & VIRUS 9

General Structural Organisation of bacterial and viral cell- growth and identification of bacteria, observation of culture. Microscopy - Light microscopy, dark field microscopy, phase contrast microscopy fluorescence and electron microscopy.

UNIT IV: GENETIC DISORDERS AND IMMUNITY 9

Autosomal and sex linked disorders- Storage disorders -Types of hypersensitivity reactions - Immune deficiency syndrome - Primary-HIV- Autoimmune diseases - SCID, SLE, Rheumatoid arthritis

UNIT V: STAINING TECHNIQUES 9

Identification of disease producing organisms, simple stain, Gram stain, AFB stain, Fluorescent techniques, antigen-antibody techniques.

TOTAL HOURS: 45

TEXT BOOKS:

1. Robbins S.L & Ramzi S.C, “Pathologic Basis of Diseases’, W.B. Saunders Co. 1999
2. Anatha Narayanan.R & Jayaram Panicker C.R, ‘Text Book of Microbiology, Orient Laongman’1998.

SEMESTER IV

	MEDICAL PHYSICS	L	T	P	C
		3	0	0	3

AIM

- The purpose of the course is to understand the concepts and methods of physics in the diagnosis and treatment of human disease

OBJECTIVES

- To study the arrangement of atoms in periodic system
- To study the interaction of radiation with cells.
- To study the somatic effects of radiation.
- To study the genetic effects of radiation.
- To study the application of physics in medicine

OUTCOMES

At the end of the course, the student should be able to:

- Understand the principle of radioactivity and uses of some radio-isotopes
- Physics relating the interaction of radiation with matter
- Radiation effects in human tissues and organs

UNIT I : ATOMIC PHYSICS **9**

Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra. Principles of Nuclear Physics – Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles.

UNIT II: INTERACTION WITH LIVING CELLS **9**

Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

UNIT III: SOMATIC EFFECT OF RADIATION **9**

Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

UNIT IV: GENETIC EFFECT OF RADIATION **9**

Threshold of linear dose effect, factors affecting frequency of radiation induced mutation, Gene controlled hereditary diseases, biological effect of microwave and RF wave. Penetration and propagation of signals effects in various vital organs, Protection standards.

UNIT V: PHOTO MEDICINE **9**

Synthesis of Vitamin D in early and late cutaneous effects, Phototherapy, Photo hemotherapy.
LASER PHYSICS **–** Characteristics of Laser radiation, Laser speckle, biological effects, laser safety management.

TOTAL HOURS: 45

TEXT BOOKS:

1. "Introduction of Health physics" ,Herman comber Thomas E Johnson McGraw Hill

2. “Radiology for the Radiologist” , 7th Edition, EvicJ.Hall, Amato J.Giacacippino Williams & Wilkins tuwar business
3. Branski.S and Cherski.P ‘Biological effects of Microwave’ Hutchinson & ROSS Inc. Strondsburg 1980.
4. Moselly, ‘Non ionising Radiation’ Adam HilgarBrustol 1988.
5. Glasser.O. “Medical Physics”,Vol.1, 2, 3 year Book Publisher Inc Chicago, 1980.

SEMESTER IV

	PERSONALITY DEVELOPMENT AND COMMUNICATION SKILLS	L	T	P	C
		0	0	4	2

(Common to ECE, BME, EEE, EIE, CSE, IT, MECH, MECHAT & CIVIL)

AIM

- To develop graduates with good Presentation and Writing skills (Professional & Technical)

OBJECTIVES

- To improve Aptitude Skills, train to improve self-learning/researching abilities, Presentation Skills & Technical Writing (Reports, Brochures, Manuscripts/Articles)

OUTCOMES

At the end of the course, the student should be able to improve their Aptitude Skills, Presentation Skills & Technical Writing skills.

METHODOLOGY: Modular Evaluation will be done based on Continuous Internal Assessment as Assignments, Short Communications, Proposals, Briefs, Reports, etc. Final Evaluation will be based on a Real-time research article based on current research carried out in the Institution or by any Faculty of the Institution (Good articles can be submitted to Journals co-authored by the Student and Faculty, with affiliation to the Institution)

UNIT I – COMMUNICATION AND SELF DEVELOPMENT: Basic Concepts of Communication; Process of Communication; Types of Formal communication; The Media of Communication; Channels of Communication; Barriers in Communication; How to Overcome Barriers to Communication.

UNIT II - GRAMMAR & SYNTAX: Synonyms; Antonyms; Words used as different parts of speech; Spotting errors; Concord; Principle of proximity between subject and verb. Sentence Structure; Combination and Transformation of sentences; Verb Patterns in English.

UNIT III - READING AND WRITING SKILLS: Purpose and Process of Reading; Reading Tactics; Reading Strategies; Reading Comprehension; Paraphrase; Preparing outlines of paragraph/text. Elements of Effective Writing; Job Application, Bio-data, Personal Resume and Curriculum Vitae; Preparing Agenda and Minutes of a Meeting; Back office job for organizing a conference/seminar; Writing Styles; Scientific and Technical Writing; Summary Writing; Writing paragraphs; Writing Essays.

UNIT IV – LISTENING AND SPEAKING SKILLS: Process of listening; Hard and Soft Skills; Feedback Skills; Essentials of Good Communications; Types of Listening; Barriers to Listening; Note taking and Note making. Skills of Effective Speaking; Component of an Effective Talk; Tone of Voice; Accent, Body Language; Timing and Duration of Speech; Audio-Visual Aids in Speech.

UNIT V – TECHNICAL REPORT, RESEARCH CASE STUDY & REPORTING: Main considerations in writing a good report; Types and Structure of Reports; Collecting Data; Technical Proposals; Visual Aids; General Tips for Writing Reports. Research Case Study and Reporting

Text Book

1. The Functional Aspects of Communication Skills, Prajapati Prasad and Rajendra K. Sharma, S. K Kataria & Sons, New Deihl, Rep"nt 2007.

Reference Books

1. Business Communication, Sinha K. K, S. Chand, New Delhi.
2. Business Communication, Asha Kaul, Prentice Hall of India.
3. Business Correspondence and Report Writing' A Practical Approach to Business and Technical Communication, Sharma, R.C. and Krishna Mohan, Tata McGraw-Hill.
4. A New Approach to English Grammar for High Schools, Madan Sabina, Spectrum Books, New Delhi

SEMESTER IV

	ELECTRONIC CIRUITS LAB	L	T	P	C
		0	0	4	2

AIM:

- To provide the ability to design the electronic circuits using the basic electronic components.

OBJECTIVE:

- To study the characteristics of basic amplifiers and power supply.
- To verify practically, the response of various oscillators.

OUTCOMES

- At the end of the course, the student should be able to understand and handle the various amplifiers, power supply and oscillators.

LIST OF EXPERIMENTS:

Design of:

1. Common Emitter amplifier
2. Common collector amplifier
3. FET amplifier
4. Class A and Class B amplifiers
5. Differential amplifier
6. Feedback amplifier
7. Oscillators
8. Multivibrators
9. Single phase half wave and full wave rectifier
10. Series voltage regulator.

SEMESTER IV

	PATHOLOGY AND MICROBIOLOGY LAB	L	T	P	C
		0	0	4	2

AIM

- Provides on opportunity to study blood cells structure, different disease diagnosis tests and urine smear, blood smear test etc experimentally. It also helps in understanding of the theoretical principles in more explicit and concentrated manner.

OBJECTIVES

- The students should be able to understand staining techniques and other microbial disease diagnostic procedures.

OUTCOMES

At the end of the course, the student should be able to

- Know the methodology of various haematological tests.
- Observe the bacteria using various staining techniques.
- Student can understand the benign and malignant tumor.

LIST OF EXPERIMENTS

1. Haemoglobin Estimation.
2. Peripheral Smear Study.
3. Urine Smear Study
4. Cross matching of Blood.
5. Tissue Biopsy – Benign and Malignant.
6. Simple stain test
7. Gram stain test
8. RBC Counting
9. WBC Counting
10. Blood Grouping

SEMESTER V

	BIOMEDICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

(Common to BME, EEE, EIE & MECHAT)

AIM

- To enable the students to develop knowledge of principles, design and applications of the Biomedical Instruments.

OBJECTIVES

- Be able to list the problems associated with the acquisition of Bio potential and list the different types of electrodes.
- To know the various Biopotential recording methods
- To study about various Physiological measurements methods
- Be able to state the purpose, uses, principle of operation and maintenance of blood flow meter and blood cell counter
- Details the various bio chemical measurements and list the different types of Biosensor**s**

OUTCOMES

By successfully completing this course, students will be able to:

- Operate and calibrate fundamental biomedical instrumentation used in hospital.
- Classify medical instruments based on principles and application used in hospital.
- To understands different Bio signal/potential.
- To understand the working principles of various instruments such as ECG, EMG, EEG, and other diagnostic and therapeutic equipment's.

UNIT-I: BIO PONTENTIAL ELECTRODES AND TRANSDUCERS 9

Origin of Bioelectric signals, recording electrodes-Electrode Tissue interface, Electrolyte –skin interface, Polarization, Skin contact impedance, motionartifacts. Types of electrodes- surface, Needle electrodes and Micro electrodes, Recording problems, Transducers-characteristics and types.

UNIT-II: BIOPOTENTIAL RECORDING 9

Need for Bio-amplifier, single ended bio amplifier, differential Bio amplifier, Right leg driven ECG amplifier, Band pass filtering, isolation DC amplifier & AC amplifier, chopper amplifier, Power line interface.ECG, EEG, EMG, PCG, EOG, ERG lead system and recording methods, typical waveform, frequency spectrum, abnormal waveform.

UNIT III: NON ELECTRICAL PARAMETER MEASUREMENTS 9

Respiration rate, Pulse rate, Temperature, Blood Pressure, O_2 , CO_2 measurements, Respiratory volume measurement, BMR measurement, Plethysmography technique, Impedance technique- Bipolar and Tetra polar circuits, Detection of various physiological parameters using impedance technique.

UNIT IV: BLOOD FLOW METER AND BLOOD CELL COUNTER 9

EM and ultrasonic blood flow meters, indicator dilution method, Thermo dilution method, Manual and Automatic Counting of RBC, WBC and Platelets.

UNIT V: BIO-CHEMICAL MEASUREMENTS & BIOSENSORS 9

Ph, Pc02, p02, Phco3 and electrophoresis, colorimeter, spectrophotometer, flame photometer,

autoanalyser, Biosensors.

TOTAL HOURS: 45

TEXT BOOKS

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

REFERENCE BOOKS.

1. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.

SEMESTER V

	DIAGNOSTIC AND THERAPUTIC EQUIPMENT – I	L	T	P	C
		3	0	0	3

AIM

- The purpose of this course is to have a good knowledge about Instruments used for diagnostic and therapeutic purpose.

OBJECTIVE

- To understand the fundamental of ECG recording and describe how the Pacemaker and Defibrillator works.
- To study about the Procedures and equipments used in EEG and describe the origin, cranial location, amplitude and frequency bands.
- To understand the sliding theory of contraction, EMG measurements, fatigue characteristics and nerve stimulators.
- To know about the Hear lung machine and machines used for the sensory measurement
- To study about respiratory measurements equipments and working of ventilators.

OUTCOMES

By successfully completing this course, students will be able to:

- Use different medical devices applied in measurement of parameters related to cardiology, neurology.
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Explain about measurements of parameters related to respiratory system

UNIT I: CARDIAC SYSTEM **9**

ECG, sources of ECG, normal and abnormal waveform, diagnosis interpretation, Heart rate monitor, Arrhythmia Simulator, Holter Monitor, Phonocardiography, Plethysmography, cardiac pacemaker-external pacemaker, implantable pacemaker, different types of pacemakers, fibrillation, defibrillator, AC defibrillator, DC defibrillator, electrodes, 68nsynchroniz and 68nsynchronized types.

UNIT II: NEUROLOGICAL SYSTEM **9**

EG, genesis, lead system, wave characteristics, frequency bands, spontaneous and evoked response, diagnostic interpretation, epileptic discharges.

UNIT III: SKELETAL MUSCULAR SYSTEM **9**

Sliding theory of contraction, recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV: HEART-LUNG MACHINE AND SENSORY MEASUREMENT **9**

Need for the unit, functioning of bubble, disc type and membrane type xy-generators, fingerpump, roller pump, electronic monitoring of functional parameter. Electroocculograph, Electro retinograph, Audiometer-Pure tone, Speech. EGG (Electrogastrograph), galvanic skin resistance(GSR).

UNIT V: RESPIRATORY MEASUREMENT AND VENTILATOR **9**

Instrumentation for measuring the mechanics of breathing – Spirometer-Lung Volume and vital capacity, measurements of residual volume, pneumotachometer – Airway resistance measurement, Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor. Types of

Ventilators – Pressure, Volume, Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators

TOTAL HOURS: 45

TEXT BOOKS

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, “Introduction to Biomedical equipment technology”, John Wiley and sons, New York, 1997

SEMESTER V

	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	1	0	4

(Common to ECE, BME, EEE, EIE & MECHAT)

AIM

- To provide the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

OBJECTIVES

- To introduce the basics of Integrated Circuits and its fabrication.
- To familiarize with operational amplifiers and its Characteristics.
- To introduce the applications of Operational Amplifier
- To Introduce about the regulator and filters.
- To introduce ADC/ DAC and PLL.

OUTCOMES

By successfully completing this course, students will be able to:

- Know the basics of Integrated Circuits and its fabrication
- Describe the applications of Operational Amplifier
- Know the various regulator and filters

UNIT – I: Integrated Circuit Fabrication **12**

Classifications of ICs – IC chip size and Circuit Complexity – Fundamentals of Monolithic IC Technology – Basic Planar Process – Fabrication of Typical Circuit – Active and Passive Components of ICs – Fabrication of FET – Thick and Thin Film Technology – Technology Trends.

UNIT – II: Operational Amplifier and its Characteristics **12**

Basic Information of operational Amplifier – Ideal Operational Amplifier - Operational Amplifier Internal Circuits – Examples of IC Op Amps – FET Operational Amplifiers – DC Characteristics – AC Characteristics – Analysis of Data Sheets of an Op Amp.

UNIT – III: Operational Amplifier Applications **12**

Basic Op Amp Applications – Instrumentation Amplifiers – AC Amplifiers – V to I and I to V Converters – Op Amp Circuits Using Diodes – Sample and Hold Circuits – Log/Antilog Amplifiers – Multiplier and Divider – Differentiator and Integrator – Operational Transconductance Amplifier – Comparators – Multivibrators – Square, Triangular and Sawtooth wave Generators.

UNIT – IV: Regulators and Filters **12**

Series Op Amp Regulators – IC Voltage Regulators – 723 General Purpose Regulators – Switching regulators – RC Active Filters – Transformation – State variable Filter – Switched Capacitor Filters – Active Filters using OTA's.

UNIT – V: D–A and A–D Converters, Timers and PLL **12**

Timer – Description of Functional Diagram – Monostable and Astable Operation – Schmitt Trigger – PLL – Basic Principles – Phase Detectors / Comparators – Voltage Controlled Oscillator – Low Pass Filter – Monolithic PLL – PLL Applications – Basic DAC Techniques – A–D Converters – DAC/ ADC Specifications.

TOTAL HOURS: 60

TEXT BOOK:

1. D. Roy Choudhury, Shail B. Jain, “Linear Integrated Circuits”, New Age International Publishers, 3rd Edition 2007.

REFERENCE BOOKS:

1. Segio Franco, “ Design with Operational Amplifiers and Analog Integrated Circuits”, McGraw Hill, 1977.
2. Ramakant A. Gayakwad, “OP – AMP and Linear ICs”, Prentice Hall, 1994.
3. Botkar K. R., “Integrated Circuits”, Khanna Publishers, 1996.
4. Gray and Mayer, “Analysis and design of Analog Integrated Circuits”, Wiley International, 1995.

SEMESTER V

	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EEE, EIE & MECHAT)

AIM

- Enable students to understand different types of microprocessors and micro controllers and to use microprocessor and microcontroller for different applications.

OBJECTIVES

- To learn the concepts of basic microprocessors.
- To get knowledge in interfacing devices.
- To know the concepts of microcontroller and its applications.
- To develop skill in simple program writing.

OUTCOMES

By successfully completing this course, students will be able to:

- At the end of the course, the student should be able to:
- Design and implement programs on 8085 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

UNIT I: INTEL 8085 MICROCPROCESSOR **9**

Evolution of microprocessors– 8085-microprocessor architecture –addressing modes- Instruction set – Memory interfacing –Basic timing diagram- interrupts – Software Interrupts - Data transfer schemes simple programs.

UNIT II: PERIPHERAL INTERFACING **9**

Programmable Peripheral Interface 8255 – Programmable Communication Interface 8251 USART – Programmable Interrupt Controller 8259A - Programmable Interval Timer 8253 – Keyboard/Display Controller8279 – DMA Controller 8237 – Floppy Disk Controller 8272- CRT Controller 8275.

UNIT III: INTEL 8086/8088 MICROPROCESSOR **9**

Architecture of 8086/8088-Register organization – Signal Description of 8086 – Minimum mode – Maximum mode and timings –8086 Instruction set – Addressing modes – Assembler directives and operators- simple programs.

UNIT IV: 8031/8051 MICROCONTROLLER **9**

Single chip microcontroller – Introduction to 8 bit microcontroller – architecture of 8031/8051- Signal descriptions of 8051- Register set of 8051 operational features of 8051- Memory and I/O Interfacing- Interrupts–Instruction set – addressing mode –simple programs

UNIT V: INTERFACING **9**

Microprocessor based process control system – microcomputer based scale – interfacing alphanumeric displays, keyboard interface-speed control of stepper motor – high power devices interfacing - A/D and D/A interfacing.

TOTAL HOURS: 60

TEXTBOOKS

1. Ramesh S.Gaonkar, “Microprocessor architecture, programming and its application with 8085”, Penram Int. Pub. (India) IV edition.
2. A.K Roy, K.M Bhurchandi, “Intel Microprocessors Architecture, Programming and Interfacing”, McGraw Hill International Edition – 20001.
3. Muhammad Ali Mazidi and Janica Gilli Mazidi, “The 8051 microcontroller and embedded systems” ,Pearson Education, 5th Indian reprint, 2003.

REFERENCE BOOKS

1. Rafiquzzaman M, “Microprocessors – Theory and Applications Intel and Motorola”, PHI Pvt. Ltd, New Delhi 2001.
2. Douglas V.Hall, “Microprocessors and Interfacing programming and hardware”, Tata McGraw Hill Edition 1997.

SEMESTER V

	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	1	0	4

(Common to ECE & BME)

AIM

- To introduce the concepts of Digital signal processing and DSP Processor. The mathematical analysis of FIR and IIR filter design and simulation using MATLAB are dealt with in detail.

OBJECTIVES

- Structures of Discrete time signals and systems
- Frequency response and design of FIR and IIR filters.
- Finite word length effect
- DSP Processor- TMS320C5X

OUTCOMES

By successfully completing this course, students will be able to:

- apply DFT for the analysis of digital signals & systems
- design IIR and FIR filters
- characterize finite Word length effect on filters
- design the Multirate Filters
- apply Adaptive Filters to equalization

UNIT I: DISCRETE FOURIER TRANSFORMS & FAST FOURIER TRANSFORMS 12

Introduction to DFT-Efficient computation of DFT properties of DFT -FFT algorithms-Radix-2 and Radix-4 FFT algorithms-Decimation in Time- Decimation in Frequency algorithms- IFFT - Use of FFT algorithms in Linear Filtering and correlation.

UNIT II: IIR FILTER DESIGN 12

Design of IIR filter – Butterworth, Chebyshev– Order determination –Digital IIR filter design from analog transfer function by Impulse Invariant, Bilinear transformation-Approximation derivatives - Frequency Transformation from LPF to BPF, BSF and HPF.

UNIT III: FIR FILTER DESIGN 12

Symmetric and Anti-symmetric FIR filters – Linear phase FIR filters – Windowing technique-Rectangular, Kaiser windows-Frequency sampling techniques-Structure for FIR systems & IIR Systems.

UNIT IV: FINITE WORD LENGTH EFFECTS 12

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representations – Comparison – Overflow error – truncation error – coefficient quantization error – limit cycle oscillations- signal scaling – analytical model of sample and hold operations-Application of DSP.

UNIT V: MULTI RATE SIGNAL PROCESSING 12

Introduction- Concepts of Multi-rate Signal Processing- Decimation by integer factor- interpolation by integer factor-Sampling rate conversion by non integer factor – multistage approach to sampling rate conversion – Application: echo canceller.

TOTAL HOURS: 60

TEXT BOOK:

1. John G. Proakis and Dimitris G.Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", PHI of India Ltd., New Delhi 3rd Edition 2000.
2. Sanjit K.Mitra 'Digital Signal Processing', A Computer Based Approach, Tata McGraw-Hill, New Delhi, 1998, Second Edition.

REFERENCES:

1. Alan V Oppenheim, Ronald W Schafer and John R Buck. "Discrete time signal processing", PHI/Pearson Education, 2000, second Edition.
2. JhonyR.Johnson, "Introduction to Digital Signal Processing", Prentice Hall of India/Pearson Education, 2002.
3. S. Salivahanan, A. Vallavaraj G. Gnapriya, "Digital Signal Processing", Tata McGraw-Hill Education,

SEMESTER V

	BIOMEDICAL INSTRUMENTATION LAB	L	T	P	C
		0	0	4	2

AIM

- To enable the students to know about the measurements and recording of Bioelectric Signals.

OBJECTIVES

- Record the various Bio Signals and Analysis it.
- To study the different preamplifiers used for amplifying the Bio Signals.
- To measure various physiological parameters using patient monitoring units.

OUTCOMES

By successfully completing this course, students will be able to:

- Design the amplifier for Bio signal measurements
- Recording and analysis of bio signals

LIST OF EXPERIMENTS

1. Construction and testing of Instrumentation amplifier
2. Patient monitoring system and Bio-telemetry.
3. Plotting of Human auditory response using audiometer.
4. Recording of Electromyogram.
5. Measurement of respiration rate.
6. Measurement of blood flow velocity using ultrasound transducer
7. pH Measurement and conductivity test
8. Study of ESU – cutting and coagulation modes
9. Study of ECG machine.
10. Study of EEG machine.

SEMESTER V

	MICROPROCESSORS AND MICROCONTROLLERS LAB	L	T	P	C
		0	0	4	2

(Common to ECE, BME, EEE, EIE & MECHAT)

AIM

- To provide the knowledge of assembly language programming of microprocessors and microcontrollers and interfacing peripheral devices with microprocessors.

OBJECTIVE

- To write the assembly language program for 8085, 8086 and 8051.
- To write the programs for communication between microprocessor and peripheral devices.
- To interface ADCs, DACs with microprocessor and learn the real time applications like stepper motor control, key board etc.,

OUTCOMES

By successfully completing this course, students will be able to:

- Write ALP Programmes
- Design and implement programs on 8086 microprocessor.
- Design and implement 8051 microcontroller based systems.
- Execute Programs in 8051

LIST OF EXPERIMENTS

1. 8085 Assembly language Program (ALP) to add and subtract two 8 bit numbers.
2. 8085 Assembly language Program (ALP) to multiply and divide two 8 bit numbers.
3. 8085 Assembly language Program (ALP) to arrange the numbers in ascending and descending order.
4. 8086 Assembly language Program (ALP) to add and subtract two 8 bit numbers.
5. 8086 Assembly language Program (ALP) to multiply and divide two 8 bit numbers.
6. Interfacing a stepper motor to 8085 processor and operate it in clockwise and anti-clockwise directions.
7. Interfacing an ADC to 8085 processor and generate step, ramp, triangle and square waveforms.
8. Interfacing a keyboard to 8085 microprocessor and display the key number pressed on the 7-segment display.
9. 8051Assembly language Program (ALP) to add and subtract two 8-bit numbers.
10. 8051Assembly language Program (ALP) to multiply and divide two 8 bit numbers.

SEMESTER V

	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
		0	0	4	2

(Common to ECE & BME)

AIM

To verify practically, the fundamental characteristics of various discrete time signals.

OBJECTIVES

- To study experimentally the characteristics of filters.
- To verify practically, the response of various transforms.

OUTCOMES

By successfully completing this course, students will be able to:

- Demonstrate the characteristics of filters
- Implement filters for various applications of DSP

LIST OF EXPERIMENTS

I.USING MATLAB.

1. Representation of time-series signal
2. Computation of convolution of signals
3. Response of a difference equation to initial conditions
4. Stability test
5. DFT computation
6. Design of IIR filters
7. Design of FIR filters
8. Sampling
9. Multi Rate signal Processing

II.DSP PROCESSOR IMPLEMENTATION

10. Sampling & Waveform generation
11. FIR & IIR Filters Implementation
12. Fast Fourier transforms

SEMESTER VI

	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EIE, MECHAT, CSE & IT)

AIM

- To introduce the student to various image processing techniques.

OBJECTIVES

1. To study the image fundamentals
- To study the mathematical transforms necessary for image processing.
- To study the image enhancement techniques.
- To study image restoration procedures.
- To study the image compression techniques.

OUTCOMES

By successfully completing this course, students will be able to:

- Discuss digital image fundamentals.
- Apply image enhancement and restoration techniques.
- Use image compression Techniques.
- Represent features of images.

UNIT I: DIGITAL IMAGE FUNDAMENTALS 9

Introduction-Elements of Digital Image Processing system- Visual perception and properties of human eye-Image representation-Image Sampling & Quantization-A simple image model-Some basic relationship between pixels- Image processing applications.

UNIT II: IMAGE TRANSFORMS 9

Introduction to Fourier transform - Discrete Fourier transform - Properties of two dimensional FT – Separability, Translation, Periodicity, Rotation, Average Value – DCT, DST, Walsh, Hadamard, Haar transforms.

UNIT III: IMAGE ENHANCEMENT 9

Histogram Modelling, equalization and modification. Image smoothing-Image sharpening- Spatial Filtering-Edge detection – Homomorphic filtering for image enhancement.

UNIT IV: IMAGE RESTORATION 9

Model of Image Degradation/Restoration process –Inverse filtering -Least Mean Square (Wiener) filtering – Constrained least mean square restoration – Singular value decomposition-Recursive filtering

UNIT V: IMAGE COMPRESSION 9

Image Compression: Fundamentals -Image compression models; Lossless compression:Variable-Length Coding -Contents - LZW Coding; Lossy Compression:Lossy Predictive Coding - Transform Coding - Wavelet Coding.

TOTAL HOURS: 45

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. woods, “Digital Image Processing”, Addition - Wesley Publishing Company, New Delhi, Third Edition,2007.

2. Anil. K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India Pvt Ltd., New Delhi, 1995

REFERENCES:

1. Kenneth R Castleman, “Digital Image Processing”, Prentice Hall, New Delhi, 1995.
2. William K. Pratt, “Digital Image Processing”, John Wiley, NJ, 1987.
3. Sid Ahmed M.A., “Image Processing Theory, Algorithm and Architectures”, McGraw-Hill, 1995.
4. Rafael C. Gonzalez and Richard E. woods, “Digital Image Processing Using MATLAB”, Addition - Wesley Publishing Company, Second Edition, New Delhi, 2004.

SEMESTER VI

	DIAGNOSTIC AND THRAPUTIC EQUIPMENTS – II	L	T	P	C
		3	0	0	3

AIM

- To know about the ultrasonic and diathermy principles and clinical applications. Understand the transmission of bio-signals using telemetry techniques. Understand sources of leakage current and method of monitoring it.

OBJECTIVE

- To study various display techniques and use of ultrasonic in various fields of medicine.
- To understand various patient monitoring systems and transmission of bio-signals using telemetry principles.
- To study the clinical application of diathermy principles.
- To understand diagnostic applications of endoscopy and tomography.
- To study sources of leakage current and method of monitoring it.

OUTCOMES

By successfully completing this course, students will be able to:

- Discuss ultrasound imaging techniques and its usefulness in diagnosis
- Analyze different types and uses of diathermy units
- Outline the importance of patient safety against electrical hazard

UNIT I: ULTRASONIC TECHNIQUES FOR DIAGNOSIS 9

Basic principles of Echo technique, display techniques A, B, M modes, Echo cardiograms, Echo encephalogram, Ultrasonic applied as diagnostic tool in ophthalmology, obstetrics and gynaecology.

UNIT II: PATIENT MONITORING AND BIOTELEMETRY 9

Patient monitoring system – ICU, post operative, ICCU, single channel telemetry, multichannel telemetry, radiopill. Transmission of Biosignals over telephone lines, Applications in ECG and EEG Transmission.

UNIT III : DIATHERMY 9

Clinical applications of electrotherapy, short wave diathermy, ultrasonic diathermy ,microwave diathermy, surgical diathermy unit, IR lamps, UV lamps.

UNIT IV: SPECIAL DIAGNOSTIC TECHNIQUES 9

Principles of Cryogenic technique and application, Endoscopy, Laproscopy, Thermography, Lithotripsy

UNIT V: PATIENT SAFETY 9

Physiological effects of electricity – important susceptibility parameters – Macro shock– Micro shock hazards – Patient's electrical environment – Isolated Power system –Conductive surfaces – Electrical safety codes and standards – Basic Approaches to protection against shock, Protection equipment design, Electrical safety analyzer –Testing the Electric system

TOTAL HOURS: 45

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007
2. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, 2002
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical equipment technology”, John Wiley and sons, New York, 1997

REFERENCE BOOKS:

1. John G. Webster, Bioinstrumentation”, John Willey and sons, New York, 2004.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw - Hill, New Delhi, 2003.

SEMESTER VI

	RADIOLOGICAL EQUIPMENTS	L	T	P	C
		2	1	0	3

AIM

- To get the clear understanding of X-ray generation, radio isotopes and various techniques used for visualizing organs.

OBJECTIVE

- To study about the functioning of X-ray tubes and scattered radiation and method by which fogginess can be reduced.
- To study about the different types radio diagnostic unit, transverse tomography and types of radio detection.
- To know the concepts of MRI functionality and imaging various sections of body.
- To study about the different types of radiation detectors and various organ functions.
- To understand the function of X ray generation and radio isotopes.

OUTCOMES

By successfully completing this course, students will be able to:

- Explain the different radio diagnostic and therapeutic techniques.
- Understand generation of x-rays and its uses in imaging.
- Know techniques used for visualizing different sections of the body.
- Learn radiation therapy methodologies and the radiation safety.

UNIT I: X – RAYS **9**

Principle and production of soft X – Rays, Selection of anodes, heel pattern, Scattered Radiation, Porter-Bucky systems, Cooling System, Testing for various parameters of the unit, principles of Angiography and Fluoroscopic Techniques, Image Intensifiers, Single plane and bi plane recording units, digital subtraction angiography, dental X- ray units.

UNIT II: COMPUTER TOMOGRAPHY **9**

Principle, Plane of Movement, Multisection Radiography, Computerised Axial Tomography, Type of Detection, image reconstruction, Spiral CT, Transverse Tomography.

UNIT III: MAGNETIC RESONANCE IMAGING **9**

Principle of MRI, MRI instrumentation, Imaging Different Sections of the Body, Tissue Characterisation, MR Spectroscopy, Functional MRI.

UNIT IV: EMISSION IMAGING **9**

Alpha, Beta, Gamma Emission, different types of Radiation Detectors, G.M. & Proportional Counters, Pulse Height Analysers, Isotopic, Scanners, Isotopic Diagnosis of RBC Destruction Rate, GI Bleedings Iron Concentration, Liver Functions, Functions of Gamma Camera, PET, SPECT.

UNIT V: RADIATION THERAPY USING X – RAYS AND ISOTOPES **9**

Direct and Indirect effects of high energy radiation, Units for radiation Exposer, Depth Dose curves, Linear Accelerator Betatron, Cobalt and Cesium Therapy, Computation of Absorbed Dose Level, Automatic Treatment Planning, Hazardous Effects of Radiation, Radiation measuring units, Allowed Levels, ICRP regulation Protection Methods.

TOTAL HOURS: 45

TEXT BOOKS

1. Steve Webb, “The Physics of Medical Imaging”, Adam Hilger Philadelphia, 1988.
2. R. S. Khandpur, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1997.

REFERENCES:

1. Chesney D.N~ and Chesney M.O., “X-Ray Equipments for Students Radiographer”, Blackwell Scientific Publications, Oxford, 1971.
2. Jacobson B. and Webster J.G., “Medicine and Clinical Engineering”, Prentice Hall India, New Delhi, 1999.
3. Alexander, Kalender and Linke, “Computer Tomography”, John Wiley, Chichster, 1986.
4. William R. Hendee, E. Russel Ritenour,” Medical Imaging Physics”, Third Edition, Mosby Year Book, St. Louis, 1992

SEMESTER VI

	COMPUTERS IN MEDICINE	L	T	P	C
		3	0	0	3

AIM

- To import the knowledge on computer assistance medicine.

OBJECTIVE

- To understand the basics of computer hardware PC
- To learn how to design the medical system
- To enable the students know about the computers in patient monitoring system
- To understand the medical system modelling by using computer
- To know about computers in medical research

OUTCOMES

By successfully completing this course, students will be able to:

- Exposed to PC hardware as well as various microprocessor family.
- Know the hardware behind data acquisition.
- Learn scope of virtual reality in health care.
- Develop insight knowledge about the biometrics and network security.

UNIT I: OVERVIEW OF COMPUTER HARDWARE PC-AT **9**

8086 architecture, system connections, Instruction set & programming, Microcontrollers, Motherboard and its logic, RS232-C and IEEE bus standards, CRT controllers, FDC,HDC and Post sequence, PC based video card, modems and networking.

UNIT II: SYSTEM DESIGN **9**

Multichannel computerised ECG, EMG and EEG data acquisition, storage and retrieval, transmission of signal and images.

UNIT III: COMPUTERS IN PATIENT MONITORING **9**

Physiological monitoring, automated ICU, computerised arrhythmia monitoring, information flow in a clinical lab, computerised concepts, interfacing to HIS.

UNIT IV: COMPUTERS IN MEDICAL SYSTEMS MODELING **9**

Radiotherapy, drug design, drug delivery system, physiological system modelling and simulation.

UNIT V: COMPUTERS IN MEDICAL RESEARCH **9**

Role of expert systems, pattern recognition techniques in medical image classification, ANN concepts.

TOTAL HOURS: 45

TEXT BOOKS

1. R.D.Lele, “Computers in Medicine”, Tata McGraw-Hill, New Delhi, 1999.
2. Douglas V.Hall, “Microprocessors and Interfacing: Programming and hardware”, McGraw Hill, Singapore, 1999.

SEMESTER VI

	DATA STRUCTURES	L	T	P	C
		3	0	0	3

(Common to ECE, BME, CSE, IT, EEE, EIE & MECHAT)

AIM:

The aim is to introduce the concept of storage of data using list, stack, queue

OBJECTIVES:

- To introduce the concepts of Advanced Data Structures.
- To introduce the concepts of Tree

OUTCOMES

By successfully completing this course, students will be able to:

- Discuss the different methods of organizing large amount of data.
  Know the various tree structures
- Describe the applications of graphs

Unit I Linear Structures **9**

Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists –Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and queues

Unit II Tree Structures **9**

Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – Threaded Binary Trees.

Unit III Balanced Trees **9**

AVL Trees – Splay Trees – B-Tree - heaps – binary heaps – applications of binary Heaps

Unit IV Hashing and Set **9**

Hashing – Separate chaining – open addressing – rehashing – extendible hashing - Disjoint Set ADT – dynamic equivalence problem – smart union algorithms – path compression – applications of Set

Unit V Graphs **9**

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – biconnectivity – Euler circuits – applications of graphs

Total Hours: 45

TEXT BOOK

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition , Pearson Education, 2005.

REFERENCES

1. V. Aho, J. E. Hopcroft, and J. D. Ullman, “Data Structures and Algorithms”, Pearson Education, First Edition Reprint 2003.
2. R. F. Gilberg, B. A. Forouzan, “Data Structures”, Second Edition, Thomson India Edition, 2005.

SEMESTER VI

	DIGITAL IMAGE PROCESSING LAB	L	T	P	C
		0	0	4	2

(Common to ECE, BME & MECHAT)

AIM

- To impart knowledge on Image processing Techniques

OBJECTIVE

- To expertise in writing the program for generalized image processing and to understand its utilization in real time applications.

OUTCOMES

By successfully completing this course, students will be able to:

- Perform filtering operations in the image
- Use transforms and analyse the characteristics of the image.
- Write program to analyse the texture of the image
- Apply image processing technique to solve real world problems

LIST OF EXPERIMENTS:

1. Image types – acquisition and display
2. Image Transforms – fourier and inverse fourier
3. Image Transforms – DCT,
4. Image Transforms – Hadamard
5. Image Enhancement – Histogram Equalisation
6. Image Smoothening
7. Image Sharpening
8. Edge detection
9. Image restoration – Noise removal
10. Image Restoration – Inverse filtering
11. Image Compression – Lossy compression
12. Image Compression – Wavelet coding

SEMESTER VI

	DIAGNOSTIC AND THERAPUTIC EQUIPMENTS LAB	L	T	P	C
		0	0	4	2

AIM

- To enable the students to know about the various Diagnostic & Therapeutic Equipments and measuring of various biological signals.

OBJECTIVES

- Recording of various Physiological signal and analysis.
- Study of different Therapeutic Equipments

OUTCOMES

- The learner is able to analyze the Bio medical signals, to check the safety of any medical equipments and to have the knowledge about therapeutic equipments.

LIST OF EXPERIMENTS

1. Recording and analysis of ECG signals.
2. Recording and analysis of EEG signals.
3. Recording - Fatigue test of EMG signals.
4. Simulation of ECG – detection of QRS complex and heart rate
5. Study of Pacemaker simulator
6. Study of Defibrillator simulator
7. Study of shortwave and ultrasonic diathermy.
8. Study of biotelemetry
9. Electrical safety measurements.

SEMESTER VI

	DATA STRUCTURES AND OOPS LAB	L	T	P	C
		0	0	4	2

AIM

- To teach the principles of good programming practice and to give a practical training in writing efficient programs in C++

OBJECTIVES

- To teach the students to write programs in C++
- To implement the various data structures as Abstract Data Types
- To write programs to solve problems using the ADTs

OUTCOMES

At the end of the course, the student should be able to:

- Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.
- Apply good programming design methods for program development.
- Apply the different data structures for implementing solutions to practical problems.

Implement the following exercises using C++:

1. Exercises using Objects, Classes, Inheritance, Operator Overloading and Polymorphism.
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list and Array implementations of Stack ADT
4. Queue ADT
5. Quick Sort
6. Design C++ classes with static members, methods with default arguments, friend functions. (For example, design matrix and vector classes with static allocation, and a friend function to do matrix-vector multiplication)
7. Implement complex number class with necessary operator over loadings
8. Overload the new and delete operators to provide custom dynamic allocation of memory.
9. Develop a template of linked-list class and its methods.
10. Develop templates of standard sorting algorithms such as merge sort.

SEMESTER VII

	HOSPITAL MANAGEMENT	L	T	P	C
		3	0	0	3

AIM

- To introduce the students to the field of hospital and equipment management.

OBJECTIVE

- To understand the overview of hospital organization and planning.
- To study about the principles and tools of human resource management and manpower planning in hospitals.
- To understand the process of recruitment and training in hospitals and to know about the various departments of hospital.
- To plan the maintenance of records in the other supportive departments of hospital such as food, pharmacy.
- To study about various types of communication and safety aspects in hospital.

OUTCOMES

At the end of the course, the student should be able to:

- Explain the principles, practices and areas of application in Hospital Management.
- Have Knowledge about the health organization of the country.
- Have a well-founded knowledge hospital organization and management
- Have a fundamental knowledge of regulatory requirement and health care codes
- Have a skills about the equipment maintenance management
- Acquire the skills Function, role of Clinical Engineer.

UNIT I : OVERVIEW OF HOSPITAL ADMINISTRATION 9

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning.

UNIT II: HUMAN RESOURCE MANAGEMENT ON HOSPITAL 9

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD –Human Resource Inventory – Manpower Planning.

UNIT III: RECRUITMENT AND TRAINING 9

Different Departments of Hospital, Recruitment, Selection, Training Guidelines –Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV: PLANNING SUPPORTIVE SERVICES 9

Medical Records Department – Central Sterilization and Supply Department –Pharmacy – Food Services - Laundry Services.

UNIT V: COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL 9

Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.

TOTAL HOURS: 45

TEXT BOOKS:

1. R.C.Goyal, “Hospital Administration and Human Resource Management”, PHI –Fourth Edition, 2006.
2. G.D.Kunders, “Hospitals – Facilities Planning and Management – TMH, NewDelhi – Fifth Reprint 2007.

REFERENCE:

1. Cesar A. Caceres and Albert Zara, “The Practice of Clinical Engineering”, Academic Press, New York, 1977.

SEMESTER VII

	BIO TELEMETRY	L	T	P	C
		3	0	0	3

AIM

- To study the overall concept of a Biotelemetry system and the concept of signal transmission.

OBJECTIVE

- To study the basic concepts and the principles used in a Telemetry system.
- To study the building blocks used to make a telemetry system.
- To study the transmission and reception of a system.
- To know about how optical fibers are used in signal transmission.
- To study about the applications.

OUTCOMES

At the end of the course, the student should be able to:

- Know the fundamental concept of biotelemetry
- Describe the types of biotelemetry
- Learn about the applications of biotelemtry

UNIT – I **9**

Fundamental concepts – Significance, Principle, functional blocks of Telemetry and Telecontrol system-Methods of telemetry – Electrical, Pneumatic, Hydraulic and Optical Telemetry – State of the art-Telemetry standards.

UNIT – II **9**

Electrical Telemetry-Current Systems – Voltage Systems – Synchro Systems – Frequency systems – Position and Pulse systems – Example of a landline telemetry system.

UNIT – III **9**

Block diagram of a Radio Telemetry system – Transmitting and receiving techniques – AM, FM, PM, Multiplexing and demultiplexing – Transmitting and receiving techniques – Digital coding methods – Advantages of PCM, PWM, PM, FSK – Delta modulation – coding and decoding equipment – Example of a radio telemetry system.

UNIT – IV **9**

Optical fibers for signal transmission – Sources for fiber optic transmission – Optical detectors – trends in fiber – optic device development – Example of an optical telemetry System.

UNIT – V **9**

Use of computers in distance mode of healthcare delivery, Web technology, Satellite communication systems; hypertext, voice & image transfer protocols, Medical image scanning, Data compression and Transfer, Capturing of medical signals, Analog to digital conversion, Video conferencing, Remote sensing, Rural primary setups, Referral and Super specialty centers, Societal medico legal aspects, Networking (local, national & global).

TOTAL HOURS: 45

TEXT BOOKS

1. D.Patranabis, Telemetry principles, Tata Mcgraw Hill Publishers (UNIT I, II, III, IV)
2. Marilyn J. Field, Telemedicine: A Guide to Assessing Telecommunications for Health Care, National Academic Press, 1996 (UNIT V)

REFERENCE BOOKS

1. Charles J. Amlaner (Author), David W. Macdonald (Author), A Handbook on Biotelemetry and Radio Tracking, Pergamon Press; 1st edition (January 1, 1980)

SEMESTER VII

	ASSIST DEVICES	L	T	P	C
		3	0	0	3

AIM

- To study about the different types of medical devices which will restore normal functional ability of particular organ which is defective temporarily or permanently.

OBJECTIVE

- Be able to list the principle and operation of devices that will help failing heart
- To study the various types of artificial kidney which does the clearance of urea from the blood
- Be able to list the various types of hand and leg replacement devices to overcome the orthopedic problems
- To understand the various types of hearing losses and hearing aids
- To know about devices which is used to assist the respiration & understand electrical stimulation techniques used in clinical applications.

OUTCOMES

At the end of the course, the student should be able to:

- Explain the functioning and usage of electromechanical units which will restore normal functional ability of particular organ that is defective temporarily or permanently.

UNIT I: CARDIAC ASSIST DEVICES **9**

Synchronous Counter pulsation, Assisted through Respiration Right Ventricular Bypass Pump, Left Ventricular Bypass Pump, Open Chest and closed Chest type, Intra Aortic Balloon Pumping Veno Arterial Pumping, Prosthetic Cardio Valves, Principle and problem, Biomaterials for implantable purposes, its characteristics and testing.

UNIT II: ARTIFICIAL KIDNEY **9**

Indication and Principle of Haemodialysis, Membrane, Dialysate, Different types of heamodialysers, Monitoring Systems, Wearable Artificial Kidney, Implanting Type.

UNIT III: PROSTHETIC AND ORTHODIC DEVICES **9**

Hand and Arm Replacement - Different Types of Models Externally Powered Limb Prosthesis Feedback in Orthodic System, Functional Electrical Stimulation, Sensory Assist Devices, Materials for Prosthetic and orthodic devices, Haptic Devices

UNIT IV: HEARING AIDS **9**

Common tests – audiograms, air conduction, bone conduction, masking techniques, SISI, Hearing aids – principles, drawbacks in the conventional unit, DSP based hearing aids.

UNIT V: RESPIRATORY AND RECENT TRENDS **9**

Intermittent positive pressure, Breathing Apparatus Operating Sequence, Electronic IPPB unit with monitoring for all respiratory parameters. Transcutaneous electrical nerve stimulator, bio-feedback.

TOTAL HOURS: 45

TEXT BOOKS

2. Kolff W.J., Artificial Organs, John Wiley and Sons, New York, 1979.
3. Andreas.F.Vonracum, “Hand book of bio material evalution”, Mc-Millan publishers.

4. Albert M.Cook and Webster J.G., Therapeutic Medical Devices, Prentice Hall Inc., New Jersey, 1982

REFERECE BOOKS

1. Gray E Wnek, Gray L Browlin – "Encyclopedia of Biomaterials and Biomedical Engineering" – Marcel Dekker Inc New York 2004.
2. John. G . Webster – "Bioinstrumentation", John Wiley & Sons (Asia) Pvt Ltd - 2004.

SEMESTER VII

	MEDICAL OPTICS	L	T	P	C
		2	1	0	3

AIM

To learn about the properties of light and its applications.

OBJECTIVE

- To study the properties of light
- To study about the source and detectors of light.
- To study the applications of light.
- To study the characteristics of Holography.
- To study the characteristics of Tomography.

OUTCOMES

At the end of the course, the student should be able to:

- Demonstrate knowledge of the fundamentals of optical properties of tissues
- Describe surgical applications of laser.
- Describe photonics and its therapeutic applications.

UNIT I : OPTICAL PROPERTIES OF THE TISSUES 9

Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles.

UNIT II: INSTRUMENTATION IN PHOTONICS 9

Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, LASERs, optical filters, polarisers, solid state detectors, time resolved and phase resolved detectors.

UNIT III: APPLICATIONS OF LASERS 9

Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology.

UNIT IV: OPTICAL HOLOGRAPHY 9

Wavefronts, Interference patterns, principle of hologram, optical hologram, applications.

UNIT V: OPTICAL TOMOGRAPHY 9

Optical coherence tomography, Elastography, Doppler optical coherence tomography, Application towards clinical imaging.

TOTAL HOURS: 45

TEXT BOOK

1. Leon Goldman, M.D., & R.James Rockwell, Jr., “Lasers in Medicine”, Gordon and Breach, Science Publishers Inc., New York, 1971.

REFERENCE BOOK

1. Mark E. Brezinski., “Optical Coherence Tomography: Principles and Applications”, Academic Press, 2006.

SEMESTER VII

	ENGINEERING MANAGEMENT & ETHICS	L	T	P	C
		3	0	0	3

(Common to ECE, BME, CSE, IT, EEE, EIE & MECHAT)

AIM

The aim of this module is to introduce students to the fundamentals of management.

OBJECTIVE

- To facilitate the students on the basis of Management concepts and the history behind the evolution of management thought and to know about trends and challenges in today's world.

OUTCOMES

At the end of the course, the student should be able to:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society

UNIT I PLANNING **9**

Nature and purpose of planning - Planning process - Types of plans – Objectives Managing by objective (MBO) Strategies - Types of strategies - Policies – Decision Making - Types of decision - Decision Making Process - Rational Decision Making Process - Decision Making under different conditions.

UNIT II ORGANIZING **9**

Nature and purpose of organizing - Organization structure - Formal and informal groups / organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - Performance Appraisal.

UNIT III DIRECTING **9**

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication - Organization Culture - Elements and types of culture – Managing cultural diversity.

UNIT IV INTRODUCTION TO ETHICS **9**

Moral dilemmas -Uses of Ethical Theories- Engineering As Social Experimentation- Engineer's Responsibility For Safety-Codes of Ethics-Challenger Case Study

UNIT V ETHICS IN ENGINEERING **9**

Employed Engineers Rights and Duties- Collective Bargaining-Occupational Crime- Global Issues-Multinational Corporation- Technology transfer-Engineers as managers-Consulting Engineers-Expert Witness-Moral Leadership

TOTAL HOURS: 45

TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.
3. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).

REFERENCES:

1. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, (1999).
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
4. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective”, Biztantra, New Delhi, (2004)
6. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press, (2003)

SEMESTER VII

	BIO SENSORS AND SIGNAL CONDITIONING LAB	L	T	P	C
		0	0	4	2

AIM

- To understand the implementation of filtering techniques and to simulate the Bio Signals using Matlab.

OBJECTIVES

- To analyse the Bio Signals like ECG, EEG, EMG and simulate the Bio Signals.

OUTCOMES

At the end of the course, the student should be able to:

- Study about DFT Computation and Fast Fourier Transform.
- Able to analyse the signals in terms of frequency spectrum and to determine the power.

LIST OF EXPERIMENTS

1. Representation of time-series; computation of convolution.
2. Response of a difference equation to initial conditions; stability.
3. DFT computation.
4. Computational experiments with digital filtering.
5. Sampling and waveform generation.
6. FIR and IIR filters implementation.
7. Fast Fourier Transform.
8. Simulation of bio signals.
9. Analysis of ECG signals.
10. Analysis of EEG signals
11. Analysis of EMG signals

SEMESTER VII

	HOSPITAL TRAINING	L	T	P	C
		0	0	4	2

AIM

- To Understand the various médical Equipment used in hospital.

OBJECTIVES

- To understand the working principle of medical euipments
- To maintain and caliberate the medical euipments
- To know the electrical hazards.

OUTCOMES

At the end of the course, the student should be able to:

- Describe the working principle of medical euipments
- Maintain and caliberate the medical euipments
- Know the electrical hazards.

SEMESTER VII

	COMPREHENSION	L	T	P	C
		0	0	4	2

AIM

- The objective of "Comprehension" is to provide opportunity for the student to apply the knowledge acquired during the earlier semesters to real-life problems which he/she may have to face in future as an engineer.

OBJECTIVES

- While learning as to how to solve real life problems, the student will receive guidance from teachers and also review various courses (subjects) learnt earlier.

- The comprehension assessment will consist of 100 to 5 tests in each Streams covering all the subject of study in the respective streams under B.E. Electronics and Communication Engineering Course.

OUTCOMES

At the end of the course, the student should be able to solve the problems in the subject of study in the respective streams under B.E. Electronics and Communication Engineering Course.

SEMESTER VIII

	PROJECT WORK & VIVA VOCE	L	T	P	C
		0	0	12	6

AIM

- The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

OBJECTIVE

- The objective of the project work is to enable the students to form the groups of not more than 3 members on a project involving theoretical and experimental studies related to the branch of study.

- Formation of Group as follows
  - Group A : 8.5 CGPA and above
  - Group B : 7 to 8.49 CGPA
  - Group C : 5 to 6.9 CGPA

  Group A Student will have a choice to take 2 students from Group B & C

- Every project work shall have a guide who is the member of the faculty of the institution. Six periods per week shall be allotted in the time table and this time shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodical seminars on the progress made in the project.

- The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department.

- Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, project work details and conclusion.

- This final report shall be typewritten form as specified in the guidelines.

- The continuous assessment shall be made as prescribed in the regulations

OUTCOMES

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

ELECTIVE

	TISSUE ENGINEERING	L	T	P	C
		3	0	0	3

AIM

To study the basic structures of cell, molecular biology aspects and tissue engineering

OBJECTIVE

- To understand the structure and organization of tissues
- To understand the cell culture
- To study about the molecular biology aspects
- To know about the scaffolding and transplantation of tissues
- To understand the regulatory issues in tissue engineering

OUTCOMES

On completion of this course

- Student will identify the various structures of tissues and how it organised in the body
- Student will identify the various types of cells the mechanism of cell culture
- Student will acquire molecular biology aspects such as cell signalling, cell attachment, adhesion etc.
- Students will know the preparation of scaffold and its usefulness in tissue transplant.
- Students will gain the ethics and regulatory issues in tissue engineering

UNIT – I: INTRODUCTION **9**

Basic definition, Structural and organization of tissues: Epithelial, connective; vascularity and angiogenesis, basic wound healing, cell migration, current scope of development and use in therapeutic and in-vitro testing.

UNIT – 2: CELL CULTURE **9**

Different cell types, progenitor cells and cell differentiations, different kind of matrix, cell-cell interaction. Aspects of cell Culture: cell expansion, cell transfer, cell storage and cell characterization, Bioreactors.

UNIT – 3: MOLECULAR BIOLOGY ASPECTS **9**

Cell signaling molecules, growth factors, hormone and growth factor signaling, growth factor delivery in tissue engineering, cell attachment: differential cell adhesion, receptor-ligand binding, and Cell surface markers.

UNIT – 4: SCAFFOLD AND TRANSPLANT **9**

Engineering biomaterials for tissue engineering, Degradable materials (collagen, silk and polylactic acid), porosity, mechanical strength, 3-D architecture and cell incorporation. Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver. Basic transplant immunology stems cells: introduction, hepatopoiesis.

UNIT – 5: CASE STUDY AND REGULATORY ISSUES **9**

Case study of multiple approaches: cell transplantation for liver, musculoskeletal, cardiovascular, neural, visceral tissue engineering. Ethical, FDA and regulatory issues of tissue engineering.

TOTAL HOURS: 45

TEXT BOOKS:

1. "Principles of tissue engineering", Robert. P. Lanza, Robert Langer & William L. Chick, Academic press.

2. “The Biomedical Engineering –Handbook”, Joseph D. Bronzino, CRC press.
3. “Introduction to Biomedical Engg.” Endarle, Blanchard &Bronzino, Academic press.
4. “Tissue Engineering”, B. Palsson, J.A. Hubbell, R. Plonsey & J.D. Bronzino, CRC- Taylor & Francis

ELECTIVE

	BIOMEDICAL INFORMATICS	L	T	P	C
		3	0	0	3

AIM

To study the applications of information science and its impact in medical field

OBJECTIVE

- To understand the hospital management system and integrated hospital information system
- To know about the basic concepts of artificial intelligence and expert systems
- To study the hospital management information systems and computer assisted patient education
- To understand the concept of 3 dimensional imaging and its applications
- To study the concepts of telemedicine, its issues and reliability

OUTCOMES

On completion of this course

- Student will know how to manage the patient related information in hospitals.
- Students will master over artificial intelligence and design of expert systems
- Students will know how to assist patients using computers and making computer assisted surgery
- Students will know usages of endoscopes and its limitations.
- Students will acquire the concepts of telemedicine and tele surgery, its issues and reliability..

UNIT I: **9**

Introduction - Hospital management and information system: functional area - pre-requisites - integrated hospital information systems - health information system- and disaster management plan.

UNIT II: **9**

Artificial intelligence - expert systems - materials and methods- computer based patient Records- computer assisted medical education

UNIT III: **9**

Hospital Management and Information systems - structure and functions - computer assisted patient education computer assisted patient surgery

UNIT IV: **9**

Three-dimensional imaging: limitations of endoscopy and imaging - benefits of virtual endoscopy - materials and methods- limitations- applications - merits and demerits - surgical simulation - virtual environment

UNIT V: **9**

Telemedicine – needs - materials and methods - Internet telemedicine - controversial issues – reliability - cost analysis – applications – telesurgery - the Internet

TOTAL HOURS: 45

TEXT BOOK:

1. Mohan Bansal, “Medical Informatics- a primer”, Tata McGraw-Hill, 2003.

REFERENCE BOOKS:

1. Hsinnchun Chen, “Medical Informatics: Knowledge Management and Data Mining in Biomedicine”, Springer, 2005.
2. F. T. De Dombal, “Medical Informatics: The Essentials”, Butterworth-Heinemann, 1996.
3. Charles P. Friedman, Jeremy C. (EDT) Wyatt, “Evaluation Methods in Medical Informatics” - Springer Verlag, 1997.

ELECTIVE

	BIOFLUIDS AND DYNAMICS	L	T	P	C
		3	0	0	3

AIM

- The need for engineers with integrated multidisciplinary knowledge is expected to grow along with the rapid advances in biomedical science and technology. This course elaborates on the application of fluid mechanics principles to major human organ systems.

OBJECTIVE

- The objective of this course is to learn about
- Introduction to physiologically relevant fluid flow phenomena, underlying physical mechanisms from an engineering perspective.
- On the integration of various fluid mechanics concepts to address relevant problems of the human body's systems

OUTCOMES

On completion of this course

- The students will apply the fundamentals of mechanics to bio fluids
- Students will know the properties of blood and will find the problem related to flow of blood in vessels.
- Students will identify the mechanism of heart and will find the need of prosthetic vales if pathology.
- Students will know the mechanical properties of soft tissues which is very useful while prostheses.
- Students will know the mechanical properties of soft and hard tissues which are very useful while prostheses.

UNIT I: BIO-FLUID MECHANICS **10**

Newton's laws, Stress, Strain, Elasticity, Hooks-law, viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic fluids, vascular tree, Relationship between diameter, velocity and pressure of blood flow, Resistance against flow. Bioviscoelastic fluid: Viscoelasticity - Viscoelastic models, Maxwell, Voigt and Kelvin Models,Response to Harmonic variation, Use of viscoelastic models, Bio-Viscoelastic fluids: Protoplasm, Mucus, Saliva, Synovial fluids.

UNIT II: FLOW PROPERTIES OF BLOOD **10**

Physical, Chemical and Rheological properties of blood. Apparent and relative viscosity, Blood viscosity variation: Effect of shear rate, hematocrit, temperature,protein contents of blood. Casson's equation, Problems associated with extracorporeal blood flow. Rheology of blood in microvessels: Fahraeus - Lindquist effect and inverse effect, distribution of suspended particles in a narrow rigid tube. Nature of red blood cells in tightly fitting tubes, hematocrit in very narrow tube.

UNIT III: CARDIAC MECHANICS **8**

Cardiovascular system. Mechanical properties of blood vessels: arteries, arterioles, capillaries and veins. Blood flow: Laminar and Turbulent, Physics of cardiovascular diseases, Prosthetic heart valves and replacements.Respiratory mechanics: Alveoli mechanics, Interaction of Blood and Lung P-V curve of Lung, Breathing mechanism, Airway resistance, Physics of Lung diseases.

UNIT IV: SOFT TISSUE MECHANICS **9**

Pseudo elasticity, non-linear stress-strain relationship, Viscoelasticity, Structure, function and mechanical properties of skin, ligaments and tendons.

UNIT V: ORTHOPEDIC MECHANICS **8**

Mechanical properties of cartilage, diffusion properties of Articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, lubrication of joints.

TOTAL HOURS: 45

TEXT BOOKS:

1. Y.C Fung, Biomechanics- “Mechanical properties of living tissues”, 2nd ed, Springer - Verlag, 1993.
2. D.O Cooney, “Biomedical engineering Principles”. Marcel Dekker, INC New York,1976.

REFERENCE BOOKS:

1. Silver Frederick H. “Biomaterials, Medical Devices & Tissue Engineering”,Chapman & Hall, London, 1994
2. D.A Mc Donald, Blood flow in arteries, Edward Arnold ltd, 1998.

ELECTIVE

	BIOMEDICAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

AIM:

To understand the concepts of Biomedical Signal processing.

OBJECTIVE:

- To learn about the Basics of signal processing
- To learn about various compression techniques in Biomedical signals
- To learn about the Cardiological signals processing
- To learn about the concepts of Noise canceling.
- To learn about the techniques of neurological signal processing

OUTCOMES

On completion of this course

- Students will apply the various signal processing techniques to modify the signal according to need.
- Students will transmit the signal using biotelemetry with signal reduction techniques.
- Students will familiar with pre and post processing of cardiac signal.
- Students will apply the adaptive noise cancelling techniques to remove the noise in ECG signal.
- Students will identify the various types of EEG waves and able to indentify the brain disorders like epilepsy

UNIT-I: INTRODUCTION TO SIGNAL PROCESSING **9**

Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables. Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, noise figure of systems.

UNIT-II: DATA COMPRESSION TECHNIQUES **9**

Lossy and Lossless data reduction Algorithms, ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantization, DCT transform.

UNIT-III: CARDIOLOGICAL SIGNAL PROCESSING **9**

Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition, Heart rate variability analysis.

UNIT-IV : ADAPTIVE NOISE CANCELING **9**

Principles of Adaptive Noise Canceling, Adaptive Noise Canceling with the LMS adaptation Algorithm, Noise Canceling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT-V: NEUROLOGICAL SIGNAL PROCESSING **9**

Modeling of EEG Signals, Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves - Auto Regressive (A.R.) modeling of seizure EEG - Sleep Stage analysis - Inverse Filtering - Least squares and polynomial modeling.

TOTAL HOURS: 45

TEXT BOOKS:

1. Rangaraj M. Rangayyan – "Biomedical Signal Analysis". IEEE Press, 2001.
2. D.C.Reddy, "Biomedical Signal Processing- principles and techniques", Tata McGraw-Hill, 2005.
3. "Biomedical Digital Signal Processing", Willis J.Tompkins, PHI,

REFERENCE BOOKS:

1. Weitkunat R, "Digital Bio signal Processing", Elsevier, 1991.
2. Akay M , "Biomedical Signal Processing", Academic: Press 1994
3. Cohen.A, "Biomedical Signal Processing", -Vol. I Time & Frequency Analysis, CRC Press, 1986.

ELECTIVE

	THERAPEUTIC AND SURGICAL EQUIPMENTS	L	T	P	C
		3	0	0	3

AIM

To provide the knowledge about various types of surgical and Therapeutic equipments

OBJECTIVIES

- To understand the need of Pacemaker and Defibrillator and its types
- To know about the working principle of surgical Diathermy
- It deals with artificial kidney
- It provides the knowledge about Anesthesia machine and X-ray machine
- Enable the students to understand the Artificial respiration

OUTCOMES

On completion of this course

- Students can apply the pacemaker and defibrillator to cardiac patience.
- Students can apply the surgical diathermy instruments to patients who are in need of physiotherapy.
- Students will know how to dialysis for kidney patients and use of lithotripsy for stone removal.
- Students will know how to give Anesthesia for patients for surgery.
- Students will know the usage of ventilators for artificial respiration.

UNIT I: PACEMAKER AND DEFIBRILLATOR 9

Cardiac Pacemakers - Need for Cardiac Pacemaker - External Pacemakers - Implantable Pacemakers – Recent Developments in Pacemaker system analyzer. Cardiac Defibrillators -Need for a Defibrillator - DC Defibrillator -Implantable Defibrillators – Pacer-cardio vector Defibrillator analysis.

UNIT II: INSTRUMENTS FOR SURGERY AND TREATMENT 9

Instruments for surgery - principle of surgical diathermy - surgical diathermy machine - safety aspects in Electro-Surgical diathermy Units. Physiotherapy and electrotherapy equipment - High frequency heat therapy – shortwave Diathermy - Microwave diathermy - Ultrasonic therapy unit – Pain relief through Electrical Stimulation – Bladder Stimulators – Cerebellar Stimulators.

UNIT III: HAEMODIALYSIS MACHINE AND LITHOTRIPTERS 9

Haemodialysis Machines - Function of the kidneys - Artificial Kidney – Dialyzers - Membrances of haemodialyzers- Haemodialysis machines - Portable Kidney machines. Lithotripters – The stone disease problem - First lithotripter machine – modern lithotripter systems - Extracorporeal Shockwave Therapy

UNIT IV: ANESTHESIA MACHINE AND RADIO THERAPY EQUIPMENTS 9

Need for Anesthesia – Anesthesia machine - Electronics in Anesthesia machine. Radiotherapy Equipment – Use of High voltage X-Ray machines - Development of Betatron, Heart lung Machine.

UNIT V: VENTILATORS 9

Mechanics of Respiration - Artificial Respiration – Ventilators - Types of ventilators - Ventilator terms - Classification of Ventilators – Pressure – volume - flow Diagrams - Modern ventilators - High frequency ventilators. Humidifiers - Nebulizers and Aspirators.

TOTAL PERIODS: 45

TEXT BOOK:

1. R. S. Khandpur, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill Publication company Ltd, New Delhi, 1997.

REFERENCE BOOKS:

1. Joseph. J Carry and John. J. Brown, “Introduction to Biomedical Equipment Technology”, 4th Edition, Pearson Education, 2003.
2. John G Webster, “Medical Instrumentation: Application and Design” John Wiley & Sons, 1998.
3. John G Webster, "Bioinstrumentation", John Wiley & Sons, 2004.

	ELECTIVE	L	T	P	C
	BIOMEDICAL ROBOTICS AND AUTOMATION	**3**	**0**	**0**	**3**

AIM

- This paper attempts to edify the student on the basics of automation, its design and control. It lays emphasis on specialized robotic systems and critical surgeries performed and recent technical innovations and future applications especially in micro and nano scale surgery.

OBJECTIVES

- To understand the concept of automation and apply the same in the field of medicine
- To appreciate the accuracy and precision achieved by robotic systems which is critically essential in surgical procedures
- To ascertain the design, integration and control of robotic systems and discover solutions to challenges posed by the technical side of medical robotics
- It endeavors to enlighten the student on the cutting-edge technologies used presently.
- Their limitations and the need for miniature equipments to provide better surgical results.

OUTCOMES

On completion of this course

- Student will get the knowledge of how to configure and manipulate the robots.
- Student will get the knowledge of types of robots and usage of intelligent tools for robotic systems design.
- Students will develop mobile robots.
- Students will get familiar in recent advances in micro mechatronics.
- Students can apply the applications of robotics in biomedical devices..

UNIT I: INTRODUCTION **9**

Geometric configuration of robots - manipulators - drive systems - internal and external sensors - end effectors - control systems - robot programming languages and applications - Introduction to robotic vision

UNIT II: ROBOTIC SURGERY **9**

Surgical robots-types, advances and advantages. Technologies involved in robotic surgery-sensors, actuators, micromechanics, communication control, virtual reality and artificial intelligence. Application of intelligent tools for robotic systems design, integration of electronics and communications systems with human nerve network.

UNIT III: MOBILE ROBOTICS **9**

Architecture for advanced mobile robotics, actuator design, navigation, obstacle avoidance, sensors and vision systems. Legged robotic devices, control of mobile robots in semi structured environment - Advanced robotics: control, instrumentation - navigation - route planning - autonomous operation - haptic interface - haptic feedback in systems design - system architecture - data fusion, system integration.

UNIT IV: ADVANCES IN MICROMECHATRONICS **9**

Robot force control strategies, autonomous mobile multi jointed systems. Robotic systems: current applications of the da Vinci system, Zeus, neuro arm, cyber knife, ROBODOC, robotic radio surgery system, pintrace. Application of FES for restoration of locomotion. Development of specialized sensors for online monitoring of biological parameters, computer assisted surgery, rehabilitation robotics in virtual environment, applications in unstructured environment.

UNIT V: BIOMEDICAL APPLICATIONS **9**

Nerve cell repair using micro mechatronics, micro and Nano devices for targeted delivery of medicines to tumour sites and diagnosis using navigable biosensors. Surgeries performed using robotic systems- TECAB, mitral valve surgery, bariatric surgery, minimally invasive surgeries. Surgical procedures in general surgery, neurology, urology, gasteroenterology, cardiology, Orthopedics, paediatrics and radio surgery.

TOTAL HOURS: 45

TEXT BOOKS

1. "Advanced Robotics & Intelligent Machines", by J. O. Gray, Institution of electrical engineers, Darwin G. Caldwell, D. G. Campbell, Institution of Electrical Engineers (1996)
2. "Computer Vision, Virtual Reality and Robotics in Medicine", by Nicholas Ayache Springer-Verlag (1995)3. Robotics Research by Raymond A. Jarvis, Alexander Zelinsky Springer (2003).
3. "Embedded Robotics", by Thomas Bräunl Springer (2003)

	ELECTIVE	L	T	P	C
	MEDICAL IMAGING TECHNIQUES	**3**	**0**	**0**	**3**

AIM

- To study the various imaging techniques used in biomedical field.

OBJECTIVES

- To understand the concept of image transforms and to study the different image processing systems.
- To study the various image enhancement techniques.
- To analyze the image
- To study the image reconstruction techniques.
- Study of image compression and to classify lossy and loss less compression
-

OUTCOMES

On completion of this course

- Student will get the knowledge of how to process the image..
- Student will get the knowledge of enhancement of image to improve the image quality
- Students will do the image processing techniques like edge detection, segmentation, feature extraction etc.
- Students will reconstruct the image in CT, MRI etc.
- Students can compress the image using various techniques for transmission..

UNIT-I: IMAGE PROCESSING SYSTEMS & IMAGE TRANSFORMS **9**

Image perception, Computer graphics and Image processing. MTF of the visual system, Image fidelity criteria, Image model, Image sampling and quantization, Windowing, Neighborhood operations. 2D - sampling theory, Image quantization, optimum mean square quantizer, Image transforms - 2D - DFT and other transforms. Rotation, resizing, mathematical transforms of image.

UNIT-II: IMAGE ENHANCEMENT **9**

Image enhancement, point operation, Histogram modeling, spatial domain operations, Frequency domain operations, Image restoration, Image degradation Model, Inverse and Wiener filtering.

UNIT-III: IMAGE ANALYSIS **9**

Image Analysis, Image Spatial feature extraction, edge detection, Image segmentation, Classification techniques, Color image processing.

UNIT-IV: RECONSTRUCTION TECHNIQUES **9**

Image reconstruction from projections, Random transform, filter back projection algorithm, Algebraic methods, 3D Tomography, Imaging methods in CT scanners, Reconstruction of CT images, Imaging methods in MRI images, Fourier reconstruction of MRI, 3D imaging, Depth from Triangulation, Time of flight, multiple projections.

UNIT-V: IMAGE COMPRESSION **9**

Image compression - Lossy & Lossless compression, transform coding, pixel coding, predictive coding, Interference coding

TOTAL HOURS: 45

TEXT BOOKS

1. Gonzalaz. R and Wintz P. "Digital Image Processing", Addision Wesley Publishing Co, 2007
2. Anil. K.J, "Fundamentals of digital Image Processing", Prentice Hall of India Pvt. Ltd., New Delhi, 1995
3. Bernd Jahne, "Digital Image Processing", 6th revised and extended edition, Springer

REFERENCE BOOKS

1. Semmlow John L. "Biosignal & Biomedical Image Processing - MATLAB based applications", Marcel Dekker Inc.,
2. Albert Macouski, "Medical Imaging systems", Prentice Hall, New Jersey
3. Eric Kresetl, "Imaging Systems for Medical Diagnosis", Siemens

	ELECTIVE	L	T	P	C
	ADVANCED BIOMATERIALS	3	0	0	3

AIM

- This course is designed to introduce students to a more advanced understanding of Biomaterials and clinically relevant biomaterial performance.

OBJECTIVES

- To make students be familiar with the general types of polymeric and natural materials used in soft and tissue replacements, such as nerve replacement and skin regeneration.
- This includes skin, Hard and soft tissue regeneration. Biomaterials available for burn patients, cancer patients, and trauma patients are the central theme of this course.
- To understand the rationale for the design of clinically available biomaterials for patients undergoing soft tissue replacement surgeries
- Understand biomaterial selection, design, and structure-function relationships
- Understand the concept and evaluation of biocompatibility

OUTCOMES

On completion of this course

- Student will identify solid structures for imperfections.
- Student will get the knowledge of usage and types of metallic implants.
- Student will get the knowledge of usage and types of polymeric implants.
- Students will get the knowledge of need of biocompatibility to avoid tissue rejection.
- Students will synthesis Nano drugs and know drug delivery systems.

UNIT I: STRUCTURE OF SOLIDS **9**

Crystal structure of solids - crystal imperfections - noncrystalline solids. Strength of biomaterials: Strength and strengthening mechanisms of metals, ceramics, glasses and polymers. Surface properties of materials - physical properties of materials - Mechanical properties - Viscoelasticity. Applications of polymers, metals, ceramics and composite as biomaterials for implantation

UNIT II: METALLIC IMPLANTS MATERIALS **9**

Stainless steel, Co-based alloys, Ti and Ti-based alloys Ceramic implant materials: Nanoparticles relating to Aluminium oxides Aluminium oxides Glass ceramics, Carbons. Hard tissue replacement implant: Orthopedic implants, Nano crystalline structures of Bone and Calcium phosphate cements Dental implants. Nano dental materials

UNIT III: POLYMERIC IMPLANT MATERIALS **9**

Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers. Rubbers, Thermoplastics. Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes. Synthetic polymeric membranes and their biological applications. Biopolymers in controlled release systems Preparation of nanobiomaterials. Soft tissue replacement implants: Percutaneous and skin implants, Vascular implants, Heart valve implants, Artificial skin. Dialysis membrane, Tailor made composite in medium

UNIT IV: BIOCOMPATIBILITY **9**

Definition, Wound healing process-bone healing, tendon healing. Material response: Function and Degradation of materials in vivo. Host response: Tissue response to biomaterials, Effects of wear particles.

Testing of implants: Methods of test for biological performance - Invitro implant tests, Invivo implant test methods. Qualification of implant materials

UNIT V : SYNTHESIS OF DRUGS **9**

Synthesis of nanodrugs - metal nanoparticles and drug delivery vechicles - Nanoshells - Tectodentrimers Nanoparticle drug systems - Diagnostic applications of nanotechnology

TOTAL HOURS: 45

TEXT BOOKS

1. J B Park, "Biomaterials - Science and Engineering", Plenum Press, 1984.
2. Jonathan, "Biological Performance of materials", Marcel Decker, 1981.
3. Lawrence Stark & GyanAgarwal, "Biomaterials".

REFERENCE BOOKS

1. “Nanofabrication towards biomedical applications:, wiley - VCHVerlag GmbH & CO,

	ELECTIVE	L	T	P	C
	QUALITY CONTROL IN MEDICAL ENGINEERING	3	0	0	3

AIM

- The course is designed to make the student better understanding of Quality standards and management methodologies in medical Engineering.

OBJECTIVES

- After active participation in this course and an effort to learn overview of various methodologies used for management in health care.
- To understand the various Quality standards and regulations used for health care.
- To gain the knowledge about management methodologies in medical Engineering.
- To achieve the various tools
- It gives knowledge in regulatory bodies

OUTCOMES

On completion of this course

- After active participation in this course and an effort to learn overview of various methodologies used for management in health care.
- Student will understand the quality policy and function developement.
- Student will get the knowledge of usage and types of metallic implants.
- Student will get the knowledge of need and classification of standardization
- Students will get the knowledge of regulation and regulation codes.

UNIT I **9**

Philosophy of Quality Management, Customer Focus, Top Management Commitment, Team work, Quality control Tools, Problem solving methodologies, New Management Tools, work habits, stnategic Quality planning.

UNIT II **9**

Quality policy development, quality function development, designing for Quality, Manufacturing for Quality.

UNIT III **9**

Need for standardization, Regional, National, International standardization, classification of equipment, methods of Testing standardization, Maintenance of standardization & Recalibration.

UNIT IV **9**

FDA Regulations, Joint Commission, Accreditation of hospitals, other Regulatory codes.

UNIT V **9**

Need for ISO 9000 System, Advantages, clauses of ISO 9000, Implementation of ISO 9000, Quality costs, Quality Auditing, Case studies.

TOTAL HOURS: 45

TEXT BOOKS

1. Rose, J.E., "Total Quality Management", Kogan Page Ltd., 1993.
2. Cesar A. Cacere & Albert Zana, “The Practise of clinical Engineering”, Academic Press, Newyork, 1977.

REFERENCE BOOKS

1. John Bank, "The Essence of Total Quality Management", Prentice Hall of India, 1993.
2. Webster J.G and Albert M.Cook, “Clinical Engineering, Principles & Practices”, Prentice Hall Inc., Engle wood cliffs, New Jersy, 1979.

	ELECTIVE	L	T	P	C
	ADVANCED DIGITAL SIGNAL PROCESSING	3	0	0	3

(Common to ECE, BME & EIE)

AIM:

To learn the advanced digital signal processing techniques.

OBJECTIVE:

- To study the parametric methods for power spectrum estimation
- To study Spectrum Estimation
- To study about Linear Estimation and Prediction
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering
- To study Multirate signal processing fundamentals

OUTCOMES:

Upon completion of the course, students will be able to

- Describe the parametric methods for power spectrum estimation
- Know the adaptive filtering techniques using LMS algorithm and
- Know the applications of adaptive filtering
- Describe the Multirate signal processing fundamentals

UNIT I: DISCRETE RANDOM PROCESS **9**

Discrete random process, Random Variables, Ensemble Averages, Parameter Estimation, Gaussian processes, Stationary Process, Autocovariance and Autocorrelation Matrices, Simulation of White noise, Power Spectrum, Filtering random processes, Spectral factorization theorem, Special types of random processes.

UNIT II: SPECTRUM ESTIMATION **9**

Nonparametric methods – Periodogram, Modified periodogram, Bartlett's method, Welch's method, Blackman- Tukey method, Parametric methods- Autoregressive Spectrum Estimation, Moving Average Spectrum Estimation, Autoregressive Moving Average Spectrum Estimation.

UNIT III: LINEAR ESTIMATION AND PREDICTION **9**

Levinson Durbin Recursion, Levinson Recursion, FIR Wiener filter, Linear prediction, Noise Cancellation, Lattice realization, IIR Wiener Filter- Causal Wiener Filtering, Discrete Kalman Filter.

UNIT IV: ADAPTIVE FILTERS **9**

FIR adaptive filters- Newton' Steepest descent method- Wiener Hoff LMS adaptive algorithm, Adaptive Noise Cancellation, Adaptive channel equalization, Recursive least squares- Exponentially weighted RLS, Sliding Window RLS.

UNIT V: MULTIRATE DIGITAL SIGNAL PROCESSING **9**

Interpolation and Decimation – Direct digital domain approach- Decimation by an integer factor- Interpolation by an Integer factor- Single and Multistage realization- Polyphase realization, Application to sub band coding.

TOTAL HOURS:45

TEXT BOOKS:

2. Monson H Hayes," Statistical Digital Signal processing and Modeling," Wiley student Edition, John Wiley and sons.2004.

REFERENCE BOOKS:

1. John G Proakis and Manolakis," Digital signal Processing principles, Algorithms and Application," Pearson, Fourth Edition,2007 .

ELECTIVE

	NANOTECHNOLOGY IN MEDICINE	L	T	P	C
		3	0	0	3

AIM

To study about materials, fundamentals, applications of Nanotechnology.

OBJECTIVE

- To know about the concept of Nanotechnology.
- To study about the fundamentals of Nanoscience.
- To study about materials and properties used for MEMS & NEMS
- To know about the medical use of nanomaterials.
- To study about the applications**.**

OUTCOMES:

Upon completion of the course, students will be able to

- Describe the concept of Nanotechnology
- Know the fundamentals of Nanoscience
- Describe the materials and properties used for MEMS & NEMS
- Know about the applications.

UNIT-I: INTRODUCTION **9**

Introduction to Nanotechnology: Nanomaterials, Fullerenes and carbon forms. Nanoparticles and Colloids, structure and bonding in nanoparticles, Nanomaterials fabrication by Bottom-up and Top down approaches, Classification of nanodevices based on the characteristics, Quantum dots and their properties.

UNIT - II : FUNDAMENTALS OF NANOSCIENCE **9**

Size dependence of properties - Particle size determination - Bulk to nano transition - Semiconducting nanoparticles - Carbon nanostructures - Mechanical properties (hardness, ductility, elasticity) - Optical properties of nanotubes - Electrical properties of nanotubes.

UNIT-III: MEMS & NEMS **9**

Definition of MEMS, materials for MEMS (Silicon, Polymers and metals) and their properties, Deposition processes, Photolithography, and etching processes, Limitations of MEMS, NEMS, difference between MEMS and NEMS, properties of NMES, fabrication processes, applications.

UNIT-IV: NANOMEDICINE **9**

Nanomedicine: Medical use of Nanomaterials, Drug delivery systems. Cancer treatment, Surgery.Drug tracking systems.Targeted drug delivery systems.Applications of Nanomaterials in Medical imaging.Neuro-electronic interfaces.

UNIT-V: BIO MOLECULAR NANOTECHNOLOGY **9**

Nanorobots and their application, nanosensors based on biomolecules such as DNA and proteins, nanoparticles for gene delivery systems, Computational genes, Biosensors for Glucose and measurement, Optical biosensors and their application ,Preparation of Nanosystems: Introduction to nanolithography -

Carbon nanotubes: preparation - Synthesis and preparation of nanomaterials (crystalline and thinfilm) - Physical and chemical methods - Control and stability (size, shape, composition).

TOTAL HOURS: 45

TEXT BOOKS

1. Lynn E. Foster, Foreword by George Allen, Foreword by Joe Lieberman, "Nanotechnology'.
2. Di Ventra, Massimiliano; Evoy, Stephane; Heflin, James R., "Introduction to Nanoscale Science and Technology", Springer publications, 2004 (UNITS I, II, III & IV)

REFERENCE BOOKS

1. Chattopadhyay, "Introduction to Nanoscience and Nanotechnology', PHI, 2009
2. B.k. Parthasarathy, "Nanoscience And Nanotechnology", Gyan Books, 2007

ELECTIVE

	MEMS	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EEE, EIE & MECHAT)

AIM

- To students to gain basic knowledge on MEMS (Micro Electro Mechanical System) and various fabrication techniques. This enables them to design, analyze, fabricate and test the MEMS based components.

OBJECTIVES

- Introduction to MEMS and micro fabrication
- To study the Mechanics for MEMS Design.
- To study Electro Static Design and System Issues.
- To know various MEMS Applications
- To know about the optical and RF MEMS

OUTCOMES:

At the end of the course, the student should be able to:

- Discuss various MEMS fabrication techniques.
- Explain different types of sensors and actuators and their principles of operation at the micro
- Scale level.
- Apply MEMS in different field of medicine.

UNIT I INTRODUCTION TO MEMS 9

MEMS and Microsystems, Miniaturization, Typical products, Micro sensors, Micro actuation, MEMS with micro actuators, Micro accelorometers and Micro fluidics, MEMS materials, Micro fabrication

UNIT II MECHANICS FOR MEMS DESIGN 9

Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics.

UNIT III ELECTRO STATIC DESIGN AND SYSTEM ISSUES 9

Electrostatics: basic theory, electro static instability. Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators. bistable actuators. Electronic Interfaces, Feedback systems, Noise, Circuit and system issues,

UNIT IV MEMS APPLICATION 9

Case studies – Capacitive accelerometer, Peizo electric pressure sensor, Microfluidics application, Modeling of MEMS systems, CAD for MEMS.

UNIT V INTRODUCTION TO OPTICAL AND RF MEMS 9

Optical MEMS, - System design basics – Gaussian optics, matrix operations, resolution. Case studies, MEMS scanners and retinal scanning display, Digital Micro mirror devices. RF Memes – design basics, case study – Capacitive RF MEMS switch, performance issues.

TOTAL HOURS: 45

TEXT BOOK:

1. Stephen Santeria," Microsystems Design", Kluwer publishers, 2000.
2. N. P. Mahalik, "MEMS",Tata McGraw hill, Sixth reprint, 2012.

REFERENCE:

1. Nadim Maluf," An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor," The MEMS Handbook", CRC press Baco Raton,2000.
3. Tai Ran Hsu," MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002. Liu,"MEMS", Pearson education, 2007..

ELECTIVE

	BIOMETRIC SYSTEMS	L	T	P	C
		3	0	0	3

AIM:

To study about fundamentals, Principles of various Biometric systems.

OBJECTIVES:

- To know about the fundamentals of Biometric systems
- To understand the finger print principles and technology
- To study about the Iris recognition method
- To understand the Facial scan technologies, face Recognition-Representation and Classification
- To understand the voice scan technology, features and their models.

OUTCOMES:

At the end of the course, the student should be able to:

- Demonstrate knowledge engineering principles underlying biometric systems.
- Analyze design basic biometric system applications.

UNIT I: BIOMETRIC FUNDAMENTALS **9**

Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.

UNIT II: FINGERPRINT IDENTIFICATION TECHNOLOGY **9**

History, Components, Application of Fingerprints, The Technology- Finger Scan Strengths and Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms.

UNIT III: IRIS RECOGNITION **9**

Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.

UNIT IV: FACE RECOGNITION **9**

Introduction, Components, Facial Scan Technologies, Face Detection, Face Recognition-Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

UNIT V: VOICE SCAN **9**

Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration.

TOTAL HOURS: 45

TEXT BOOKS:

1. James Wayman & Anil Jain, “Biometric Systems – Technology, Design and Performance Evaluation”, Springer-verlag London Ltd, 2005, USA.
2. Sanir Nanavati, Michael Thieme, “Biometrics Identity Verification in a Networked world”, Wiley Computer Publishing Ltd, 2003, New Delhi.

REFERENCE:

1. John D. Wood word Jr., “Biometrics”, Dream tech Press, 2003, New Delhi.

ELECTIVE

	GENITIC ENGINEERING AND ITS APPLICATION	L	T	P	C
		3	0	0	3

AIM

To study about the fundamentals of Genetic Engineering and its applications.

OBJECTIVE

- To learn about the basics of Clones
- To study about the PCR and Applications.
- To study about the Applications of DNA technology
- To study about the applications of Genetic Engineering.

OUTCOMES:

At the end of the course, the student should be able to:

- Describe the principle and applications of PCR
- Know the Applications of DNA technology
- Describe the molecular markers
- Describe the applications of Genetic Engineering

UNIT I EXPRESSION AND DETECTION OF CLONES 9

Detection of clones and its expression – expression of cloned genes in yeast and E. coil – Blot analysis – Southern, Northern and Western Blot – Genomic and cDNA library construction and its applications.

UNIT- II PCR AND ITS APPLICATIONS 9

Principles – designing of primers – PCR methodology – Types of PCR – Identification of PCR products - application in disease profile

UNIT III MOLECULAR MARKERS 9

Molecular markers – RFLP – RAPD – AFLP – 16s rRNA typing gene chip and micro array; application in disease profile

UNIT IV APPLICATIONS OF rDNA TECHNOLOGY 9

Gene cloning in medicine, transgenic animals. Gene therapy, types of gene therapy methodology advantages and limitations of gene therapy and its applications

UNIT V OTHER APPLICATION 9

Site – directed mutagenesis, methods of gene transfer, plant agrobacterium mediated using gene gun, animals embryo transfer example dolly. Application of recombinant technology in medicine.

TOTAL HOURS:45

TEXT BOOK:

1. Old RW, Primrose SB, Principle of Gene Manipulation: An Introduction to Genetic Engineering, Black Well Scientific Publications, 1993

REFERENCES:

1. T. A. Brown, Gene Cloning, 5th Edition, Blackwell Publishing 2006.
2. Ansubel FM., A, Kingston AE, Moore DO, Current protocols in Molecular Biology, Greene Publishing Associates, NY, 1988.
3. Berger SL, Kimmer AR, Methods in Enzymology, Vol 152, Academic press, 1987.
4. Gerald Karp, Cell and Molecular Biology, 6th Edition, John Wiley & Sons, 2009

ELECTIVE

	ARTIFITIAL INTELLIGENCE & PATTERN RECOGNITION	L	T	P	C
		3	0	0	3

AIM

To study about the Artificial Intelligence and the Pattern Recognition Techniques available

OBJECTIVE:

- To learn the basics of AI and its problem solving methods
- To Study the principles of pattern Recognition techniques and the analysis.

OUTCOMES:

At the end of the course, the students would

- Have a fundamental knowledge of pattern recognition
- Have a skills about the manipulating, transforms using classifiers theorems.
- Acquire the skills cluster analysis and feature extraction

1. INTRODUCTION **9**

Definition of AI, Intelligent agents, perception and language processing, problem solving, searching, heuristic searching, game playing, Logics, logical reasoning.

2. BASIC PROBLEM SOLVING METHODS **9**

Forward Vs Background, knowledge representation, frame problems, heuristic functions, weak methods of matching.

3. PRINCIPLES OF PATTERN RECOGNITION **9**

Patterns and features, training and learning in pattern recognition, pattern recognition approach, different types of pattern recognition.

4. DECISION MAKING **9**

Baye's theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimaters, nearest neighbor classification, maximum distance pattern classifier, adaptive decision boundaries.

5. CLUSTER ANALYSIS AND FEATURE EXTRACTION **9**

Unsupervised learning, hierarchical clustering, Graph theories approach to pattern clustering, fuzzy pattern classifier, application of pattern recognition in medicine.

TOTAL HOURS: 45

TEXT BOOKS

1. Elain Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw- Hill, 2009.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

ELECTIVE

	BIO MECHANICS	L	T	P	C
		3	0	0	3

AIM

To study about the principles and properties of Bio mechanics.

OBJECTIVE

- To learn different terms used in biomechanics.
- To study about the structure and properties of bone.
- To study the mechanical properties of living tissues.
- To study about the respiratory mechanism and its functions.
- To study about the cartilage ,kinetics and kinematics of joints.

OUTCOMES:

At the end of the course, the student should be able to:

- Explain the mechanics of physiological systems.
- Analyze the biomechanical systems.
- Design orthopaedic applications.

UNIT I: BIO-FLUID MECHANICS **9**

Newton's laws, Stress, Strain, Elasticity, Hooks-law, viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic fluids, vascular tree, Relationship between diameter, velocity and pressure of blood flow, Resistance against flow.

UNIT II: BONE& ITS PROPERTIES **9**

Bone structure and Composition, Blood Circulation in Bone, Viscoelastic properties of Bone, Electrical Properties of Bone, Fracture Mechanism and Crack Propagation in bones, Kinetics and Kinematics of Joints.

UNIT III: CARDIAC MECHANICS **9**

Cardiovascular system. Mechanical properties of blood vessels: arteries, arterioles, capillaries and veins. Blood flow: Laminar and Turbulent, Physics of cardiovascular diseases, Prosthetic heart valves and replacements.

UNIT IV: RESPIRATORY MECHANICS **9**

Alveoli mechanics, Interaction of Blood and Lung P-V curve of Lung, Breathing mechanism, Airway resistance, Physics of Lung diseases. Soft tissue mechanics **:**Pseudo elasticity, non-linear stress-strain relationship, Viscoelasticity, Structure, function and mechanical properties of skin, ligaments and tendons.

UNIT V: ORTHOPEDIC MECHANICS **9**

Mechanical properties of cartilage, diffusion properties of Articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, lubrication of joints.

TOTAL HOURS: 45

TEXT BOOKS:

1. Y.C Fung, Biomechanics- "Mechanical properties of living tissues", 2nd ed, Springer- Verlag, 1993.
2. D.O Cooney, "Biomedical engineering Principles". Marcel Dekker, INC NewYork, 1976.

REFERENCE BOOKS:

1. Silver Frederick H. "Biomaterials, Medical Devices & Tissue Engineering", Chapman & Hall, London, 1994

ELECTIVE

	PHYSIOLOGICAL MODELLING	L	T	P	C
		3	0	0	3

AIM

- Understand the concept of modelling and learn how to model any physiological control system for purpose of analysis.

OBJECTIVES

- To study the different types of modelling and its utilities.
- To study the physiological system as various electrical parameters.
- To develop mathematical background to understand the order of the system using transfer function.
- Study the physiological activities taking place in controlling specific physiological parameter and convert this detail as an acceptable model.

OUTCOMES:

At the end of the course, the student should be able to:

- Explain application of Physiological models.
- Model dynamically varying physiological system
- Discuss methods and techniques to analyze and synthesis dynamic models
- Develop differential equations to describe the dynamic models, simulate and visualize
- Implement physiological models using software to get dynamic responses

UNIT I: PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG 9

System concept, system properties, piece-wise linear approximation, electrical analog for compliance, thermal storage, pulse response of first order systems, response of resistant and compliance system.

UNIT II: TRANSFER FUNCTIONS 9

Transfer functions and its use, engineering concept in coupled system, example of Transformed signals.

UNIT III: IMPEDANCE CONCEPT 9

Transfer functions with impedance concept, prediction of performance, identification of the system from impedance function, periodic signals, relationship between transfer function and sinusoidal response, evaluation of transfer function from frequency response.

UNIT IV: FEEDBACK SYSTEMS 9

Characteristics of physiological feedback systems, stability analysis of systems.

UNIT V: SIMULATION OF BIOLOGICAL SYSTEMS 9

Simulation of thermal regulation, pressure and flow control in circulation, occulo motor system, endocrinal system, functioning of receptors.

TOTAL HOURS: 45

TEXT BOOKS:

1. William B.Blesser, “System approach to Bio-medicine”, McGraw-Hill book co., New York, 1969.
2. Manfred Clynes and John H.Milsum, “Bio-medical engineering system”, McGraw-Hill Book co., New York, 1970.
3. Michael C.K. Khoo,” Physiological Control Systems -Analysis, Simulation and Estimation” Prentice Hall of India Pvt. Ltd., New Delhi, 2001

REFERENCE BOOK:

1. Douglas S. Rigg, “Control theory and physiological feedback mechanism”, The William & Williams co., Baltimore, 1970

ELECTIVE

	NANO ELECTRONICS	L	T	P	C
		3	0	0	3

(Common to ECE, BME & MECHAT)

AIM:

- This course is offered to students to gain basic knowledge on Nano electronics and various fabrication techniques involved in nanoscience.

OBJECTIVE:

- To Know basic concepts in Nanotechnology
- To learn the Fundamental of Nano electronics
- To learn the silicon MOSFET and Quantum Transport Devices
- To learn the fabrication of Carbon Nanotubes
- To study about the Molecular Electronics in Nanotechnology

OUTCOMES:

At the end of the course, the student should be able to:

- Describe the basic concepts in Nanotechnology
- Know the Fundamental of Nano electronics
- Acquire the skill about silicon MOSFET and Quantum Transport Devices
- Learn the fabrication of Carbon Nanotubes

UNIT I: INTRODUCTION TO NANOTECHNOLOGY 9

Background to nanotechnology: Types of nanotechnology and nanomachines – periodic table – atomic structure – molecules and phases – energy – molecular and atomic size – surface and dimensional space – top down and bottom up; Molecular Nanotechnology: Electron microscope – scanning electron microscope – atomic force microscope – scanning tunnelling microscope – nanomanipulator – nanotweezers – atom manipulation – nanodots – self assembly – dip pen nanolithography. Nanomaterials: preparation– plasma arcing – chemical vapor deposition – sol-gels – electrodeposition – ball milling – applications of nanomaterials.

UNIT II : FUNDAMENTALS OF NANOELECTRONICS 9

Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation: - power dissipation limit – dissipation in reversible computation – the ultimate computer.

UNIT III : SILICON MOSFETs & QUANTUM TRANSPORT DEVICES 9

Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts. Quantum transport devices based on resonant tunneling, Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications:- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV: CARBON NANOTUBES 9

Carbon Nanotube: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic propertics – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of all carbon nanotube nanoelectronics.

UNIT V: MOLECULAR ELECTRONICS 9

Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

TOTAL HOURS: 45

TEXT BOOKS

1. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and BurkhardRaguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002
2. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 20032.
3. T.Pradeep, NANO:“The Essentials–Understanding Nanoscience and Nanotechnology”, TMH, 2007

REFERENCE BOOKS

1. T.Pradeep, NANO:“The Essentials–Understanding Nanoscience and Nanotechnology”, TMH, 2007

ELECTIVE

	VLSI DESIGN TECHNIQUES	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EIE, EEE & MECHAT)

AIM:

To learn about the VLSI technology

OBJECTIVES:

- To study the MOS transistor and technology
- To study the stick diagram characteristics
- To study the circuit characterization
- To study the VLSI components
- To study the verilog language

OUTCOMES:

Upon completion of the course, students should

- Explain the basic CMOS circuits and the CMOS process technology.
- Discuss the techniques of chip design using programmable devices.
- Model the digital system using Hardware Description Language.

UNIT I : MOS TRANSISTOR THEORY AND PROCESS TECHNOLOGY 9

NMOS and PMOS transistors - Threshold voltage - Body effect - Design equations - Second order effects - MOS models and small signal AC characteristics - Basic CMOS technology.

UNIT II: INVERTERS AND LOGIC GATES 9

NMOS and CMOS Inverters - Stick diagram - Inverter ratio - DC and transient characteristics -switching times - Super buffers - Driving large capacitance loads - CMOS logic structures -Transmission gates - Static CMOS design - Dynamic CMOS design.

UNIT III: CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION 9

Resistance estimation - Capacitance estimation - Inductance - Switching characteristics – Transistor sizing - Power dissipation and design margining - Charge sharing - Scaling.

UNIT IV: VLSI SYSTEM COMPONENTS CIRCUITS AND SYSTEM LEVELPHYSICAL DESIGN 9

Multiplexers - Decoders - comparators - Priority encoders - Shift registers - Arithmetic circuits -Ripple carry adders - Carry look ahead adders - High-speed adders - Multipliers- Physical design -Delay modelling - Cross talk - Floor planning - Power distribution - Clock distribution - Basics of CMOS testing.

UNIT V: VERILOG HARDWARE DESCRIPTION LANGUAGE 9

Overview of digital design with Verilog HDL - Hierarchical modeling concepts - Modules and port definitions - Gate level modeling - Data flow modeling - Behavioral modeling - Task & functions -Test Bench.

TOTAL HOURS: 45

TEXT BOOKS:

1. Neil H.E. Weste, Kamran Eshraghian, “Principles of CMOS VLSI Design”, PearsonEducation ASIA, 2nd edition, 2000.
2. Samir Palnitkar, “Verilog HDL”, Pearson Education, 2nd Edition, 2004.

REFERENCE BOOKS:

1. Pucknell, “Basic VLSI Design”, Prentice Hall of India Publication, 1995.
2. Eugene D. Fabricius, “Introduction to VLSI Design”, McGraw Hill International Editions,1990.
3. Bhasker J., “A Verilog HDL Primer”, 2nd Edition, B.S. Publications, 2001.
4. John P. Uyemura, “Introduction to VLSI Circuits and Systems”, John Wiley & Sons, Inc.,2002.

ELECTIVE

	COMPUTER HARDWARE, INTERFACING & INSTRUMENTATION	L	T	P	C
		3	0	0	3

AIM

To have knowledge about 80186, 80286,80386, 80486 and Pentium processors

OBJECTIVE

- To gain knowledge about 80186 and 80286 processors
- To gain knowledge about 80386 and 80486 processors
- To study in detail about Pentium processors
- To gain knowledge about hardware and its functions
- To study in detail about PC based data acquisition systems

OUTCOMES:

At the end of the course, the student should be able to:

- Explain 8086 family of processors, motherboards, PC based data acquisition and troubleshooting of PCs

UNIT I: INTEL ADVANCED PROCESSORS **9**

80186, 80286- Architecture, Programming enhancements, 80c188EB interfacing.

UNIT II: INTEL 80386, 80486 PROCESSOR **9**

80386- Introduction, Special 80386 registers, Memory management, protected mode, virtual 8086 mode, memory paging mechanism, 80486 Microprocessor – Introduction and architecture.

UNIT III: PENTIUM PROCESSORS **9**

Pentium Architecture- Memory Management- New Pentium instructions - Pentium Pro microprocessors - Pentium II, Pentium III, Pentium 4- Special Features and Software changes.

UNIT IV: PC HARDWARE OVERVIEW **9**

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX., Memory and I/O Port Addresses, Peripheral Interfaces and Controller.

UNIT V: PC BASED DATA ACQUISITION **9**

Plug-in data acquisition and control boards and programming – ADC, DAC, Digital I/O board and Timing board, Serial port and parallel port programming. Data acquisition and programming using serial interfaces – PC and microcontroller serial ports, USB and IEEE 1394.

TOTAL HOURS: 45

TEXT BOOKS

1. B.B.Brey, "The Intel Microprocessor 8086/8088/80186/80188,80286,80386, 80486 Pentium, Pentium Pro, PII, PIII & IV Architectures, Programming & Interfacing", Pearson India, 2007.
2. Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware". Revised second Edition, Indian edition.Tata McGraw Hill, New Delhi, 2007.

REFERENCE BOOKS

1. K.Ray, K.M. Bhurchandi, "Advanced microprocessors and peripherals", II Edition, Tata McGraw Hill 2006.

EELECTIVE

	RAPID PROTOTYPING	L	T	P	C
		3	0	0	3

AIM

- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields.

OBJECTIVE

- Generating a good understanding of RP history, its development and applications. Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.

OUTCOMES:

- To provide knowledge on different types of Rapid Prototyping systems and its applications in various fields

UNIT I: INTRODUCTION **9**

Need - Development of RP systems – RP process chain - Impact of Rapid Prototyping on Product Development –Digital prototyping - Virtual prototyping- Rapid Tooling - Benefits- Applications.

UNIT II: RAPID PROTOTYPING PROCESSES **9**

Introduction – classification - laminated object manufacturing - fused deposition modeling stereo lithography-solid ground curing-selective laser sintering-3 D printing.

UNIT III: CAD PROCESSES **9**

Introduction - data requirements - solid modeling - surface modeling. Geometric processing interface formats - model preparation - slicing, support structures and machine instructions.

UNIT IV: MATERIALS FOR RAPID PROTOTYPING **9**

Nature of material – type of material – polymers, metals, ceramics and composites liquid based materials, photo polymer development – solid based materials, powder based materials - case study selection of materials for suitable processes advantages limitations.

UNIT V: RAPID TOOLING PROCESSES **9**

Introduction-classification-indirect rapid tooling-silicone rubber moulding - epoxy moulding-electro forming - vacuum casting- vacuum forming- rapid tools for injection moulding- direct rapid tooling processes-SLS rapid tool-shape deposition manufacturing – laser deposition lamination- rapid tooling roots.

TOTAL HOURS: 45

TEXT BOOKS:

1. Ibrahim zeid, “CAD/CAM theory and practice”, Tata McGraw Hill,1998

REFERENCE BOOKS:

1. Rafiq I. Noorani, “Rapid Prototyping – Principles and Applications”, Wiley & Sons, 2006.

2. Chua C.K, Leong K.F and Lim C.S, “Rapid Prototyping: Principles and Applications’, second edition, World Scientific, 2003.
3. Rapid proto typing reports, CAD/CAM publishing, 1991

ELECTIVE

	ENTREPRENEURIAL SKILLS DEVELOPMENT FOR ENGINEERS	L	T	P	C
		3	0	0	3

(Common to ECE, BME, MECH & AUTO)

AIM:

To develop a good entrepreneurial skills to the budding engineers

OBJECTIVE:

- To understand the importance of entrepreneurship for engineering students.
- To inculcate entrepreneurship skills among engineers.
- To create awareness of business and train in preparing the project report and create awareness of IPR for engineering students.
- To understand the importance of finance and its transactions.
- To develop the skills of consequences of business sickness and take corrective measures.

OUTCOMES:

At the end of the course, the student should be able to:

- Know the importance of entrepreneurship
- Describe the importance of finance and its transactions
- Acquire skills of consequences of business sickness and take corrective measures.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur – Definition-Evolution and importance of entrepreneurship-Views and Theories of Entrepreneurship-Traits of Entrepreneurs - Types of Entrepreneurs – Risks and Rewards -Entrepreneur - Technocrat –Manager -Comparison –Role of Entrepreneurship in Economic Development- Factors affecting Entrepreneurial Growth-Engineers as Entrepreneurs-Ten commandments for the beginning entrepreneur.

UNIT 2 MOTIVATION **9**

Motivation-Definition and objectives-Types of motivation-Theories of Motivation- Achievement Motivation Training- Self Rating- Business games- Thematic Apperception Test - Stress Management. Entrepreneurship Development Programmes - Need- objectives.

UNIT 3 BUSINESS AND ENTERPRISE MANAGEMENT **9**

Business-definition- Classification –Small Enterprises- Characteristics- ownership structure-Various types of ownership-Project Formulation – Steps involved in setting up a Business - Market survey and Research-Techno economic Feasibility Report - Preliminary Project Report-Importance of Project Appraisal-Sources of information-Classification of needs and Agencies-Intellectual property rights.

UNIT 4 FINANCIAL MANAGEMENT 9

Need and objectives of financial management for engineers-Sources of Finance- Term Loans- Capital structure- Financial Institutions- Management of working capital- Costing - Break Even Analysis-Managerial uses of Breakeven analysis-Network analysis Techniques –Problems on PERT &CPM – Taxation

UNIT 5 BUSINESS SICKNESS AND GROWTH STRATEGIES 9

Sickness in small Business –Definition of sick unit- Symptoms of Sickness- Magnitude- Causes and Consequences-Preventive and Corrective measures - Institutional Support to Entrepreneurs- Government Policy for small Enterprises - Growth strategies in small Industry - Expansion- Diversification- Joint venture- Merger- sub-contracting.

TOTAL HOURS: 45

TEXT BOOKS:

1. S.S. Khanka- Entrepreneurial Development- S.Chand & Co. Ltd- Ram Nagar - New Delhi- 2005.
2. Bhramarbar Badhai-"Entrepreneurship for Engineers"-DhanpatRai&co (P) ltd, Delhi-2001.

REFERENCES:

1. EDII - "A manual for Entrepreneurs"- Entrepreneurship Development Institute of India, Ahmedabad- Tata McGrawHill-2006...
2. MSME-'A guide book for new entrepreneurs'-2nd edition-2010.
3. Lawrence R.Jauch, Rajiv Gupta,William F.Glueck- "Business Policy & Strategic Management"- 7th edition-Frank Bros&co.(publishers) ltd,.2007
4. Robert D Hisrich, Michael P Peters &Dean A Shepherd-"Entrepreneurship"-TataMcGrawHill, 2008.
5. Mary K Coulter, "Entrepreneurship in Action", Prentice Hall-2006.

ELECTIVE

	INFORMATION SECURITY	L	T	P	C
		3	0	0	3

(Common to ECE, BME, CSE, IT, EEE, EIE, MECHAT, MECH, AUTO, CIVIL, BT & BINFO)

AIM

- To study the critical need for ensuring Information Security in Organizations

OBJECTIVES

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

OUTCOMES:

At the end of the course, the student should be able to:

- Describe the basics of Information Security
- Know the legal, ethical and professional issues in Information Security
- ❖ Acquire skills in the technological aspects of Information Security

UNIT 1 INTRODUCTION 9

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

UNIT II SECURITY INVESTIGATION 9

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

UNIT III SECURITY ANALYSIS 9

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

UNIT IV LOGICAL DESIGN 9

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

UNIT V PHYSICAL DESIGN 9

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

TOTAL HOURS: 45

TEXT BOOK

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003.

REFERENCE BOOKS

1. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003
3. Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.

INDUSTRIAL ELECTIVE

	LEARNING IT ESSENTIALS BY DOING	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EEE, EIE & MECHAT)

AIM:

- To study the essentials of information technique by doing.

OBJECTIVES

- To understand the fundamentals of of Computer architecture.
- To know how to test and debug the programme.
- To know the data base technology, design and models of data.
- To study the object oriented programming and concepts.
- To study the computer network technologies and web applications..

OUTCOMES

On completion of the course

- Student will get the basics of fundamentals of Computer architecture and its functions
- Student will acquire programming knowledge in C and debugging.
- Students will get the knowledge of database management, writing queries etc.
- Students will design and implement object oriented methodology.
- Students will work in maintenance and servicing of servers, computer networks.

Unit I:

• Fundamentals of Computer architecture-introduction-organization of a small computer
• Central Processing Unit - Execution cycle – Instruction categories – measure of CPU performance Memory – Input/output devices - BUS-addressing modes.
• System Software – Assemblers – Loaders and linkers – Compilers and interpreters
• Operating system – introduction – memory management schemes Process management Scheduling – threads.

Unit II:

• Problem solving with algorithms- Programming styles –
• Coding Standards and Best practices - Introduction to C Programming
• Testing and Debugging. Code reviews
• System Development Methodologies – Software development Models
• User interface Design – introduction – The process – Elements of UI design & reports.

Unit III:

• RDBMS- data processing – the database technology – data models
• ER modeling concept –notations – Extended ER features
• Logical database design - normalization
• SQL – DDL statements – DML statements – DCL statements
• Writing Simple queries – SQL Tuning techniques – Embedded SQL - OLTP

Unit IV:

• Objected oriented concepts – object oriented programming

• UML Class Diagrams– relationship – Inheritance – Abstract classes – polymorphism
• Object Oriented Design methodology - Common Base class
• Alice Tool – Application of OOC using Alice tool.

Unit V:
• Client server computing - Internetworking – Computer Networks –
• Working with TCP/IP – IP address – Sub netting – DNS – VPN – proxy servers World Wide Web – Components of web application - browsers and Web Servers
• URL – HTML – HTTP protocol – Web Applications - Application servers – Web Security.

INDUSTRIAL ELECTIVE

	BUSINESS INTELLIGENCE & ITS APPLICATIONS	L	T	P	C
		3	0	0	3

(Common to ECE, BME, EEE, EIE, MECHAT, CSE & IT)

AIM

- To study the business intelligence techniques and its applications.

OBJECTIVES

- ❖ To understand the basics of business intelligence.
- ❖ To know the concepts of Data Integration, Data Profiling and Applications.
- ❖ To know the aspects of multidimensional data modeling
- ❖ To know the basics of basics of enterprise reporting and its concepts.
- ❖ To study the benefits of business intelligence.

OUTCOMES

On completion of the course

- ❖ Student will get the basic information in the various concepts of business intelligence.
- ❖ The need and advantage of Data Integration, data quality, Data Profiling and Applications.
- ❖ Students will apply business intelligence to multidimensional data modeling
- ❖ Students will have the knowledge of enterprise reporting
- ❖ Students will get the benefits of business intelligence in ERP, Cloud computing etc

UNIT – I INTRODUCTION TO BUSINESS INTELLIGENCE 9

Introduction to OLTP AND OLAP – BI Definition and BI Concepts – Business Applications of BI - BI Framework- Role of Data Warehousing in BI –BI Infrastructure Components- BI Process – Developing Data Warehouse – Management Framework – Business driven approach –BI Technology –– BI Roles & Responsibilities

UNIT - II BASICS OF DATA INTEGRATION (Extraction Transformation Loading) 9

Concepts of Data Integration need and advantages of using Data Integration – Introduction to common data integration approaches – Introduction to ETL using SSIS – Introduction to Data Quality – Data Profiling Concepts and Applications.

UNIT - III INTRODUCTION TO MULTIDIMENSIONAL DATA MODELING 9

Introduction to Data and Dimensional Modeling – Multi Dimensional Data Model – ER modeling Vs Multi Dimensional Model – Concepts of Dimensions - facts - cubes- attributes- hierarchies- star and snowflake schema – Introduction to Business Metrics and KPIs – Creating Cubes using SSAS.

UNIT - IV BASICS OF ENTERPRISE REPORTING 9

Introduction to Enterprise Reporting - Concepts of dashboards - balanced scorecards – Introduction to SSRS Architecture– Enterprise Reporting using SSRS reporting service

UNIT - VBI ROAD AHEAD 9

BI and Mobility – BI and cloud computing – BI for ERP systems - Benefits of BI in ERP-NorthWind_Traders Data-Data Analyses through Excel-Kettle Tool – Conversion of data using Kettle Tool.

TOTAL HOURS: 45

TEXT BOOKS

1. RN Prasad, Seema Acharya, "Fundamentals Of Business Analytics" Wiley India,2011

REFERENCE BOOKS

1. Soumendra Mohanty, “Data Warehousing Design, Development and Best Practices”, Tata McGraw-Hill, New Delhi, 2007
2. David Loshin, “Business Intelligence”, Morgan Kaufmann Publishsers, San Francisco, Fifth edition, 2007
3. Larissa Terpeluk Moss and Shaku Atre, “Business Intelligence Roadmap”, Pearson Education, 2007