REGULATIONS - 2015

B. TECH BIOMEDICAL ENGINEERING

CURRICULUM & SYLLABUS

SL. NO	SUB.CODE	COURSE TITLE	L	T	P	C
SEMESTER I						
THEORY						
1.	BEN101	English - I	3	1	0	3
2.	BMA101	Engineering Mathematics - I	3	1	0	3
3.	BPH101	Engineering Physics - I	3	0	0	3
4.	BCH101	Engineering Chemistry - I	3	0	0	3
5.	BBT101	Cell Biology	2	1	0	3
6.	BCS101	Fundamentals of Computing and Programming	3	0	0	3
7.	BBA101	Personality Development	1	1	0	2
8.	BCE101	Basic Civil Engineering	2	0	0	2
9.	BME103	Basic Mechanical Engineering	2	0	0	2
PRACTICAL						
10.	BCM1L1	Basic Civil and Mechanical Engineering Practices Laboratory	0	0	3	1
11.	BPC1L1	Physics and Chemistry Laboratory#	0	0	3/3	0
		NCC/ NSS/ Yoga (optional) to be conducted during week ends				
For a given program, Total Instruction Periods per week=35; Total No. of Credits = 25						

SL. NO	SUB.CODE	COURSE TITLE	L	T	P	C
SEMESTER II						
THEORY						
1.	BEN201	English - II	3	1	0	3
2.	BMA201	Engineering Mathematics - II	3	1	0	3
3.	BPH201	Engineering Physics - II	3	0	0	3
4.	BCH201	Engineering Chemistry – II	3	0	0	3
5.	BCS201	Internet Programming	2	0	0	2
6.	BFI201*	Foreign / Indian Language	3	0	0	3
7.	BBT201	Principles of Genetics	2	0	0	2
8.	BEE201	Basic Electrical and Electronics Engineering	2	0	0	2
PRACTICAL						
9.	BCS2L1	Internet Practices Lab	0	0	3	1
10.	BCS2L2	Computer Practices Lab	0	0	3	1
11.	BEE2L1	Basic Electrical and Electronics Engineering Practices Laboratory	0	0	3	1
12.	BPC2L1	Physics and Chemistry Laboratory#	0	0	3/3	1

		NCC/ NSS/ Yoga (optional) to be conducted during week ends				
For a given program, Total Instruction Periods per week=35; Total No. of Credits = 25						

SEMESTER III

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BMA301	Mathematics III	3	1	0	4
2	BBM301	Anatomy and Physiology	3	0	0	3
3	BEI301	Electrical Measurements and Instrumentation	3	1	0	4
4	BCE301	Environmental Studies	3	0	0	3
5	BEC304	Microprocessors & its Applications	3	0	0	3
6	BEC306	Introduction to Electronic Devices & Circuits	3	1	0	4
PRACTICAL						
7	BEC3L1	Microprocessor Lab	0	0	4	2
8	BEI3L2	Electrical & Electronic Measurement Lab	0	0	4	2
9	BBM3L2	Anatomy and Physiology Lab	0	0	3	2
		TOTAL				**27**

SEMESTER IV

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BBM401	Biostatistics	3	1	0	4
2	BBM402	Clinical Biochemistry	3	0	0	3
3	BBM403	Biomedical Instrumentation I	3	1	0	4
4	BBM404	Medical Electronics	3	0	0	3
5	BEC404	Basic Principles of Communication and Circuit	3	1	0	4
6	BBM405	Biosensors and Transducer	3	0	0	3
7	BCS401	Computer Organisation and Architecture	3	0	0	3
PRACTICAL						
8	BBM4L1	Biosensors and Transducer Lab	0	0	3	2
9	BBT4L2	Biochemistry lab	0	0	3	2
		TOTAL				**28**

SEMESTER V

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BEI501	Linear and Digital Integrated Circuits	3	0	0	3
2	BEI502	Digital Signal Processing	3	1	0	4
3	BBM502	Biofluids and Biomechanics	3	0	0	3
4	BBM503	Biomedical Instrumentation II	3	1	0	4
5	BBM505	Biomaterials & Implantable Devices	3	0	0	3
6	BBM506	Physiology Control System	3	1	0	4
7	BBM504	Elective I	3	0	0	3
PRACTICAL						
8	BBM5L1	Biomedical Instrumentation Lab	0	0	3	2
9	BBM5L2	Linear and Digital Integrated Circuits lab	0	0	3	2
10	BBM5S1	Technical Seminar	0	0	2	1
		TOTAL				**29**

SEMESTER VI

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BBM601	Radiological Equipment	3	1	0	4
2	BBM602	Real Time Processor and BioMEMS	3	0	0	3
3	BBM603	Pathology and Microbiology	3	0	0	3
4	BBM604	Medical Informatics	3	0	0	3
5	BBM605	Bio-Signal Processing	3	1	0	4
6	BBM6E1	Elective II	3	0	0	3
PRACTICAL						
7	BBM6L1	Bio Signal Processing Lab	0	0	3	2
8	BBM6L2	Pathology and Microbiology Lab	0	0	3	2
9	BBM6P1	Mini Project	0	0	2	1
		TOTAL				**25**

SEMESTER VII

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BBM701	Digital and Medical Image Processing	3	1	0	4
2	BBM702	Neural Networks and Pattern Recognition	3	1	0	4
3	BBM703	Health, Hospital & Equipment Management	3	0	0	3
4	BBM704	Modelling of Physiological Systems	3	0	0	3
5	BBM7E1	Elective III	3	0	0	3
6	BBM7E2	ElectiveIV	3	0	0	3
PRACTICAL						
7	BBM7L1	Image Processing Lab	0	0	3	2
8	BBM7L2	Inplant Training in Hospital	0	0	2	1
9	BBM7P1	Project work (Phase - I)	0	0	3	2
		TOTAL				**25**

SEMESTER VIII

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	BBM801	Elective V	3	0	0	3
2	BBM8E1	Elective IV	3	0	0	3
3	BBM8E2	Elective V	3	0	0	3
PRACTICAL						
4	BBM8P1	Project Work (Phase - II)	0	0	18	6
		TOTAL				**15**

Total credit for the programme = 199

LIST OF ELECTIVES

SL. NO	COURSE CODE	COURSE TITLE	L	T	P	C
1	BBM051	Tissue Engineering and Artificial Organs	3	0	0	3
2	BBM052	Biological Effects of Radiation	3	0	0	3
3	BBM054	Bioinformatics	3	0	0	3
4	BBM055	Telemedicine	3	0	0	3
5	BEI057	Microcontroller and System Design	3	0	0	3
6	BEI062	VLSI Design	3	0	0	3
7	BEI063	Digital System Design	3	0	0	3
8	BEI064	Virtual Instrumentation	3	0	0	3
9	BBM056	Bioprocess Technology	3	0	0	3
10	BBM057	Robotics and Nanotechnology	3	0	0	3
11	BBA702	Professional Ethics	3	0	0	3
12	BBM058	Clinical Engineering	3	0	0	3
13	BBM059	Computer Networks	3	0	0	3
14	BBM060	Medical Imaging Techniques	3	0	0	3
15	BBM061	Biostatistics	3	0	0	3
16	BBM062	Intellectual Property Rights	3	0	0	3
17	BBM063	Medical Physics	3	0	0	3
18	BBM064	Rehabilitation Engineering	3	0	0	3

BEN 101 ENGLISH   I

L T   P C
3 1 0 3

OBJECTIVE: To make them master the techniques of professional communication so that they become employable after completing the course.

COURSE OUTCOMES:
CO01 - Parts of speech - Active and passive voices - Subject verb agreement.
CO02 - Etiquettes of E mail communication.Interpreting graphic representation - Flow chart and Bar chart.

CO03 - Degrees of comparison – Positive, Comparative, Superlative .
CO04 –Writing a review- Preparing minutes of the meeting , Agenda , official circulars
 CO05 –Hints development - Imperatives - Marking the stress Connectives , prepositional relatives.

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1			S			W				S		
CO2			S					M				
CO3	M			S							S	
CO4						S		M				

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT   I   **9 + 3**
 Parts of speech - Active and passive voices - Subject verb agreement. -   Writing about School life, Hobbies, Family and friends – Word formation with prefixes and suffixes - Tenses - Concord - Summarizing - Note-making

UNIT   II   **9+3**
Cause and effect relations – Punctuations –Differences between verbal and nonverbal communication -E - mail communication – Homophones - Etiquettes of E mail communication.
Interpreting graphic representation - Flow chart and Bar chart.

UNIT   III   **9+3**

Degrees of comparison – Positive, Comparative, Superlative - wh questions -   SI units -Lab reports - Physics, chemistry, workshop and Survey report for introducing new product in the market.

UNIT   IV   **9+3**

Writing project proposals - Presentation skills - Prefixes and suffixes - If conditions - Writing a review- Preparing minutes of the meeting , Agenda , official circulars.

UNIT   V   **9+3**

Accident reports (due to flood and fire) - Hints development - Imperatives - Marking the stress Connectives , prepositional relatives.

Total: 60 Periods

Text Book
1. Department of humanities and social sciences division, Anna university, oxford university press, 2013.

Reference:
1. S.P.Danavel, English and Communication for Students of Science and engineering, Orient Blackswan, Chennai,
2. Rizvi, M.Asharaf, Effective Technical Communication, New Delhi, Tata McGraw Hill Publishibg Company, 2007. MuraliKrishna and SunithaMoishra, Communication Skills for Engineers . Pearson, New Delhi, 2011..

BMA 101 - ENGINEERING MATHEMATICS - I

L T P M C
3 1 0 100 3

OBJECTIVES:
- To impart a Eigen values and eigen vectors of the real matrix
- To make them understand Orthogonal transformation of a symmetric matrix to diagonal form
- The lectures are to be given in such a way as to make the students to be well versed with Equation of a Sphere- Plane section of a sphere.

COURSE OUTCOMES :

- **CO01** – Having a knowledge of Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.
- **CO02** – To learn Equation of a cylinder- Right circular cylinder.
- **CO03** – Having a deep knowledge with Curavuture in Cartesian coordinates and Centre and radius of curvature
- **CO04** – o learn Partial derivatives and Euler's theorem for homogeneous functions.
- **CO05** - Having a well-versed knowledge Triple integration in Cartesian coordinates- Area as double integral- Volume as triple integral.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M	S								
CO2	M		S		S	S						
CO3	S			S	M							
CO4		M	M			S						

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT-1 MATRICES   **9+3**

Characteristic equations- Eigen values and eigen vectors of the real matrix- Properties- Cayley-Hamilton theorem(Excluding proof)- Orthogonal transformation of a symmetric matrix to diagonal form- Quadratic form- Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II THREE DIMENSIONAL ANALYTICAL GEOMETRY   9+3
Equation of a Sphere- Plane section of a sphere- Tangent plane- Equation of cone- Right circular cone- Equation of a cylinder- Right circular cylinder.

UNIT-III DIFFERENTIAL CALCULUS   9+3
Curavuture in Cartesian coordinates- Centre and radius of curvature- Circle of curvature- Evolutes- Envelopes- Evolute as envelope of normals.

UNIT-1V FUNCTIONS OF SEVERAL VARIABLES   9+3
Partial derivatives- Euler's theorem for homogeneous functions- Total derivatives- Differentiation of implicit functions- Jacobians- Taylor's expansion- Maxima and Minima- Method of Lagrangian multipliers.

UNIT-V MULTIPLE INTEGRALS   9+3
Double integration- Cartesian and Polar coordinates- Change of order of integration- Change of variables between Cartesian and Polar coordinates- Triple integration in Cartesian coordinates- Area as double integral- Volume as triple integral.

                                                    Total : 60 Periods

TEXT BOOK:
1. Ravish R.Singh and Mukkul Bhatt, " Engineering Mathematics-I" First Reprint, Tata McGraw Hill Pub Co., New Delhi. 2011.

REFERENCES:
1. Ramana.B.V. "Higher Engineering Mathematics" , Tata McGraw Hill Publishing Company, New Delhi, 2007.
2. Glyn James, "Advanced Engineering Mathematics" , 7th Edition, Pearson Education, 2007.
3. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wi;ey and Sons,New York, 2003.
4. Murray R.Spiegel, "Advanced Calculus", Schaum's Outline Series, First Edn, McGraw Hill Intl Book Co., New Delhi, , 1981.
5. Grewal.B.S, "Higher Engineering Mathematics" , 40th Edition, Khanna Publications, Delhi. 2007.

BPH101 Engineering Physics – I
(New Syllabus 2015 – 2016 batch onwards)

SUBJECT CODE – BPH101	L	T	P	M	C
	3	3	0	0	100

OBJECTIVES :
* To make a bridge between the physics in school and engineering courses.
* To impart a sound knowledge on the basic concepts of modern sciences like engineering applications of ultrasonics, lasers, fundamentals of crystal physics.

COURSE OUTCOMES:
    CO01 - To Know about Ultrasonics and its application in NDT.
    CO02 - To Know the principle of Laser and its application in Engineering and medicine.
    CO03 - Acquire Knowledge on Quantum Physics.
    CO04 – Properties of Electro Magnetic Theory.
    CO05 – To Understand the impact of Crystal Physics.

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M							M			
CO2			S				W					
CO3		W		S							S	
CO4	S			M		S						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I - ULTRASONICS
Introduction – Production- Magnetostriction Effect- Magnetostriction Generator- Piezoelectric Effect- Piezo Electric Generator- Detection Of Ultrasonic Waves- Properties- Cavitation- Acoustic Grating -Industrial Applications- Drilling, Welding, Soldering, Cleaning And Sonar- Velocity Measurement- - Non Destructive Testing(NDT)- Pulse Echo System Through Transmission And Reflection modes- A,B And C- Scan Display- Important Medical Applications- Sonogram--problem.

UNIT II - LASER
Introduction- Principle of Spontaneous Emission and Stimulated Emission- Einstien's A &B Coefficients- Derivation-Condition For Producing Laser Beam- Population Inversion- Pumping- Resonance Cavity- Types Of Lasers- ND-YAG- He-Ne- CO_2 Lasers-Industrial Applications- Heat Treatment- Welding-Cutting-Medical Applications-Laser Surgery- Advantages & Disadvantages-problem.

UNIT III - QUANTUM PHYSICS
Drawbacks with classical physics- Blackbody radiation: Max Planck theory and concept of energy quantization, deduction of Wien's displacement law, Raleigh-Jeans law – Matter waves- de Broglie wave length-photoelectric effect – Schrödinger equation (time-independent, and time-dependent equations)- wave functions and energy spectrum- application to particle in box-problem.

UNIT IV - ELECTROMAGNETIC THEORY
Electric charges-coulombs law of inverse squares- Electric field and its calculations-field lines-Gauss's law- applications of Gauss law. Magnetism - Magnetic field- Magnetic field lines- Magnetic flux- Motion of charged

particles in magnetic field- Magnetic field of a moving charge. Electromagnetic wave- speed of and electromagnetic wave and its quantitative deduction-group velocity- energy in electromagnetic wave- electromagnetic waves in matter-problem.

UNIT V - CRYSTAL PHYSICS

Lattice- Unit Cell- Bravais Lattice- Lattice Plane- Miller Indices- D-Spacing In Cubic Lattice- Calculation of Number of Atoms Per Unit Cell- Atomic Radius- Coordination Number- Packing Factor- SC,BCC, FCC, HCP Structures- Polymorphism And Allotropy- Crystal Defects- Point, Line And Surface Defects- Burgers Vector- problem.

Text Books
1. Marikani, A. 'Engineering Physics' Second Edition PHI Learning Pvt Ltd - 2013
2. Sears.F.W., Zemansky.M.W., Young.H.D,;'University Physics; Narosa Publishing House.
3. Avadhanulu. M.N.; Engineering Physics-Vol-1; S.Chand And Company Ltd, 2010.

Reference Books
1. Sears., Zemansky.,, Young.;'College Physics; Addison Wesley Publishing Company.
2. Resnick, R., and Halliday, D. and Walker, J.; Fundamental of Physics; John Wiley and Sons.
3. Senthil Kumar, G. 'Engineering Physics – I' VRB publishers Pvt Ltd. 2010.

BCH101 REVISED SYLLABUS FOR ENGINEERING CHEMISTRY – I

[FROM – 2015 -16]   3 0 0 100

OBJECTIVES :
- To impart knowledge to the Students about the principles, water characterization and treatment of portable and industrial purposes.
- To make them understand the Principles of polymer chemistry and engineering applications of polymers
- To impart a sound knowledge about the Principles of electrochemistry, electrochemical cells, emf and applications of emf measurements

COURSE OUTCOMES :

CO01 – Having a knowledge of Water characterization and treatment of portable and Industrial purposes.
CO02 – Having the thinking of Principles of polymer chemistry and engineering applications of polymers
CO03 – Having a deep knowledge about the Principles of electrochemistry
CO04 – With a true wisdom about Corrosion
CO05 - Having a sound knowledge in the Field of the Conventional and non- conventional energy .
CO/PO Mapping

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2		W	S		M							
CO3		M		S								
CO4	S		M	W								

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I   WATER TECHNOLOGY   9
INTRODUCTION
Characteristics :
Hardness of water – types - temporary and permanent hardness - estimation by EDTA method
Alkalinity – types of alkalinity - Phenolphthalein and Methyl orange alkalinity - determination –Domestic water treatment – disinfection methods (Chlorination, ozonation , UV treatment)
Boiler feed water – requirements – disadvantages of using hard water in boilers
(caustic embritlement , boiler corrosion , priming and foaming) – Prevention of scale formation – softening of hard water - Internal treatment (Calgon treatment method) –
External treatment – Demineralization process – Desalination and Reverse osmosis.

UNIT II   POLYMERS   9
INTRODUCTION
Polymers:
Definition – polymerization – degree of polymerization - types of polymerisation – Addition polymerization and Condensation polymerization – Mechanism of Polymerization - free radical polymerization mechanism only
Plastics:
Classification – thermoplastics and thermosetting plastics – difference between   thermoplastics   and thermosetting plastics - preparation, properties and uses of PVC, Teflon, nylon-6,6, PET
Rubber :
Types – drawbacks of natural rubber -vulcanization of rubber - properties and uses of vulcanized rubber
Synthetic rubbers – butyl rubber and SBR

UNIT III   ELECTROCHEMISTRY   9
INTRODUCTION
CELLS :
Types of Cells :
Electrochemical cells , Electrolytic cells – Reversible and Irreversible cells EMF – measurement of emf – Single electrode potential – Nernst equation

Reference electrodes:
Standard Hydrogen electrode -Calomel electrode
Ion selective electrode:
Glass electrode and measurement of pH using Glass electrode
Electrochemical series – significance
Titrations:

Potentiometer titrations (redox - Fe^{2+} vs dichromate titrations)
Conductometric titrations (acid-base – HCl vs. NaOH titrations)

UNIT IV   CORROSION AND CORROSION CONTROL   9
INTRODUCTION
Chemical corrosion
Definition - Chemical Corrosion - Electrochemical corrosion – different types (Galvanic corrosion – differential aeration corrosion) – mechanism of Chemical   and Electrochemical corrosion factors influencing corrosion
Corrosion control – sacrificial anode and impressed cathodic current methods
Protective coatings :
Paints – constituents of the paint and their functions
Metallic coatings – electroplating of Gold and electroless plating of Nickel.
V.NON-CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES   9
INTRODUCTION :
Nuclear fission and nuclear fusion reactions – differences between nuclear fission and nuclear fusion reactions – nuclear chain
Reactions – nuclear energy critical mass - super critical mass - sub - critical mass Light water nuclear reactor for power generation (block diagram only) – breeder reactor
Solar energy conversion – solar cells – wind energy
Fuel cells – hydrogen – oxygen fuel cell
Batteries :
Primary and secondary Batteries – differences between Primary and secondary Batteries
Secondary batteries :
Lead–acid storage battery –working –uses
Nickel–cadmium battery - working –uses
Solid – state battery : Lithium battery

TOTAL: 45 PERIODS

TEXT BOOKS:
1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S. Dara "A text book of engineering chemistry" S.Chand & Co.Ltd., New Delhi (2006).
3. P. J. Lucia, M. Subhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai, (2007).

REFERENCES:

1. B.K.Sharma "Engineering chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008)

BBT 101 CELL BIOLOGY

L T P C
2 0 0 2

OBJECTIVES:

The Students will be able to
- To understand the fundamentals of the structure of cells
- To study the types and functions of cell organelles
- To comprehendthe methods involved in the cellular transport
- To know the cause, and methods of cell signaling
- Finally to give a basic knowledge of cell culture and its applications

COURSE OUTCOMES :

CO01 – Having a knowledge of , Eukaryotic cell and prokaryotic cell – differences and key organelles

CO02 – Having the thinking of Nucleus, Cytoplasm, Endoplasmic reticulum, Golgi complex, lysosomes, cell   membranes, chloroplast, mitochondria.

CO03 –Having a deep knowledge about the Transport across cell membranes , importance and its classification   Active and passive, passive transport and movement of water.

CO04 – With a true wisdom about , Qualification and characterization of receptors, different modes of signal transduction and amplification with examples.

CO05 - Having a sound knowledge about , Media preparation, Propagation of eukaryotic and prokaryotic cell.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S				M						
CO2		W	S	S		S						
CO3		M			M							
CO4	S		M	S	S							

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT:

UNIT I Cell Structure 6

Cells-definition, Eukaryotic cell and prokaryotic cell – differences and key organelles, Relationship and evolution of Eukaryotic cell and prokaryotic cell, plant cells and animal cells–differences and general structure- Cellular environment, tissues, various types of cell, Extra cellular matrix, cytoskeletal proteins, Cell cycle-Mitosis and meiosis

UNITII Cell Organelles 6

Cell Organelles and function – Nucleus, Cytoplasm, Endoplasmic reticulum, Golgi complex, lysosomes, cell membranes, chloroplast, mitochondria – structure, importance and function

UNIT III Cellular Transport 6

Transport across cell membranes – importance, classification – Active and passive, passive transport – movement of water, small lipid across membrane. Active – Na+ K+ ATPase Pump, Lysosomal and Vacuolar pumps. Cotransport – Symport, antiport – examples, Endocytosis and Exocytosis transport across prokaryotic membrane, entry of viruses and toxins

UNITIV Cell Signaling And Signal Transduction 6

Cell signaling – process importance, various kinds of Receptors and ligands – Examples, Different modes of action of ligands, Qualification and characterization of receptors, different modes of signal transduction and amplification with examples, signaling through G-Proteins (Monomeric and trimeric), signaling for growth factors, second messengers, protein kinases, Ca ions and cAMP molecule in signaling.

UNIT V Cell Culture 6

Definition, Media preparation, Propagation of eukaryotic and prokaryotic cell, cell lines, primary cultures, stock cell cultures, maintenance of cell lines in cell culture, explants cultures, differentiation and contamination

TOTAL: 30 PERIODS

TEXT BOOKS:

1. P.K. Gupta, "Cell and Molecular Biology", Rastogi Publication, 2003
2. Molecular Biology of the Cell, Bruce Albert et al., Taylor and Francis, 2002

REFERENCE BOOKS

1. Molecular Biology of the Cell, Baltimore, Damell J., Lodish, H. Baltimore, D., Freeman Publications, 2003
2. The Cell, T. Coopper, John Wiley and Sons, 2005
3. Cytology,VermaandAggarval, S. Chand Publications, 2003

BCS 101 FUNDAMENTALS OF COMPUTING AND PROGRAMMING

L T PC
3 0 0 3

OBJECTIVES:
1. To enable the student to learn the major components of a computer system.
2. To know the correct and efficient way of solving problem.

COURSE OUTCOMES:

       CO01- Classification of Computers-Basic Computer Organization-Number system.

       CO02 - Pseudo code Introduction to Office Packages: MS Word , Spread Sheet, Power Point, MS Access, Outlook.

       CO03-Managing Input and Output statements-Decision making-Branching and Looping statements

       CO04 – Managing Inputand Output operators-Decision making-Branching and Looping.

       CO05 – Overview of C++ - Applications of C++-Classes and objects-OOPS concepts Constructor andDestructor

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S			W				S		
CO2			S					M				
CO3	M			S							S	
CO4						S		M				

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I: Introduction to Computer 9
Introduction-Characteristics of computer-Evolution of Computers-Computer Generations - Classification of Computers-Basic Computer Organization-Number system. Computer Software: Types of Software—System software-Application software-Software Development Steps

UNIT II: Problem Solving and Office Automation 9
Planning the Computer Program – Purpose – Algorithm – Flowcharts– Pseudo code Introduction to Office Packages: MS Word , Spread Sheet, Power Point, MS Access, Outlook.

UNIT III: Introduction to C   **9**

Overview of C-Constants-Variables-Keywords-Data types-Operators and Expressions - Managing Input and Output statements-Decision making-Branching and Looping statements.

UNIT IV: Arrays and Structures   **9**

Overview of C-Constants, Variables and Data types-Operators and Expressions -Managing Input and Output operators-Decision making-Branching and Looping.

UNIT V: Introduction to C++   **9**

Overview of C++ - Applications of C++-Classes and objects-OOPS concepts -Constructor and Destructor- A simple C++ program –Friend classes and Friend Function.

Text books: **Total: 45 Periods**

1.   Ashok, N.Kamthane,”Computer Programming”, Pearson Education (2012).
2.   Anita Goel and Ajay Mittal,”Computer Fundamentals and Programming in C”, Dorling Kindersley
      (India Pvt Ltd).,Pearson Education in South Asia,(2011).
3.   Yashavant P. Kanetkar, “Let us C”,13th Edition,BPB Publications(2013).
4.   Yashavant P. Kanetkar,”Let us C++”10th Edition, BPB Publications (2013).

References:

1.   Pradeep K.Sinha, Priti Sinha “Foundations of Computing”, BPB Publications (2013).
2.   Byron Gottfried, “Programming with C”, 2nd edition, (Indian Adapted Edition), TMH publication.
3.   PradipDey,ManasGhosh,Fundamentals of Computing and Programming in ‘C’ First Edition ,Oxford
      University Press(2009)
4.   The C++ Programming Language ,4thEdition,BjarneStroustrop,Addison-Wesley Publishing
      Company(2013)

BBA101/BBA102 Personality Development

L T P C
1 1 0 2

OBJECTIVE:
The students should be able to act with confidence, be clear about their own personality, character and future goals.

COURSE OUTCOME:
- To make students understand the concept and components of personality and thereby to apply the acquired knowledge to themselves and mould their personality.
- To impart training for positive thinking, this will keep the students in a good stead to face the challenges.
- To bring out creativity and other latent talents with proper goal setting so that self- esteem gets enhanced.
- To develop an individual style and sharpen the skills in the area of leadership, decision making, time management and conflict management.
- To sharpen the employability skills of the professional undergraduate students and aid them in landing in the desired job.

UNIT   I   Introduction   to   Personality   Development 9

The concept personality - Dimensions of personality – Theories of Freud & Erickson- Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analyses.

UNIT   II   Attitude   &   Motivation 9

Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude - Advantages –Negative attitude
- Disadvantages - Ways to develop positive attitude - Difference between personalities having positive and negative attitude. Concept of motivation - Significance - Internal and external motives - Importance of self- motivation- Factors leading to de-motivation

Unit   III   Self-esteem 9

Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-
esteem - Symptoms - Personality having low self esteem - Positive and negative self-esteem. Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours - Lateral thinking.

Unit   IV   Other   Aspects   of   Personality   Development 9

Body language - Problem-solving - Conflict and Stress Management - Decision-making skills -Leadership and qualities of a successful leader - Character-building -Team-work - Time management -Work ethics –Good manners and etiquette.

Unit   V   Employability   Quotient 9

Resume building- The art of participating in Group Discussion – Acing the Personal (HR & Technical)

Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

Total: 45 Periods

Text Books:

- Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata Mc Graw Hill.
- Stephen P. Robbins and Timothy A. Judge(2014), *Organizational Behavior 16th Edition:* Prentice Hall.

Reference Books:

- Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi.Tata McGraw-Hill 1988.
- Heller, Robert.Effective leadership. Essential Manager series. Dk Publishing, 2002
- Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
- Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001
- Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
- Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
- Smith, B . Body Language. Delhi: Rohan Book Company. 2004

BCE 101/BCE 201 BASIC CIVIL ENGINEERING

L T P C
2 0 0 2

Course Objectives: At the end of this course, students shall be able to

1. To expose students with the basics of Civil Engineering

2. To understand the components of a building

3. To Learn Engineering aspects related to dams, water supply, and sewage disposal

Course Outcomes
CO01 - To learn the Basic Civil Engineering Materials
CO02 - To learn principles of survey Measurement of distances
CO03 - To have a clear understanding Foundation for Building
CO04 – To study stone and brick masonry and Plastering
CO05 - To learn principles standards of drinking- distribution system. – Sewage Treatment

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W											
CO2		S	W		S							
CO3		M		S								
CO4	S		S	M								

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT- I   Civil Engineering Materials   8
Introduction – Civil Engineering – Materials – Stones – Bricks – Sand – Cement – Plain Concrete – Reinforced Cement Concrete – Steel Sections – Timber – Plywood – Paints – Varnishes (simple examples only)

UNIT- II Surveying   5
Surveying – objectives – classification – principles of survey-Measurement of distances – Chain survey – Determination of areas – Use of compass – Use of leveling Instrument – (simple examples only)

UNIT- III   Foundation for Building   5
Bearing Capacity of Soil – Foundation – Functions – Requirement of good foundations – Types

of foundations – Merits & Demerits.

UNIT- IV   Superstructure   **7**
Stone Masonry – Brick Masonry – Columns – Lintels – Beams – Roofing – Flooring – Plastering
– White Washing (Simple examples only)

UNIT- V   Miscellaneous Topics   **5**
Types of Bridges –Dam- purpose – selection of site - Types of Dams – Water Treatment &
Supply sources – standards of drinking- distribution system. – Sewage Treatment (simple
examples only)

TOTAL : 30 PERIODS

**Text
Books:**
1.   Raju .K.V.B, Ravichandran .P.T, "Basics of Civil Engineering", Ayyappa Publications,
Chennai, 2012.
2.   Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, (1st ed. 2005).
3.   Dr.M.S Palanisamy, "Basic Civil Engineering" (3rd ed. 2000), TUG Publishers, New
Delhi/Tata Mc Graw

Hill Publication Co., New Delhi

Reference Books:
1.   Rangwala .S.C," Engineering Material"s, Charotar Publishing House, Anand, 41st Edition:
2014.
2.   National Building Code of India, Part V, "Building Materials", 2005
3.   Ramesh Babu "A Textbook on Basic Civil Engineering" (1998). Anuradha Agencies,
Kumbakonam.
4.   Ramamrutham S., "Basic Civil Engineering", Dhanpat Rai Publishing Co. (P) Ltd. (1999).

L T P C
2 0 0 2

Course Objectives:

1) To provide basic knowledge regarding various power plants.
2) To provide basic knowledge of I.C engines, Refrigeration and Air- Conditioning.
3) To provide basic Knowledge of basic manufacturing process.
4) To provide basic knowledge of mechanical design required for engineering.

Course Outcomes

CO01 - To learn the Renewable and Non-renewable resources
CO02 - To Working principles of petrol and diesel engines
CO03 - To have a clear study Layout of typical domestic refrigerator
CO04 – To study Mould making and casting process
CO05 - To learn

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		W	M		S							
CO3		M		W								
CO4	S		S	M								

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-I   Energy Resources and Power Generation   **6**
Renewable and Non-renewable resources- solar, wind, geothermal, steam, nuclear and hydel power plants- Layout, major components and working. Importance of Energy storage, Environmental constraints of power generation using fossil fuels and nuclear energy.

UNIT-II   IC Engines   **6**
Classification, Working principles of petrol and diesel engines- two stroke and four stroke cycles, functions of main components of I.C engine. Alternate fuels and emission control.

UNIT-III   Refrigeration and Air-Conditioning System   **6**

Terminology of Refrigeration and Air-Conditioning, Principle of Vapour Compression & Absorption system- Layout of typical domestic refrigerator- window & Split type room air conditioner.

UNIT-IV   Manufacturing Processes   **6**

Brief description of Mould making and casting process, Metal forming, Classification types of forging,   forging operations, Brief description of extrusion, rolling, sheet forging, and drawing. Brief description of welding, brazing and soldering. Principal metal cutting processes and cutting tools, Brief   description of Centre lathe and radial drilling machine.

UNIT-V Mechanical Design   **6**

Mechanical properties of material-Yield strength, ultimate strength, endurance limit etc., Stress-Strain curves of materials. Stresses induced in simple elements. Factor of safety - Design of Shafts and belts. Types of bearings and its applications Introduction to CAD/CAM/CIM   &   Mechatronics.

Total: 30 Periods

TEXT BOOKS:

1.   T.J.Prabhu et al , "Basic Mechanical Engineering" , Scitech Publications(p) Ltd, 2000

REFERENCES :

1.   NAGPAL, G.R, "Power plant Engineering", Khanna Publishers, 2004.
2.   RAO.P.N, "Manufacturing Technology", Tata McGraw-Hill Education, 2000.
3.   Kalpakjian, "Manufacturing Engineering and Technology", Adisso Wesley publishers, 1995.
4.   Ganesan. V, "Internal combustion engines", Tata McGraw-Hill Education, 2000.
5.   C.P.Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill Education, 2001.
6.   V.B.Bhandari, "Design of Machine elements", Tata McGraw-Hill Education, 2010.

BEE 101/201 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L T P C
2 0 0 2

OBJECTIVES

- To impart knowledge to the Students about the principles Ohm's law ,Kirchoff's Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C).
- To make them understand the Principles of Introduction to Measurement Systems, Construction and Operating principles of PMMC,
- To impart a sound knowledge about the Basic Concepts of semiconductor devices – PN Junction Diode Characteristics

COURSE OUTCOMES :

CO01 – Having a knowledge of Current and voltage source transformation – mesh current & node voltage method –superposition theorem – Thevenin's and Norton's Theorem - Problems.

CO02 – Having the thinking of Principles of Construction, principle of operation, Basic Equations and applications and D.C. Generators and D.C. Motors.

CO03 – Having a deep knowledge about the Introduction to Measurement Systems, Construction and Operating principles of PMMC,and moving Iron**.**

CO04 – With a true wisdom about HWR, FWR , Zener Diode,BJT (CB, CE, CC) configuration & its characteristics.

CO05 - Having a knowledge in Number system – Logic Gates – Boolean Algebra – De-Morgan's Theorem.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M	S								
CO2		W		M	M							
CO3		M	S	S								
CO4	M		S	M								

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I D.C. AND A.C CIRCUITS   6

Ohm's law – Kirchoff's Laws, V – I Relationship of Resistor (R) Inductor (L) and capacitor (C). Series parallel combination of R, L&C – Current and voltage source transformation – mesh current & node voltage method –superposition theorem – Thevenin's and Norton's Theorem - Problems.

UNIT – II ELECTRICAL MACHINES   6

Construction, principle of operation, Basic Equations and applications - D.C.Generators and D.C.Motors**.** -Single phase Induction Motor - Single Phase Transformer.

UNIT – III BASIC MEASURMENT SYSTEMS   6

Introduction to Measurement Systems, Construction and Operating principles of PMMC, Moving Iron, Dynamometer Wattmeter, power measurement by three-watt meter and two watt method – and Energy meter.

UNIT IV – SEMICONDUCTOR DEVICES   6

Basic Concepts of semiconductor devices – PN Junction Diode Characteristics and its Application – HWR, FWR – Zener Diode – BJT (CB, CE, CC) configuration & its characteristics.

UNIT V – DIGITAL ELECTRONICS   6

Number system – Logic Gates – Boolean Algebra – De-Morgan's Theorem – Half Adder & Full Adder – Flip Flops.

Total No. of Periods: 30

TEXT BOOKS:

1. N.Mittle "Basic Electrical Engineering". Tata McGraw Hill Edition, New Delhi, 1990.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.
3. Jacob Millman and Christos C-Halkias, "Electronic Devices and Circuits", Tata McGraw Hill

REFERENCE BOOKS:
1. Edminister J.A. *"Theory and problems of Electric Circuits"* Schaum's Outline Series. McGraw Hill Book Compay, 2nd Edition, 1983.
2. Hyatt W.H and Kemmerlay J.E. "*Engineering Circuit Analysis*", McGraw Hill Internatinal Editions, 1993.
3. D. P. Kothari and I. J. Nagrath "Electric machines" Tata McGraw-Hill Education, 2004
4. Millman and Halkias, "Integrated Electronics", Tata McGraw Hill Edition,2004.

BCS 1L1/BCS 2L2 COMPUTER PRACTICE LABORATORY I

L T PC
0 0 2 1

LIST OF EXERCISES

A) Word Processing **11**
Document creation,Text manipulation with Scientific Notations.
Table creation,Table formatting and Conversion.
.Mail merge and Letter Preparation.
Drawing-Flow Chart

B) Spread Sheeet **12**
Chart – Line,XY,Bar and Pie.
Formula – Formula Editor.
Spread Sheet-Inclusion of Object , Picture and Graphics,Protecting the document   and sheet.
Sorting and Import / Export features.

C) Simple C Programming * **11**
Data types, Expression Evaluation, Condition Statements.
Arrays
Structures and Unions
Functions

D) Simple C++ Programming **11**
13. Classes and Objects
14. Constructor and Destructor

*For Programming exercises Flow chart and Pseudo code are essential.

Total: 45 Periods

BCM1L1/ BCM2L1BASIC CIVIL & MECHANICAL ENGINEERING PRACTICES   LABORATORY

L T P C
0   0 2
1

OBJECTIVE:

To provide exposure to the students with hands on experience on various basic Civil & Mechanical Engineering practices.

COURSE OUTCOME:

1. To provide hands on exercises in common plumbing and carpentry works associated with residential and industrial buildings.
2. To expose the students regarding pipe connection for pumps & turbines and to study the joint used in roofs, doors, windows and furnitures.
3. To provide hands on exercise on basic welding, machining and sheet metal works.
4. To provide exposure regarding smithy, foundry operations and in latest welding operations such as TIG, MIG, CO2, spot welding etc.,
5. To expose the students regarding the construction and working of centrifugal pump, air-conditioner and lathe.

	Direct		Indirect
1	Observation Book	1	Students Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

I.   CIVIL ENGINEERING

PRACTICE Buildings:
Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
a)   Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in

household fittings.
b)   Study of pipe connections requirements for pumps and turbines.
c)   Preparation of plumbing line sketches for water supply and sewage works.
d)   Hands-on-exercise: Basic pipe connectionof PVC pipes &G.I. Pipes – Mixed pipe material connection – Pipe connections with different joining components.
e)   Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Hand tools and Power tools:
a)   Study of the joints in roofs, doors, windows and furniture.
b)   Hands-on-exercise:Wood work, joints by sawing, planning

and cutting. c)   Preparation of half joints, Mortise and Tenon joints.

II   MECHANICAL ENGINEERING PRACTICE

Welding: Preparation of butt joints, lap joints and tee joints by arc welding.

Basic Machining:

    a)   Simple Turning and Taper turning b)   Drilling Practice

Sheet Metal Work:

    a)   Forming & Bending:

    b)   Model making – Trays, funnels, etc. c)   Different type of joints.

    d)   Preparation of air-conditioning ducts.

Machine assembly practice:
        a)   Assembling, dismantling and Study of centrifugal pump
        b)   Assembling, dismantling and Study of air
conditioner c)   Assembling, dismantling and
Study of lathe.

Moulding:
        Moulding operations like mould preparation for gear and step cone pulley etc.,

Fitting:
        FittingExercises – Preparation of square fitting and vee – fitting models.

Demonstration:
        a)   Smithy operations, upsetting, swaging, setting down and bending. Example –
Exercise –
        Production of hexagonal
headed bolt. b)   Gas welding.

TOTAL: 45 PERIODS

REFERENCES:
1. K. Jeyachandran, S. Nararajan & S, Balasubramanian, "A Primer on Engineering Practices Laboratory" , Anuradha Publications, (2007).
2. T.Jeyapoovan, M. Saravanapandian & S. Pranitha, "Engineering Practices Lab Manual",Vikas Publishing House Pvt. Ltd. (2006)
3. H. S. Bawa, "Workshop Practice",Tata McGraw – Hill Publishing Company Limited, (2007).
4. A. Rajendra Prasad & P. M. M. S Sarma, "Workshop Practice", Sree Sai Publication, (2002).
5. P. Kannaiah & K.L. Narayana, "Manual on Workshop Practice", Scitech Publication, (1999).

BEE1L1 Basic Electrical Engineering Lab

L T P C
0 0 2/2 1

Direct		Indirect	
1	Observation Book	1	Students Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examinations	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

I - List of Experiments for Electrical Engineering Lab

1. Fluorescent lamp wiring

2. Stair case wiring

3. Measurement of electrical quantities-voltage current, power & power factor in RLC circuit

4. Residential house wiring using fuse, switch, indicator, lamp and energy meter

5. Measurement of energy using single phase   energy meter

6. Measurement of resistance to earth of electrical equipment

I - List of Experiments for Electronics Engineering Lab

1. Study of electronic components and equipments.

    A. Resistor colour coding using digital multi-meter.

    B. Assembling electronic components on bread board.

2. Measurement of ac signal parameters using cathode ray oscilloscope and function generator.

3. Soldering and desoldering practice.

4. Verification of logic gates (OR, AND, OR, NOT, NAND, EX-OR).

5. Implementation of half adder circuit using logic gates.

BPC 1L1 PHYSICS AND CHEMISTRY LABORATORY

L T P C

0 0 2/2 0

Direct		Indirect	
1	Observation Book	1	Students Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examinations	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of particle size using laser

2. Determination of wavelength of laser light

3. Determination of numerical aperture and acceptance angle of an optical fiber

4. Study of photo electric effect

5. Determination of velocity of sound and compressibility of liquid-ultrasonic interferometer

6. Determination of wave lengths of mercury spectrum - spectrometer grating

II - LIST OF EXPERIMENTS – CHEMISTRY

1. Estimation of hardness of Water by EDTA

2. Estimation of Copper in brass by EDTA

3. Determination of DO in water (Winkler's method)

4. Estimation of Chloride in Water sample (Argento metry)

5. Estimation of alkalinity of Water sample

6. Determination of molecular weight and degree of polymerization using Viscometer.

BEN 201 ENGLISH II

L T P C
3 1 0 3.

OBJECTIVE: To make them master the techniques of professional communication so that they become employable after completing the course

To make the students learn the basics of communication in order to talk fluently , confidently and vividly

COURSE OUTCOMES:

CO01- Numerical adjectives Meanings in context Same words used as different parts of speech **.**
CO02 - C.Ds , News bulletin Special Lectures, Discourse   Note taking Sentence patterns SV, SVO, SVC, SVOC, SVOCA
CO03- Recommendations   and   suggestions Sequencing jumbled sentences to make   a paragraph advertisement and notices, designing or drafting posters,
CO04- Abbreviations and acronyms business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies):
CO05 Editing Prepositions Articles Permission letter for undergoing practical training , Essay writing - Application for a job

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S			W				S		
CO2			S					M				
CO3	M			S							S	
CO4						S		M				

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I   Orientation   **9 + 3**
Numerical adjectives - Meanings in context - Same words used as different parts of speech -Paragraph writing - Non- verbal communication - Regular and Irregular verbs.

UNIT II   Oral Skill   **9 + 3**

Listening to audio cassettes - C.Ds , News bulletin - Special Lectures, Discourse - Note taking - Sentence patterns - SV, SVO, SVC, SVOC, SVOCA - Giving Instructions - Reading Comprehension and answering questions. Inferring meaning.

UNIT III   Thinking Skill   9 + 3
Self- introduction - Describing things - Group Discussion – Debate - Role play – Telephone etiquette – Recommendations and suggestions – Sequencing jumbled sentences to make a paragraph - advertisement and notices, designing or drafting posters, writing formal and informal invitations and replies.

UNIT   IV   Writing Skill   9 + 3
 Definitions - Compound nouns - Abbreviations and acronyms - business or official letters(for making enquiries, registering complaints, asking for and giving information, placing orders and sending replies): (b) letters to the editor(giving suggestions on an issue) .

UNIT V   Formal Information   9 + 3
 Editing – Prepositions -   Articles - Permission letter for undergoing practical training , Essay writing - Application for a job , letter to the principal authorities regarding admissions, other issues, requirement or   suitability   of   course   etc.
                                                                          Total: 60 Periods
TEXT
BOOK:
Meenakshi Raman, SangeethaSharma , Technical English for Communication: Principle and Practice, OUP, 2009.

REFERENCE BOOKS:
Sumanth , English for engineers, Vijay Nicole , Imprints pvt ltd.2013.
Meenakshi Raman and SangeethaSharma , Technical Communication Principles and Practice, Oxford University
Press, 2009.
Sangeetha Sharma, Binodmishra , Communication skills for engineers and scientists , PHI Learning Pvt Ltd, New
Delhi, 2010

BMA 201 - ENGINEERING MATHEMATICS – II

L T P C
3 1 0 3

OBJECTIVE:

To impart adequate knowledge of Mathematics to the students so as to formulate problems in engineering environment and solve them using mathematical tools.

COURSE OUTCOME:

At the end of this course, students shall be able to

i) Solve differential equations, simultaneous linear equations, and some special types of linear equations related to engineering.

ii) Deal with applications in a variety of fields namely fluid flow, heat flow, solid mechanics, electrostatics, etc.

iii) Find intensity of degree of relationship between two variables and also bring out regression equations.

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S							M			W
CO2	M		S			M	W					
CO3		W		W					M		S	
CO4	S					S				M		

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I ORDINARY DIFFERENTIAL EQUATION 9+3

Higher order linear differential equations 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 VECTOR CALCULUS

9+3 Gradient, divergence and curl –Directional derivatives – Irrational and solenoidal vector fields – vector integration – Green's theorem in a plane , Gauss divergence theorem and Stoke's theorem (without proofs) – simple applications involving cubes and rectangular parallelepipeds.

UNIT III ANALYTIC FUNCTIONS
9+3

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy-Riemann equation and sufficient conditions (without proofs) – Harmonic and orthogonal properties of analytic functions – Harmonic conjugate – construction of analytic functions – conformal mapping : W= Z+C,CZ , 1/Z and bilinear transformation.

UNIT IV COMPLEX INTEGRATION
9+3

Complex integration – Statement and application of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem –Application of Residue theorem to evaluate real integrals – Unit circle and semi-circular contour (excluding ploes on boundaries).

UNIT V STATISTICS
9+3

Mean , Median ,Mode – Moments – Skewness and Kurtosis – correlation – Rank Correlation – Regression –Chi square test – 2 x 2, m x n .

TOTAL : 60 PERIODS

TEXT BOOK :
2. Gupta SC, and VK.Kapoor, "Fundamentals Mathematical Statistics", 11th edition, Sultan Chand Sons, , New Delhi, 2014.[Unit V]

3.. Bali.N.P and Manish Goyal , " Engineering Mathematics " , 3rd Edition , Laxmi Publications (p) ltd, 2008 .[Units I to IV]

REFERENCES :
1. Ramana.B.V , " Higher Engineering Mathematics " , Tata McGraw Hill Publishing Company , New Delhi, 2007.
2. George B. Thomas and Ross L.Finney. "Calculus and Analytical Geometry" 9th Edn. Narosa Indian Student Edition, New Delhi.
3. Grewal .B.S " Higher Engineering Mathematics" , 40th Editon , Khanna Publications , New Delhi , 2007 .
4. Douglas C.Montgomory, George C.Runger and Norma F.Hubele. "Engineering Statistics" 4th Edn. Wiley India Pvt Ltd. New Delhi-2. 2007.

1

BPH201   Engineering Physics – II
(New Curriculum 2015 – 2016 batch onwards)

SUBJECT CODE – BPH201

C	L	T	P	M
100	3	3	0	0

OBJECTIVES:
- To make a bridge between the physics in school and engineering courses.
- To expose the students to multiple areas of Science of Engineering materials which have direct relevance to different Engineering applications.

COURSE OUTCOMES

- **CO01 -** To Know about properties and advancements of conducting materials .
- **CO02 -** To Know the principle and properties semiconducting materials.
- **CO03 -** Acquire Knowledge on magnetic and dielectric materials
- **CO04 –** To Know about the creation of new materials with novel properties
- **CO05 –** To Understand the impact of light in technical uses

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						S				M		
CO2		W	S									
CO3	W			S			M					
CO4	S		W						S			

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I - CONDUCTING MATERIALS
Classical Free Electron Theory of Metals- Drawback of Classical Theory – Wiedemann Franz Law- Density of States- Fermi-Dirac Statistics- Calculation of Fermi Energy and Its Importance - High Resistivity Alloys – Super Conductors – Properties and Applications – Magnetic Levitation, SQUIID, Cryotron.

UNIT II - SEMICONDUCTING MATERIALS
Elemental and Compound Semiconductors and their Properties- Carrier Concentrations (Electrons and Holes) in Intrinsic Semiconductors - Carrier Concentrations in N- Type and P- Type Semiconductors – Variation of Fermi Level with Carrier Concentration and Temperature - Variation of Conductivity with Temperature – Band Gap Determination – Hall Effect – Experimental Arrangement - Application.

UNIT III - MAGNETIC AND DIELECTRIC MATERIALS

Different Type of Magnetic Material And Their Properties – Hard And Soft Magnetic Material – Domain Theory Of Ferromagnetism – Hysteresis – Energy Product of Magnetic Materials – Ferrites and Their Applications – Various Polarization Mechanisms In Dielectric – Frequency and Temperature Dependence – Internal Field and Detection of Classius – Mosotti Equation – Dielectric Loss- Dielectric Breakdown.

UNIT IV - NEW ENGINEERING MATERIAL

Shape memory Alloys- Types- General Characteristics- Applications – Metallic Glasses- Properties- Applications –transformer as a Core Material – Nano Phase Materials – Properties – Production – Ball Milling Technique – Sol- Gel Method – Chemical Vapour Deposition - Applications.

UNIT V - OPTICAL MATERIALS &OPTIC FIBERS

Light Interaction With Solids- Classification of Optical Material – Optical Properties of Metals, Insulator And Semiconductors – Traps – Colour Centers – Luminescence – phosphorescence – LED – LCD – Construction and Working – Advantages and Disadvantages – Applications.
Principle and Propagation of Light In Optical Fibres- Numerical Aperture And Acceptance Angle- Types Optical Fibre(Material, Refractive Index, Mode)- Double Crucible Technique of Fibre Drawing

TEXT BOOKS
1. Avadhanulu. M.N.; Engineering Physics - II; S.Chand And Company Ltd, 2010.
2. Jeyaraman, D. 'Engineering Physics – II' Global Publishing House, 2014

REFERENCE BOOKS
1. Rajendran V and Marikani a, 'material science' tata mcgraw hill publications Ltd, 3rd edition
2. Mukunthan .A., Usha.S.,; science of engineering materials; SciTech publications (india) Pvt Ltd; chennai, (2007).\\
3. M.Arumugam, 'material science', anuradha publications, kumbakonam (2006).

BCH 201 ENGINEERING CHEMISTRY – II

L T P C
3 0 0 3

OBJECTIVES:

- To make the students to have a sound knowledge with industrial applications of surface chemistry
- To impart knowledge about the Industrial importance of Phase rule and alloys
- To make the students to be conversant with Analytical techniques and their importance
- To have an idea and knowledge about the Chemistry of Fuels and
- To make them study to have a deep knowledge in Chemistry of engineering materials

COURSE OUTCOMES:

- **CO01 -** To Know about properties and advancements of conducting materials .
- **CO02 -** To Know the principle and propertieschemical engg.
- **CO03 -** Acquire Knowledge on magnetic and Chemical materials
- **CO04 –** To Know about the creation of new materials with novel properties
- **CO05 –** To Understand the impact of light in technical uses

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						S				M		
CO2		W	S									

CO3	W			S			M					
CO4	S		W						S			

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I - Surface Chemistry 9
Introduction **:** Adsorption , absorption , desorption , adsorbent , adsorbate and sorption – (definition only) Differences between adsorption and absorption Adsorption of gases on solids – factors affecting adsorption of gases on solids – Adsorption isotherms – Frendlich adsorption isotherm and Langmuir adsorption isotherm Role of adsorbents in catalysis, Ion-exchange adsorption and pollution abatement.

UNIT II - Phase Rule and Alloys 9
Introduction **:**Statement of Phase Rule and explanation of terms involved – one component system – water system – Construction of phase diagram by thermal analysis - Condensed phase rule [Definition only] Two Component System : Simple eutectic systems (lead-silver system only) – eutectic temperature – eutectic composition – Pattinsons Process of desilverisation of Lead Alloys : Importance, ferrous alloys – nichrome and stainless steel – 18/8 stainless steel -heat treatment of steel – annealing –hardening – tempering - normalizing – carburizing - nitriding . Non- ferrous alloys: Brass and Bronze

UNIT III - Analytical Techniques 9
Introduction: Type of Spectroscopy - Atomic spectroscopy – molecular spectroscopy - Explanation IR spectroscopy – principles – instrumentation (block diagram only) – applications - finger print region UV-visible spectroscopy — principle – instrumentation (block diagram only) – Beer-Lambert's law- – estimation of iron by colorimetry – Atomic absorption spectroscopy- principle - instrumentation (block diagram only) - estimation of Nickel by Atomic absorption spectroscopy Flame photometry– principles – instrumentation (block diagram only) - estimation of sodium ion by Flame photometry

UNIT IV - Fuels 9
Introduction **:** Calorific value – types of Calorific value - gross calorific value – net calorific value Analysis of Coal –- Proximate and ultimate analysis – hydrogenation of coal - Metallurgical coke – manufacture by Otto-Hoffmann method Petroleum processing and fractions – cracking – catalytic cracking – types – fixed bed catalytic cracking method- Octane number and Cetane number (definition only) Synthetic petrol – Bergius processes – Gaseous fuels- water gas, producer gas, CNG and LPG (definition and composition only) Flue gas analysis – importance - Orsat apparatus

UNIT V Engineering Materials 9
Introduction : Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) Manufacture of Refractories : alumina bricks and Magnesite bricks, Abrasives – natural and synthetic abrasives Natural type : Siliceous - quartz ; Non –siliceous – diamond Synthetic Abrasives : silicon carbide and boron carbide. Lubricants : Liquid lubricants - Properties – viscosity index, flash and fire points, cloud and pour points, oilyness) Solid lubricants – graphite and molybdenum sulphide

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

3. P. J. Lucia, M. Subhashini, "Engineering Chemistry, Volume 1", Crystal Publications, Chennai, (2007).

REFERENCES:
1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

BCS201 INTERNET PROGRAMMING

L T PC
2 0 0 2

OBJECTIVES

- To impart knowledge to the Students about the principles Internet principles-IP addressing-Internet Service Provider (ISP)-URL.
- To make them understand the Principles of Introduction to HTML – Structure of HTML Document

COURSE OUTCOMES :

CO01 – Having knowledge of Internet principles-IP addressing-Internet Service Provider (ISP)-URL.

CO02 – Having the thinking of Principles of Construction Tags-Headings – Links – Images – Lists – Tables – Forms – Frames - Style sheets and its types.

CO03 – Having a deep knowledge about the Introduction to Dynamic HTML-Object model and collections-Event model-Filters and transition-Data binding-Data control-Activex control.

CO04 – With a true wisdom about VB Script & Java Script:Introduction-Operators –Data type-Control structures

CO05 - Having a knowledge in Online database-functions of online database-Merits and Demerits-Internet Information Systems

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M		M		S						
CO2			S	M		S						
CO3	S		S	S								
CO4		M	S	M								

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

Unit – I Basic Internet Concepts 6

Internet principles-IP addressing-Internet Service Provider (ISP)-URL-Basic web concepts-
World Wide Web (WWW)-Intranet and Extranet-Internet Protocols:
HTTP,TCP,UDP,FTP,Telnet-Domain Name System(DNS)-E mail-Next generation internet.

Unit-II Web Design Basics   6

Introduction to HTML – Structure of HTML Document – Tags-Headings – Links – Images – Lists – Tables – Forms – Frames - Style sheets and its types.

Unit-III Dynamic HTML   6

Introduction to Dynamic HTML-Object model and collections-Event model-Filters and transition-Data binding-Data control-Activex control.

Unit-IV Client and Server Side Programming   6

VB Script & Java Script:Introduction-Operators –Data type-Control structures-Looping – Classes and Objects – Arrays-Functions-Events-Example programs.

Unit-V Internet Applications   6

Online database-functions of online database-Merits and Demerits-Internet Information Systems (IIS)-EDI applications in business and its types-Internet commerce-Types and Applications.

TOTAL: 30 Periods

TEXT BOOKS:

1. Deitel, Deitel and Nieto, '' Internet and World Wide Web-How to program'', Pearson Education Publishers,5th
    edition, 2008.
2. Elliotte Rusty Harold , ''Java Network Programming'', O'Reilly Publishers,2010
3. JavaScript: A Beginners Guide John Pollock 4th Edition, TMH Edition(2013)
4. VB Script Beginners Guide, JyotiB.Giramkar,Create Space Independent Publishing(2014)

References:

1. R.Krishnamoorthy&S.Prabhu, '' Internet and Java Programming'', New Age International Publishers, 2010.
2. ThomnoA.Powell,''The Complete Reference HTML and XHTML'', fourth edition, Tata McGraw Hill, 2012.
3. E Commerce KamleshK.Bajaj, DebjaniNag, TataMcGrawHill, Second edition,2010

L T P C
2 0 0 2

OBJECTIVE:

The Students will be able to
- To understand the fundamentals of genetics and the Mendelian laws
- To differentiate between the structure and organization of chromosomes in prokaryotes and eukaryotes

COURSE OUTCOMES:

CO01- Mendelian Laws Mendel's experiment-monohybrid cross-phenotype, genotype, Dihybrid inheritance,**.**

CO02-Chromosome structure and organization in prokaryotes and eukaryotes unusual chromosomes

CO03-Classical concepts of Pleomorphism, Multiple alleles, ABO blood groups, Rh factor, sex linkage in Drosophila

CO04-Coupling and Repulsion-Hypothesis, Test cross in maize and crossing over, theory of crossing over,molecular mechanism

CO05 - Transformation, Tansduction, Conjugation, Plasmids and Episomes

S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W							M		S		
CO2			S			W						
CO3	S			M							S	
CO4		M						S				

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

COURSE CONTENT

UNIT I BASICS OF GENETICS **6**
Classical genetics, Mendelian Laws- Mendel's experiment-monohybrid cross-phenotype, genotype, Dihybrid inheritance, Interaction of genes, Fine structure of Genes

UNIT II CHROMOSOMES 6

Chromosome structure and organization in prokaryotes and eukaryotes, unusual chromosomes-chromosome banding, chromosome abnormalities- genetic disorders

UNIT IIIALLELES 6

Classical concepts of Pleomorphism, Multiple alleles, ABO blood groups, Rh factor, sex linkage in Drosophila, linkage in human beings, mechanism of sex determination, XX-XY mechanisms of sex determination, sex determination in Drosophila, environmental factors and sex determination, sex differentiation.

UNIT IV CROSSING OVER 6

Coupling and Repulsion-Hypothesis, Test cross in maize and crossing over, theory of crossing over, molecular mechanism of crossing over, sex chromosomes and sex linked inherited disorders, colour blindness, hemophilia, Muscular dystrophy

UNIT V GENE TRANSFER 6

Transformation, Tansduction, Conjugation, Plasmids and Episomes

TOTAL: 30 PERIODS

TEXT BOOKS
1. Principles of Genetics, Gardner, Simmons and Snustad, John Wiley and Sons (Asia), 2002
2. Genes VIII, Lewin, International Edition, Prentice Hall, 2004

REFERENCE BOOKS
3. Instant Notes in Genetics, P.C. Winter, G.I. Hickey and H.L. Fletcher, Viva Books Private Limited, 2003

BCS 2L1 INTERNET PRACTICE

L T PC
0 0 2 1

LIST OF EXERCISES

1.   HTML (Hypertext Mark-up Language):

Basics of HTML.
How to create HTML Document
Steps for creating a simple HTML Program.

   a) Favorite Personality
   b) Resume Preparation

2.   Advanced HTML:
Advanced Topics of HTML
a)   Time Table
b)   Table Creation

3.   JavaScript:
Script Basics.
Incorporating JavaScript into Web page.

a)   Star Triangle
b)   Temperature Converters

4.   VBScript:
VBScript Basics.
Incorporating VBScript into HTML.

a)   Changing Background Color
b)   Simple Calculator

5.   Web Design:
Inserting External Media in the Web Page.
a)   Forms and Links
b)   Frames with Links and Lists

To export a Dream weaver Document as XML File, checking entries, working in frames, windows control, the java script URL.

BPC 2L1 PHYSICS AND CHEMISTRY LABORATORY

L T P C

0 0 2/2 1

	Direct		Indirect
1	Observation Book	1	Students Exit Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

I - LIST OF EXPERIMENTS – PHYSICS

1. Determination of resistivity of high resistance alloys and temperature coefficient

2. Study of Hall effect – Hall coefficient determination

3. Determination of electrical conductivity of good conductors

4. Study of magnetic hysteresis and energy product

5. Determination of Band gap of a semiconductor

6. Determination of Dispersive power of a prism – Spectrometer

II - LIST OF EXPERIMENTS – CHEMISTRY

1. Conducto metric titration (Simple acid base)

2. Conducto metric titration (Mixture of weak and strong acids)

3. Conducto metric titration using $BaCl_2$ vs Na_2SO_4

4. Potentiometric Titration (Fe^{2+} / $KMnO_4$ or $K_2Cr_2O_7$)

5. PH titration (acid & base)

6. Determination of water of crystallization of a crystalline salt (Copper Sulphate)

7. Estimation of Ferric iron by spectrophotometer.

L T P C
3 0 0 3

Importance of the Course:
1. Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension but also contributes significantly to the development of an individual's intelligence.
2. Language gives us access and insights into another culture. It is a fundamental truth that cultures define themselves through languages.
3. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit.

Course Objective
The Basic Course in French is designed to :
1. Introduce the basics of the language to beginners
2. To develop their knowledge as well as their communicative skills so as to be able to respond in simple everyday contexts.
 Synchronies I consists of 13 lessons with each lesson presenting a dialogue and giving the know-how, grammatical and lexical notions as well as activities required for communication. In addition, Synchronies I includes documents which initiate the learners to another world, another culture and which acclimatize them to the authentic use of the French language through the exploitation of written and iconographic documents. The Indian context has been used.

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I: 9
At the airport: Savoir– faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs 'to be', 'to call oneself', subject pronouns, interrogation

UNIT – II 9
At the University: Savoir-faire: enquiring after one's welfare, taking leave, expressing appreciation - Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular 'er' verbs, 'to have', 'to learn', negation, irregular verbs

UNIT – III 9
At the café: Savoir –faire: speaking about one's likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

UNIT – IV 9
At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & plural, indefinite pronoun, demonstrative adjectives, negation,   irregular verbs

UNIT – V 9
A concert: Savoir –faire: inviting, accepting, expressing one's inability to accept an invitation, complimenting, speaking on the phone

UNIT – VI   **9**

Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, At Nalli's Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, exclamative adjectives, imperative tense

Total: 45 hours

REFERENCES:

Course Material: Synchronie I – Méthode de Français

K. Madanagobalane -Samita Publications, Chennai, 2007

L T P C
3 0 0 3

Course Aim: To equip students with some basic knowledge of German to get oriented to the new problems in global environment and address them.

Course Objectives: At the end of this course, students shall be able to obtain good knowledge of the language, to read, write and speak German, whereby the emphasis is laid on speech. At the end of the first course, the students are in the position to communicate in a basic manner. An example of their skills would be:

• Ordering food in a restaurant
• Expressing their likes and dislikes
• Going for shopping
• Booking a room in a hotel
• Or even making complaints where ever necessary.

Course structure:

A. German Language (speaking, reading, writing, grammar and test)
B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
C. The German Way (introduction, doing business, conversation, meetings, dining)
D. Germany (Culture, Climate)

	Direct		Indirect
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I 9

Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers) Greetings, ordering, requesting, saying thank you - Grammar – the article "the", conjugation of verbs

UNIT II 9

Shopping - Grammar – adjectives, endings before nouns, practice. Self introduction

UNIT III 9

Addresses, Occupations, Studies - Grammar - 'to be', the definite/indefinite articles, individual training

UNIT IV 9

Leisure Time, Sports, Hobbies - Grammar – position of a verb in a main clause , oral practice

UNIT V 9

At a Restaurant, Food and Drink - Grammar – the personal pronoun in the Nominative and Accusative, Narrating an event

TOTAL 45 hours

Resources:
Sprachkurs Deutsch 1 (Verlag Diesterweg), New Delhi
Learning Centre

BJP 101/201 JAPANESE

L T P C
3 0 0 3

Course Objective:

The student will be able
1. To have a basic knowledge of Japanese language, Japanese culture and heritage
2. To impart knowledge Japanese lifestyle.
3. To give sufficient exposure to develop basic conversational skills.

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I **9**
Introduction-history and origin of Japanese language-Japan and its cultural heritage-Self introduction-counting numbers (1-100)-time-conversation with the use of audio devices, grammar– usage of particles wa, no, mo and ka

UNIT II **9**
Greetings, seasons, days of the week and months of the year-numbers (up to 99,999)-grammar– usage of kore, sore, are, kono, sono, ano, koko and kochira, arimasu and imasu-i-ending and na-ending adjectives-use of audio and drills for practice

UNIT III **9**
Asking the price–associated vocabulary-usage of particles ni, ga and ne- use of audio and drills for practice-Introduction to basic Kanji characters- use of audio and drills for practice

UNIT IV **9**
Family relationships- colours-Kanji (numbers) and festivals of Japan-religion-Japanese art and culture-ikebana, origami-introduction to hiragana- use of audio and drills for practice

UNIT V **9**
Vocobulary associated with directions-asking way-particles – e, de, mo, koko, soko, asoko, doko, nani, mae, ushiro, ue, shita- use of audio and drills for practice-introduction to katakana

Total: 45 Periods

Text books
1. Japanese hiragana and katakana for beginners, Timothy G. Stout, 2011
2. Genki I: An integrated course in elementary Japanese, Eri Banno and Yuko Ikeda, 2011
Reference Books

1. Japanese Reader collection Volume I, Yumi Boutwell and Clay Boutwell, Kotoba books, 2013
2. Living language Japanese Complete edition begineers through advanced course, Living language, 2012

BKR 101/201 KOREAN

L T P C
3 0 0 3

Course Objective:

Learning a language is almost akin to a journey of discovery. It not only opens up a whole new dimension
but also contributes significantly to the development of an individual's intelligence. Language gives us access and
insights into another
culture.

It is a fundamental truth that cultures define themselves through languages. Since language is a symbol of culture, the curriculum for all the languages reflects this spirit. To give students some proficiency in the foreign languages like Korean

Course Outcome:

Upon completion of the course, students should be able to manage conversation, reading and writing on the topics related to:
- Holiday and travel
- Shopping
- Feelings, advice and introductions
- Hobbies and job requirements
- Plans and preparations
- Appointments and requests
- Ordering for food, rooms and houses

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I 9
Asking/giving reasons for studying Korean, making plans for the holiday, writing letters, describing past travel experiences and future travel plans, shopping in a grocery store, shopping in electronics store, storytelling Grammar: would like to (do), want to (do), construct future tense.

UNIT II 9
Asking about feelings, asking about problems and giving advice, brief introductions - Grammar: Noun modifier, please try doing (something), irregular adjective/verb

UNIT III 9
Asking about hobbies, asking about abilities (sports), job requirements, Ordering things for delivery, ordering a meal at a restaurant - Grammar: Sentence ending for the honorific form, please do something for me, have tried (something),

UNIT IV 9

Asking about evening plans, making plans with others, making preparations - Asking about rooms, describing your room to your classmates, describing your house. Grammar: to know/not know how to do something, must (do), have to (do), should,

UNIT V   **9**
Describing your plans and giving reasons, cancelling appointments. Grammar: Shall we~? / Should we~?, with, and, irregular verbs/adjective, so, because, cannot, intend to, plan to, or hope to, (more) than, the most, tag question/is n't it? ,will (do)

                                                                                       Total: 45 Periods

Course Material:
Korean for Non-Native Speakers (Student Book 1B)
Korean Language Education Center, Sogang University

BCN 101/201 CHINESE

L T P C
3 0 0 3

Aim: To make the learners get acquainted with the language for professional life

Objective: To enhance the students use this language in day today conversations with ease and confidence.

Direct		Indirect	
1	Internal Tests	1	Students Exit Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-1   **9**

History, Origins, Old and middle Chinese, Rise of northern dialects

UNIT-II   **9**

Influences 3 Varieties of Chinese. 1.Classification 2.Standard Chinese and diglossia 3.Nomenclature

UNIT-III   **9**
Chinese characters, Homophones, Phonology

UNIT-IV   **9**
Tones, Phonetic transcriptions, Romanization, Other phonetic transcriptions

UNIT-V   **9**
Grammar and morphology, Vocabulary, Loanwords, Modern borrowings and loanwords

Total: 45 Periods

REFERENCES:

- Hannas, William C. (1997), *Asia's Orthographic Dilemma*, University of Hawaii Press, ISBN 978-0-8248-

    1892-0.

- Qiu, Xigui (2000), *Chinese Writing*, trans. Gilbert Louis Mattos and Jerry Norman, Society for the Study of

    Early China and Institute of East Asian Studies, University of California, Berkeley, ISBN 978-1-55729-

    071-7.

- Ramsey, S. Robert (1987), *The Languages of China*, <u>Princeton University Press</u>, <u>ISBN</u> <u>978-0-691-01468-5</u>.

- Schuessler, Axel (2007), *ABC Etymological Dictionary of Old Chinese*, Honolulu: University of Hawaii

  Press, <u>ISBN</u> <u>978-0-8248-2975-9</u>.

- R. L. G. "<u>Language borrowing Why so little Chinese in English?</u>" *The Economist*. June 6, 2013.

BMA301   MATHEMATICS – III   **L   T   P   C**
                                                       3   1   0   4

OBJECTIVE:
1. To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
2. To acquaint the student with Fourier transform techniques used in wide variety of situations.
3. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes
4. To develop Z transform techniques for discrete time systems.

Course Outcomes
CO01 - To learn the problem solving methods in linear differential equations
CO02 - To learn Dirichlet's condition and operations using Fourier series
CO03 - To have a clear understanding about 2nd order equations and wave equations
CO04 – Properties of Laplace transform and problem solving using it
CO05 - Properties of Fourier transform and problem solving using it

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO01	S	S		M			M				M	W
CO02	S	S		M			M				M	W
CO03	S	S		M			M				M	W
CO04	S	S		M			M				M	W
CO05	S	S		M			M				M	W

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		

6	End Semester Examinations		

Course Content

UNIT – 1
PARTIAL DIFFERENTIAL EQUATIONS   9

Formation – Solution of Standard types of first order equations – Lagrange's equation – Linear partial differential equations of second and higher order with constant coefficients

UNIT –II
FOURIER SERIES   **9**
Dirichlet's conditions – General Fourier series- Half range sine and cosine series – Parse Val's identity – Harmonic analysis

UNIT – III
BOUNDARY VALUE PROBLEMS   9

Classification of second order linear partial differential equations – solution of one – dimensional wave equations, one dimensional heat equations.

UNIT IV
LAPLACE TRANSFORMS   9
Transforms of simple functions – basic operational properties – transforms of derivatives and integrals – initial and final value theorems – inverse transforms – convolution theorem – periodic functions – applications of Laplace transforms for solving linear ordinary differential equation up to second order with constant coefficients and simultaneous equations of first order with constant coefficients.

UNIT – V
FOURIER TRANSFORMS   9

Statement of Fourier integral theorem – Fourier transform pairs – Fourier sine and cosine transforms – properties – transforms of simple functions – convolution theorem – Parse Val's identity

                                        L = 45 TOTAL: 45 PERIODS

TEXT BOOKS:
1. *Kandasamy, P., Thilakavathy, K. And Gunavathy.K. "Engineering Mathematics ", Vol II & III (4th revised edition) S Chand and co. , New Delhi, 2001.*
2. *Narayanan.S , Manicavachangam pillay ,.T.K., Ramanaiah, G. " Advanced Mathematics for Engineering Students ", Vol II & III (2nd Edition), S.Viswanathan (Printers and publishers pvt ltd) 1992.*
3. *Venkatraman, M.K. " Engineering mathematics" Vol III – A&B , 13th edition National publishing company , Chennai 2002*

BBM 301   ANATOMY AND PHYSIOLOGY   **L   T   P   C**
                                                  3   0   0   3

OBJECTIVE:
To provide the students the exposure to the fundamentals in human anatomy and physiology.

Course Outcomes
At the end of the course, the students would
CO01 – Learn the basic terminologies, structural and functional elements of human body
CO02 - Understand the physiological aspects of respiratory and cardiac system
CO03 – Learn the structure and function of nervous tissue, visual and auditory pathways
CO04 – Analyze the process of temperature regulation; understand the process of GI reflex
CO05 – Attain a good knowledge on the role of hormones and functions of Endocrine gland

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO01	M	W	S	W	M	M	M	M				
CO02	M	W	S	W	M	M	M	M				
CO03	M	W	S	W	M	M	M	M				
CO04	M	W	S	W	M	M	M	M				
CO05	M	W	S	W	M	M	M	M				

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content
UNIT I   INTRODUCTION: HUMAN BODY AND CELL PHYSIOLOGY   9
Define Anatomy, Terms of Location, Position and Planes, Cell structure, Cell membrane Transport, Resting membrane potential and ionic basis of potentials, Action potential in nerve, Muscle and Heart.

UNIT II   RESPIRATORY AND CARDIAC SYSTEM   9
Cardiac Cycle – ECG – Blood Pressure – Feedback Control for Blood Pressure – Nervous control of Heart. Cardiac output – Coronary and Peripheral Circulation, Physiological aspects of respiration. Exchange of gases – Regulation of Respiration. Disturbance of respirating function. Pulmonary function test.

UNIT III   NERVOUS SYSTEM ANDSPECIAL SENSES   9

Structure and function of Nervous tissue – Reflex action – Peripheral Nervous System– Autonomic Nervous System, Structure of Sense Organs (Eye, Ear, Nose and Skin), Visual and Auditory Pathway.

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 – Temperature regulation and Sweat Gland.

UNIT V   ENDOCRINE AND REPRODUCTIVE SYSTEM   9

Mention of Endocrine glands general hormonal action (Pituitary, Thyroid, Parathyroid, Adrenal, Pancrease), Second messengers, testis, ovaries, Fallopian tube, Uterus.

L = 45 TOTAL: 45 PERIODS

REFERENCES

1. Guyton 'Text book of Medical Physiology – WB Jaunder company Philadelphia - 10 edition 2002
2. Cyrul A Keele and Eric Neil – Samsons Wrights Applied physiology – Oxford University press New Delhi – 1991
3. Ranganathan T S,Text Book of human Anatomy S. Chand and company New Delhi – 1994
4. Best and Taylor, The livery Body – BC publication New Delhi 1980

BEI301 – ELECTRICAL MEASUREMENTS AND INSTRUMENTS

L T   P   C
3   0   0   3

OBJECTIVES:

The student will be made to understand:
 • Magnetic circuits, principle and application of transformers
 • Principle of operation of DC motors and AC Machines
 • Principle of fractional-kW motors and their applications.

OUTCOME:

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

CO01 – Describe principles and applications of different ammeters and voltmeters
CO02 – Explain the types and working of watt meters and energy meters
CO03 – Learn the types, construction, and working of different types of potentiometers
CO04 – Describe in detail the different methods of resistance measurements
CO05 – Describe in detail the different methods of impedance measurements

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				M		M			W			W
CO2		M		M								
CO3						M						
CO4		S		M					W			
CO5		S		M		M			W			

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT – 1   **9**
DIFFERENT TYPES OF AMMETERS AND VOLTMETERS
Galvanometers – Principle of operation, Construction and sources of errors and compensation in PMMC and Moving iron Instruments – Dynamometer and Rectifier type Ammeter and Voltmeters

UNIT –II   **9**
WATTMETERS AND ENERGY METERS
Electrodynamics type wattmeter – Theory and its errors – methods of correction – LPF Wattmeter – Phantom loading – Induction type Kwh meter – theory and adjustments – calibration of wattmeter's and energy meters

UNIT – III   **9**
POTENTIOMETERS AND INSTRUMENT TRANSFORMERS
Student type potentiometer & L and N type potentiometer – precision potentiometer – polar and co – ordinate type – A.C. potentiometers – their applications – construction and theory of operation C.T. and V.T. phasor diagrams – Characteristics- applications.

UNIT IV   **9**
RESISTANCE MEASUREMENT
Measurement of low , medium & High resistances ammeter Voltmeter method – Wheatstone Bridge – Precision form wheat stone Bridge – Kelvin Double Bridge – Ductor Ohmmeter – Series Shunt type ohmmeters – High Resistance measurement – Megger – Direct deflection methods – price's Gauard wire method – Megohm Bridges – loss of charge method – earth resistance measurement.

UNIT – V   **9**
IMPEDANCE MEASUREMENT
A.C.Bridges – Measurement of inductance , capacitance – Q of coil – Maxwell's Bridge – Maxwell's Wien Bridge – Hay's Bridge Schering Bridge - Anderson Bridge – Cambell Bridge to measure mutual inductance – errors in A.C Bridge method and their compensation – Detectors and exited field A.C Galvanometer – Vibration Galvanometer
L:45

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS:
1.Sawhney A.K., A. Course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Raiand Sons, New Delhi, 1995.

BCS 303   COMPUTER ORGANISATION AND ARCHITECTURE   L T P C

3 0 0 3

OBJECTIVES:

To learn C++ programming language, be exposed to the different data structures and be familiar with applications using different data structures.

OUTCOME:

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

CO01 - Design and implement C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.

CO02 - Apply good programming design methods for program development.

CO03 - Apply the different data structures for implementing solutions to practical problems.

CO04 – Learn the interface of different types of I/O devices

CO05 – Know in detail about parallel architecture

CO/PO Mapping

S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	W			S	M		M					
CO2		M		S		W			M		W	
CO3	W			S	M		M		M			
CO4		M		S		W					W	
CO5	W			S			M		M		W	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT - 1   REVIEW OF FUNDAMENTALS   9

CPU. Memory, I/O design, performance evaluation

UNIT – 2   CPU ARCHITECTURE   9

Instruction Sets of Different Machines – CISC Vs RISC – Pipelining Issues – Super Scalar Architecture

UNIT – 3   MEMORY DESIGN   9

Virtual Memory – Cache design for different architectures & multiprocessor environments – Evaluating Memory Performance

UNIT – 4   I/O DESIGN   9

Speed Limits – Interfacing to Different types of I/O Devices – Performance Measures

UNIT – 5   PARALLEL ARCHITECTURE   9

Data Flow – Vector Processor – EPIC – Case Studies

TOTAL : 45

TEXT BOOKS:

1. D.A.Patterson and J.L.Hennessy, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann Publishers, 2006.
2. M. Mano, "Computer System Architecture", 3rd Edition, Pearson Education, 2008.

REFERENCE BOOKS:

1. Naresh Jotwani, "Computer System Organisation", Tata McGraw Hill, 209.
2. Carl Hamacher V, Zvonko G Vrasesic and Safwat G Zaky, "Computer Organisation and Architecture", McGraw Hill, 1997.
3. Vincent P. Heuring, Harry F. Jordan, "Computer Systems and Design and Architecture", Pearson Education, Second Edition, 1995.
4. Faye A Briggs, "Computer Architecture & Parallel Processing", McGraw Hill International Edition 1983.

BBM302	BIOSENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

OBJECTIVES :

The student should be made to:
- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
- Know the principle of transduction, classifications and the characteristics of different transducers and study its Biomedical applications.
- Know the different display and recording devices.

OUTCOME:

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

CO01- Describe the purpose and methods of measurements

CO02 - Explain different display and recording devices for various applications.

CO03 - Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications

CO04- Remember and understand the concepts, types, working and practical applications of important biosensors.

CO05 – Know some of the commonly used biomedical transducers

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M	S	S	M	S			W	M	
CO2	M	S	M	S	S	M	S			W	M	
CO3	M	S	M	S	S	M	S			W	M	
CO4	M	S	M	S	S	M	S			W	M	
CO5	M	S	M	S	S	M	S			W	M	

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT - I 9
SCIENCE OF MEASUREMENT

Units and Standards - calibration methods - statics calibration - classification of errors, error analysis - statistical methods - odds and uncertainity.

UNIT - II 9
CHARACTERISTICS OF TRANSDUCERS

Static characteristics - accuracy, precision, sensitivity, linearity etc - mathematical model of transducers - zero first - order and second - order transducers - response to impulse step, ramp and sinsoidal inputs.

UNIT - III 9
VARIABLE RESISTANCE TRANSDUCERS

Principle of operation, construction details, characteristics and applications of resistance potentiometers, strain gauges, resistance thermometers, thermistors, hot-wire aneometer, piezoresistive sensors and humidity sensors.

UNIT - IV 9
BIOSENSORS - PHYSIOLOGICAL RECEPTORS - J RECEPTORS

Chemo receptors, Baroreceptors, Touch receptors, Biosensors - Working Principle and Types, Applications.

UNIT - V   9
OTHER TRANSDUCERS

Piezoelectric tranducers, magnetostrictive transducer, IC sensor digital transducers - smart sensor - fibre optic transducers.

L = 45 TOTAL: 45 PERIODS

Text Books:
1. Doeblin. E. O, Measurment Systems, McGraw Hill Book Co. 1998
2. Renganathan S, Transducer Engineering, Allied Publishers, Chennai,2000.

BEC 306   INTRODUCTION TO ELECTRONIC DEVICES AND CIRCUITS
L	**T**	**P**	**C**
3	**1**	**0**	**4**

OBJECTIVE:-
- 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.

OUTCOME:
 At the end of the course, the student should be able to:
- Understand and design electric circuits and do various tests on it
- Gain knowledge on solving circuits using network theorems.
- Attain in-depth knowledge on the phenomenon of resonance in coupled circuits.
- Work on obtaining the transient response of circuits.
- Plot the phasor diagrams and analysis of three phase circuits.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	M	S	M	S	S	M	S			W	M	
CO2	M	S	M	S	S	M	S			W	M	
CO3	M	S	M	S	S	M	S			W	M	
CO4	M	S	M	S	S	M	S			W	M	
CO5	M	S	M	S	S	M	S			W	M	

Course Assessment Methods:
Direct	Indirect

1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT I **9**
PN JUNCTION

Analysis of PN junction diode equation, transition and diffusion capacitance, break down characteristics. Charge control model and switching characteristics, tunnel diode, light emitting diode, bipolar junction transistor, Ebers moll's equation, JFET – theory of operation and current equation.

UNIT II **9**
SPECIAL SEMICONDUCTOR DEVICES AND DEVICES TECHNOLOGY

Charge transfer device, UJT, SCR, Diac, Triac, GTO and introduction to gallium arsenide devices, N MOS, C MOS integrated circuits.

UNIT III **9**
AMPLIFIERS

Biasing circuits for transistors-FET and their analysis –CE, CC and CB amplifiers –PET amplifiers
Differential amplifiers- common mode and difference mode analysis- Drift compensation FET inputs stages- introduction to tuned amplifiers.

UNIT IV **9**
RECTIFIERS

Half and full wave, ripple factor calculations for C, L, L-C.

UNIT V **9**
POWER SUPPLIES

SMPS, linear electronic voltage regulators, power control using SCR.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK :

1. *Albert Paul Malvino, "Electronic Principles " Tata McGraw Hill, 6ᵗʰ edition 2005*

BBM3L1 BIO SENSORS AND TRANSDUCER LAB **L T P C**
                                                         0 0 3 2

OBJECTIVES:
To study about the characteristics ,working and applications of various devices in the field of
bio sensors and transducers .

Lab Outcomes:
CO01: To understand voltage characteristics of a potentiometric transducer.
CO02: To learn the Strain Gauge characteristics.
CO03: To learn load cell characteristics.
CO04: To learn the characteristics of Photoelectric tachometer.
CO05. To learn the characteristics Hall Effect transducer.
CO06. To learn the characteristics of LVDT.
CO07. To learn the characteristics of LDR,,thermistor and thermocouple.
CO08. To learn the Ramp response characteristic of filled in system thermometer.
CO09. To learn the Step response characteristics of RTD and thermocouple.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S			S			M			
CO2					M					S		W
CO3	M		M					M				
CO4		W								W		
CO5				M			M					M
CO6							S		S			
CO7	M				M			S				
CO8											S	
CO9			M		S			S				

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

List of Experiments

1. Displacement versus output voltage characteristics of a potentiometric transducer.
2. Strain Gauge characteristics.
3. Load cell characteristics.
4. Photoelectric tachometer.
5. Hall Effect transducer.
6. Characteristics of LVDT.
7. Characteristics of LDR, thermistor and thermocouple.

8. Ramp response characteristic of filled in system thermometer.
9. Step response characteristics of RTD and thermocouple.

BEI3L2 ELECTRICAL AND ELECTRONIC MEASUREMENT LAB L T P C
                                                      0 0 3 2

OBJECTIVES:
To study about the characteristics ,working and applications of various devices in the field of measurement.

Lab Outcomes:
CO01: To understand the Use of Wheat Stone bridge as resistance to voltage converter
CO02. To learn the characteristics and working of Kelvin double bridge.
CO03. To learn and Determine the critical damping resistance of a D'Arsonval Galvanometer.
CO04. To learn the characteristics and working of phase energy meter.
CO05. To learn the characteristics and working of Calibration of wattmeter.
CO06. To learn the characteristics and working of current transformers.
CO07. Calibration of ammeter, voltmeter and wattmeter using student type potentiometer.
CO08.To learn the Design/construction and calibration of series and shunt type ohmmeters.
CO09. To learn the characteristics and working of Operational amplifier applications.
CO10. To learn the characteristics and working of Regulated power supply using fixed voltage IC regulators and LM 723.
CO11.To learn the Frequency response characteristics of CE and CB amplifiers.
CO12. To learn the characteristics and working of feedback in amplifiers.
CO13. To learn the characteristics and working of RC phase shift and Wien Bridge Oscillator.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S			S			M			
CO2					M					S		W
CO3	M		M					M				
CO4		W								W		
CO5				M			M					M
CO6							S			S		
CO7	M				M			S				
CO8											S	
CO9			M		S			S				M
CO10												
CO11	S				S					M		
CO12												S
CO13	S		S				M			M		

Direct		Indirect	
1	Observation Book	1	Course and Survey

2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

List of Experiments
1. Use of Wheat Stone bridge as resistance to voltage converter and to determine its Sensitivity for various ratios.
2. Kelvin double bridge.
3. Determination of critical damping resistance of a D'Arsonval Galvanometer.
4. Tests on a single - phase energy meter.
5. Calibration of wattmeter at different power factors.
6. Testing of current transformers.
7. Calibration of ammeter, voltmeter and wattmeter using student type potentiometer.
8. Design construction and calibration of series and shunt type ohmmeters.
9. Operational amplifier applications.
10. Regulated power supply using fixed voltage IC regulators and LM 723.
11. Frequency response characteristics of CE and CB amplifiers.
12. Study of feedback in amplifiers.
13. RC phase shift and Wien Bridge Oscillator.

BBM3L2   **ANATOMY AND PHYSIOLOGY LAB**   **L   T   P   C**
                                                                 0   0   3   2

OBJECTIVE:
To provide the students the exposure to the fundamentals in human anatomy and physiology.

Course Outcomes
At the end of the course, the students would
CO01 – Learn the basic terminologies, structural and functional elements of human body
CO02 - Understand the physiological aspects of respiratory and cardiac system
CO03 – Learn the structure and function of nervous tissue, visual and auditory pathways
CO04 – Analyze the process of temperature regulation; understand the process of GI reflex
CO05 – Attain a good knowledge on the role of hormones and functions of Endocrine gland

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO01	M	W	S	W	M	M	M	M				
CO02	M	W	S	W	M	M	M	M				
CO03	M	W	S	W	M	M	M	M				
CO04	M	W	S	W	M	M	M	M				
CO05	M	W	S	W	M	M	M	M				

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey

3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

1. Study on Upper Extremity bone.
2. Study in Lower Extremity bone.
   - Identification of Bone
   - Side identification
   - Identification of Important feature
3. Study of ECG.
4. Blood Pressure Monitoring.
5. Blood Cell Count – Total count and Hemoglobin estimation.
6. ESR estimation.
7. Blood group identification and differential count of differential WBC' Count.
8. Auscultation for Heart Sounds
9. Weber's and Kinnee's test too auditory conduction.

BMA402	**NUMERICAL METHODS**	L T P C
		3 1 0 4

OBJECTIVES:

This course aims at providing the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

OUTCOMES:

At the end of the course, the students would

CO01- Have a fundamental knowledge of the basic solutions of equations and eigen value problems.

CO02- Have a well-founded knowledge of standard numerical differentiation and integration which can describe real life phenomena.

CO03- Acquire skills in handling situations involving first and second order differential equations

CO04- Understand boundary value problems on ordinary and partial differential equations

CO05- Be able to analyze the interpolation techniques.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT-I 9

SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS

Iterative method Newton - Raphson method for single variable. Solutions of Linear system by Gaussian Gauss – Jordan, Jacobi and Gauss – Seidel methods, Inverse of a matrix by Gauss – Jordan method. Eigen value of a matrix by power and Jacobi methods.

UNIT-II 9

INTERPOLATION (FINITE DIFFERENCES)

Newton's Divided Difference Formula – Lagrange's Interpolation Newton forward and backward difference formulae – Stirling's Bessel's central difference formulae.

UNIT-III 9

NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical Differentiation with interpolation polynomials, Numerical integration by Trapezoidal Simpson's (Both 1/3" and 3/8") rules. Double Integrals using Trapezodial and Simpson's rules.

UNIT-IV 9

INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

Single step methods – Taylors series, Euler's and Modified Euler, Runge – Kutta method of first and second order differential equations. Multiple step methods – Milne and Adam's – Bashforth predict and Corrected Method.

UNIT-V 9

BOUNDARY VALUE PROBLEMS FOR ODE AND PDE

Finite difference for the second order ordinary differential equations. Finite difference solutions for one dimensional heat Equations. Finite difference solutions for one dimensional heat Equations(both implicit and Explicit) one dimensional wave equation and two dimensional Laplace and Poisson Equation.

L = 45 TOTAL: 45 PERIODS

References:

1. *Srinivasan, "Numerical Methods for Engineering" CBS Publishers.Chennai.1994.*
2. *Datta, "Numerical Methods for Linear Control Systems" CBS Publishers. Chennai 2005*
3. *Yang, "Applied Numerical Methods Using MATLAB" CBS Publishers. Chennai 2005*

BBM401   **CLINICAL BIOCHEMISRTY**   **L   T   P   C**
                                                            3   0   0   3

OBJECTIVES:
The student will get:
• Introduced to the basics of biochemistry, i.e, synthesis and carbohydrates, lipids etc
• Familiarized with the Classification, structure and properties of carbohydrates, Lipids, Protein and Enzyme

COURSE OUTCOMES:
At the end of the course, the student will learn:
CO01- Classification, properties, metabolism and synthesis of carbohydrates, glucose.
CO02- Classification of amino acids, proteins, metabolism of urea etc
CO03- Types and properties of lipids, metabolic disorders etc
CO04- Chemical nature and properties of Enzymes, hormones and nucleic acids and related discorders
CO05- Basic functional tests, measurement of electrolytes etc.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content
UNIT-I   9
CARBOHYDRATE
Carbohydrate classification, structure and Properties of Mono-di and Polysaccharides with its clinical importance and its uses Biological importance of carbohydrates metabolism – glycolysis, TCA cycle, Glyes, resgenesis, Pentose phosphate pathway, Uronic acid pathway, metabolism of fructose, Sorbitol pathway, metabolism of gelatos and its dysfunction

UNIT-II   9
PROTEIN

Classification of amino acids – characteristics of amino acids – Zwitterions, iso-electric point. Protein classification. Structure of proteins, primary, secondary, tertiary and quaternary structure. Biological importance of polypeptides. Metabolism of ammonia, Urea cycle Metabolic disorders of glacier, Phenyl alumina, tyrosine, Trytophan. Metabolic defects of branched chain amino acids maple syrup urine disease.

UNIT-III 9
LIPIDS
Classification of lipids. Compound lipids. Structure and properties of compound lipids, glycolipids, glycerophosphatides, Phospoinositides. Derived lipids – cholesterol – Biosynthesis of cholesterol Bile acids and its importance. B oxidation of fatty acids. Disorder sol lipid metabolism. Arthosclerosis, hypercholesterolemia, hyperlipoproteinemias and fatty, liver diseases.

UNIT-IV 9
ENZYMES, HARMONES AND NUCLEIC ACID
Enzymes – chemical nature. Hormones – chemical nature, properties of hormones and hormonal disorders. Nucleic acid. Composition and function of nucleic acid. Structure of DNA, RNA, Synthesis and degeneration of Purine and Pyramidine metabolism.

UNIT-V 9
BIOCHEMISTRY OF BLOOD AND BODY FLUIDS
Liver function test. Renal function test. Acid base balance and imbalance measurements of electrolytes, their abnormal and normal values and conditions. Biochemistry of urine testing, uses of isotopes in Biochemistry.

L = 45 TOTAL: 45 PERIODS

Text Books:
  1. *Text book of medical biochemistry – Rana shine, MN Chatterje 3ʳᵈ edition.*
  2. *Sathyanarayana, Textbook of Biochemistry, 2003.*

References:
 1. *Saini A.S "Clinical Biochemistry in Diagnosis and Management" CBS Publishers. Chennai 2005*
 2. *Varley / Harold "Practical Clinical Biochemistry" CBS Publishers. Chennai 2005*

BBM402   **BIO MEDICAL INSTRUMENTATION - I**   **L   T   P   C**
                                                                 3   0   0   3

OBJECTIVES:
The students will be exposed to electrical and non-electrical physiological measurements and bioamplifiers.

OUTCOMES:
At the end of the course, the student will:
CO01- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
CO02- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
CO03- Know the different display and recording devices for various biosignals
CO04- Know the measurement techniques for blood flow measurement and cell counting
CO05- Learn the uses of pH, spectrometers and auto-analyzer

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT-I   **9**
INTRODUCTION TO MEDICAL INSTRUMENTS
Design of medical instruments – components of biomedical instrument system, Electrodes & Transducers.

UNIT-II   **9**
BIOSIGNAL ACQUISITION
Physiological signal amplifiers. Biosignal analysis signal recovery and data acquisition. Pattern recognition.

UNIT-III   **9**
BIOPOTENTIAL RECORDS

ECG, EMO, EEG, ERO, EOG, Echo cardiography – characteristics of the recording systems – lead systems and recording methods – waveforms.

UNIT-IV 9
BLOOD FLOWMWTERS AND BLOOD CELL COUNTING
EM and Ultrasonic blood flowmeters. Indicator dilution method, thermo dilution method, Manual and automatic counting of RBC, WBC and platelets.

UNIT-V 9
BIOCHEMICAL MEASUREMENTS
ph, pco2, po2, - calorimeter, spectrophotometer, flame photometer. Autoanalyser.
                                                    L = 45 TOTAL: 45 PERIODS

Text Books:
1. *Dr. M. Arumugam, Textbook of Biomedical Instrumentation,2003.*
2. *Richard A. Norman "Principles of Biomedical Instrumentation" John Wiley and sons. New York.1988.*

Reference:.
1. *Khanpur R.R., Handbook of Biomedical Instrumentation, Tata McGraw hill publishing company. New Delhi 1999.*
2. *Scott / Mathur "Textbook of Biomedical Instrumentation" CBS Publishers. Chennai 2007 .*

BBM403   LINEAR AND DIGITAL INTEGRATED CIRCUITS   L   T   P   C
                                                    3   0   0   3

OBJECTIVES:
To study the application of analog ICs in the designing circuit.
To study the applications of these Digital ICs.
To understand the basic of the Digital systems.
To study the design of the various functional circuits using these ICs.

OUTCOMES:
CO01- Basics of number systems, conversion and filters
CO02- Basics of Logic gates and Boolean algebra
CO03- Full adder and Half adder and its implementation using ICs
CO04- Different types of ICs and sequential circuits
CO05- Details about RAM, ROM, EPROM and types of memories

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					

CO5	S										S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents
Unit 1: Number Systems, Codes and Operational Amplifiers   9

Number systems-Decimal, binary, Octal, Hexadecimal, conversion from one to another, complement arithmetic. Codes – Gray code, Excess-3 code, alphanumeric code. Error detection and correction. Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting an non-inverting amplifiers, differential dc amplifier, bridge amplifier, integrator, differentiator, active low pass, high pass and band pass active filters, precision diode and clamp, half wave rectifier, average detector, peak detector, log – antilog amplifiers, monostable and triangular wave generators.

UNIT II: Boolean Algebra and Logic Gates   9

Basic theorems and properties of Boolean Algebra-De Morgan's Theorem, simplification using Boolean algebra, sum of product and product of sum, Karnaugh map. Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates. Logic gates-AND, OR, NOT, NAND, NOR, EX-OR GATES. Universal property of NAND AND NOR gates.

UNIT III: Combinational Circuits   9

Basic adder – half adder, full adder, comparator, decoder, encoder, multiplexer, demultiplexer, Parity generator or checker. Boolean _Expression Implementation using these IC's.

UNIT IV: Sequential Circuits   9

Flip-flop – SR, JK, T, D, Master-slave flip-flop, shift registers, ripple counter, Excitation Tables, Design of counters using Excitation tables, synchronous counters and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Register and IC Specifications

UNIT V: Memory and Storage   9

Basics of semiconductor memory, RAM-static and dynamic, ROM-EPROM, special types of memories.

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. Roy Choudhury and ShailJain, *Linear Integrated circui*ts , Wiley Eastern Ltd., 1995.
2. Coughlin & Driscull, *Operational Amplifiers & Linear Integrated Circuits* , 6th ed., Prentice Hall Of India, 2003.

REFERENCE BOOKS
1. Gayakwad A.R. , Op-Amp and Linear Integrated circuits ,4th ed. Prentice Hall of India, 2003.
2. Sergio Franco,, Design with Operational Amplifier and Analog Integrated Circuits , McGraw Hill, 1997.

BEC404 BASIC PRINCIPLES OF COMMUNICATION AND CIRCUITS
L   T   P   C
3   1   0   4

OBJECTIVES:
The student should be made to:
1. Understand analog and digital communication techniques
2. Learn data and pulse communication techniques
3. Be familiarized with source and Error control coding
4. Gain knowledge on multi-user radio communication

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Apply analog and digital communication techniques
CO02- Use data and pulse communication techniques
CO03-Analyze Source and Error control coding
CO04-Utilize multi-user radio communication
CO05- Modulate and demodulate a signal.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course contents

UNIT I   9
BASIC OF CIRCUIT ANALYSIS

Kirchoffs law,DC and AC excitation,series and parallel circuit,sinusoidal steady state analysis. Mesh current and nods voltage method of analysis ,matrix method of analysis.Thevenins and Norton theorems,super position theorem , compensation theorem,Reciprocity theorem,maximum power transfer theorem and parallel resonance ,quality factor and bandwidth.

UNIT II   9
STATICS ELECTRIC FIELD

Coulomb's law.Electric field intensity.Gaussi law and its applications, permittivity,polarization,Boundary relation,capacitance,Dielectric strength. Energy and Energy density.Poisson's and laplace equations and applications.Electric current Density. Ohm's law at a point.Resistance and conductance , continuity relations for current problems.

UNIT III   9
STEADY MAGNETIC FIELD

The Biot stevart law. Gauss's law for magnetic fields. Torque on a loop.Ampere's law and magnetic field intensity,magnetic materials.Magnetic dipoles.Loops and solenoids. Magnetization, Inductance,Energy in an inductor and Energy density ,boundary relation, Ferromagnetism, Hysterical, Reluctance and permeance problem.

UNIT IV   9
ANALOG MODULATION SYSTEM

Basic principle of AM, FM and PM spectra power consideration .Receivers characteristic and deduction of AM, FM and system performance Threshold effect reduction.

UNIT V   9
BASE BAND DATA COMMUNICATION AND DIGITAL MODULATION

Sampling and quantization PCM, ADPCM,DM, ADM,Base and pulse shaping binary data formats.Base band transmission ISI Correlative coding .Optimum SNR matched filter detection.Digital modulation,coherent binary modulation techniques , non coherent binary modulation.

L = 45 TOTAL: 45 PERIODS

Textbook:
1. Taub and Schilling, 'Principles of Communication', Tata McGraw Hill Publication, 1990.
2. Joseph Ediminister and Mahmood Nahri, "Electric Circuits", Third Edition, Tata McGraw Hill, New Delhi, 1999.

Reference:
1. John D. Krauss, "Electromagnetics", McGraw Hill, 1999.

BEC405   MICROPROCESSOR AND ITS APPLICATIONS   L   T   P   C
                                                      3   0   0   3

OBJECTIVES:
The student should be made to:
 1. Study the Architecture of 8086 microprocessor.
 2. Learn the design aspects of I/O and Memory Interfacing circuits.
 3. Study about communication and bus interfacing.
 4. Study the Architecture of 8051 microcontroller.

OUTCOMES:
At the end of the course, the student should be able to:
1. Design and implement programs on 8086 microprocessor.
2. Design I/O circuits.
3. Design Memory Interfacing circuits.
4. Design and implement 8051 microcontroller based systems.
5. Learn the instruction sets and interfacing

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content

UNIT-I 9
ARCHITECTURE
General 8 bit microprocessor and its architecture – 8085 functional block diagram architecture – functions of different sections architecture of 8086 CPU.

UNIT-II 9
INSTRUCTION SETS
Instruction format – addressing modes – instruction set of 8085 CPU – instruction cycle – timing diagram – different machine cycles – Fetch and execute operations – estimation of execution time.

UNIT-III 9
ASSEMBLY LANGUAGE PROGRAMMING
assembly format of 8085 – assembly directions multiple precision arithmetic operations – binary to BCD and BCD to binary code conversion – ALU Programming using look up table – stack and subroutines.

UNIT-IV 9
DATA TRANSFER AND INTERFACING
Data Schemes Program I/O and interrupt structure of 8085, interrupt drives I/O – DMA serial I/O – I/O ports – latches and buffers – peripheral interface IC's 8212, 8255, 8279, 9239 – interfacing of A/D and D/A converters – RAM and ROM – memory devices – display devices – applications.

UNIT-V 9
MICRO CONTROLLERS
Architecture of 8 – bit microcontroller (8051) bus configuration – reset circuitry – power down considerations – instruction sets – programming exercises – development and troubleshooting tools – applications.

L = 45 TOTAL: 45 PERIODS

Text Books:
1. *Gaonkar R.S .,"Microprocessor Archicture programming and application " Wiley Eastern Ltd, New Delhi.*
2. *Kenneth. J .Ayala, The 8051 Microcontroller. Archicture and Programming applications.*

Reference:
1. *Mature . A "Introduction of microprocessor " Tata McGraw Hill Publishing, Co Ltd., New Delhi 1989.*
2. *Theagarajan "Microprocessor and Microcontroller - 2ndEdn". SCITECH Publications chennai.2003.*

BCE406   ENVIRONMENTAL STUDIES   **L   T   P   C**
                                                        3   0   0   3

OBJECTIVES:

To the study of nature and the facts about environment.
  1. To find and implement scientific, technological, economic and political solutions to environmental problems.
  2. To study the interrelationship between living organism and environment.
  3. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
  4. To study the dynamic processes and understand the features of the earth's interior and surface.
  5. 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.
  1. Public awareness of environment at infant stage.
  2. Ignorance and incomplete knowledge has lead to misconceptions.
  3. Development and improvement in standard of living has lead to serious environmental disasters.
  4. Understand the effects of different environmental pollution
  5. Need for value based education and human health

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO01	M	W	S	W	M	M	M	M				
CO02	M	W	S	W	M	M	M	M				
CO03	M	W	S	W	M	M	M	M				
CO04	M	W	S	W	M	M	M	M				
CO05	M	W	S	W	M	M	M	M				

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-I   **9**

THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, scope and importance. Need for public awareness.

NATURAL RESOURCES: RENEWABLE AND NON RENEWABLE RESOURCES

Natural resources and associated problems.

Forest resources: Use ami over exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.

Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case study.Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sounds, case studies.Land resources: Land as resources, land degradation, man induced landslides, soil erosion and desertification.Role of individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-II

ECOSYSTEM   9

Concepts of an ecosystem-structure and function of and ecosystem-producers, consumers and decomposers-energy flow in ecosystem-ecological-Succession-Food chains, food webs and ecological pyramids-introduction, types, characteristics features, structure and function of the following ecosystem – Forest ecosystem Grass land ecosystem, Desert ecosystem, Aquatics ecosystem(Ponds, stream,lakes,rivers,oceans,estuaries)

UNIT-III

BIODIVERSITY AND ITS CONSERVATION   **9**

Introduction – Definition: genetic, species and ecosystem diversity- Biogeographical classififcation of India- Value of Biodiversity: consumptive use, productive use, social, ethicial, aesthetic and option values – Biodiversity at global, national, local levels –India as a mega diversity nation –Hotspots of wildlife conflicts- Endangered and endemic species of India- Conservation od biodiversity In-Situ and Ex-Situ conservation of biodiversity.

ENVIRONMENTAL POLLUTION

Definition, causes, effects and control measures of – Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, and Nuclear hazards. Solids waste Management: causes effects and control measures of urban and industrial wastes –Role of an individual in earth quake, cyclone and landslides.

UNIT-IV

SOCIAL ISSUES AND THE ENVIRONMENT   **9**

From unsustainable to sustainable development, urban problems related to energy. Water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people, its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, holocaust. Case studies. Water land reclamation- Environment Protection Act- Air(Prevention and control of pollution) Act –Wildlife protection act- Forest conservation Act- Issues involved in enforcement of environmental legislation – Public awareness.

UNIT-V

HUMAN POPULATION AND THE ENVIRONMENT   **9**

Population growth, variation among nations- population explosion- family welfare Programme- Environment and human health. Human values- value Education –HIV/AIDS. Women and child welfare- Role of Information Technology in Environment and Human health –Case studies.

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. Sharma.B.K. and Kaur, *Environmental Chemistr*y, Goel Publishing House, Meerut, 1994.
2. De.A.K., *Environmental Chemistry* , New Age International (p) lt., , New Delhi, 1996.
3. Kurian Joseph & R. Nagendran, *Essential of Environmental Studies,* Pearson Education, 2004.

REFERENCE BOOKS
1. Dara S.S., *A Text Book of Environmental Chemistry and pollution control*, S.Chand & Company Ltd.,New Delhi, 2004.
2. Jeyalakshmi.R, *Principles of Environmental Science*, 1st Edition, Devi Publications, Chennai 2006.
3. Kamaraj.P & Arthanareeswari.M, *Environmental Science – Challenges and Changes*, 1st Edition, Sudhandhira Publications, 2007.
4. Arivalagan.K, Ramar.P & Kamatchi.P, *Principles of Environmental Science*, 1st Edition, Suji Publications, 2007.

BEC 4L3 **MICROPROCESSOR LAB** **L T P C**
                                       0 0 3 2

OBJECTIVES:
The student should be made to:
1. Study the Architecture of 8086 microprocessor.
 2.   Learn the design aspects of I/O and Memory Interfacing circuits.
 3.   Study about communication and bus interfacing.
 4.   Study the Architecture of 8051 microcontroller.
 OUTCOMES:
At the end of the course, the student should be able to:
        1. Design and implement programs on 8086 microprocessor.
2.   Design I/O circuits.
3.   Design Memory Interfacing circuits.
4.   Design and implement 8051 microcontroller based systems.
5.   Learn the instruction sets and interfacing

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examinations	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

1. Familiarization of 8085 microprocessor kit.
2. Familiarisation of 8051 microcontroller kit
3. 8085 and 8051 assembly language programming exercises
4. Interfacing of switches and display devices
5. Interfacing of D/A and A/D converters
6. Interface of key board and display using programming controllers
7. Interface of programmable timer
8. Stepper motor control using microprocessor
9. Interface of printer using UART

BBT4L2 **BIO CHEMISTRY LAB** **L T P C**
                                    0 0 3 2

OBJECTIVES: To quantitatively analyze the important sugars and carbohydrates.

 OUTCOMES:
At the end of the course, the student should be able to:
1. To analyze important carbohydrates
2. To estimate glucose by various methods
3. To estimate protein, amino acids by various methods
4. To estimate creatinine by various methods
5. Analyze urine for protein, ketones, glucose etc

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Direct		Indirect	
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examinations	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

1. Qualitative analysis of Glucose.
2. Qualitative analysis of Fructose.
3. Qualitative analysis of Maltose.
4. Qualitative analysis of Sucrose.
5. Qualitative analysis of Lactose.
6. Estimation of Glucose by Benedict's Method.
7. Estimation of Glucose by Lowry's Method.
8. Estimation of Protein by Biuret's Method.
9. Estimation of DNA by Diphenyl amine method.
10. Estimation of Glucose present in Urine Sample.
11. Isolation of Starch from Potato.
12. Estimation of Amino acid by Ninhydrin method.
13. Estimation of Creatinine by Jafe's method.
14. Abnormal Urine analysis (Glucose, Protein, Acetone, etc.).

OBJECTIVES:
• To provide practice on recording and analysis of different Bio potentials
• Study the function of different Therapeutic equipments.

OUTCOMES:
At the end, the student should know:
CO01- IC circuits, Op-amps, rectifiers and its applications
CO02- Safety concerns in hospitals
CO03- Use of filters in biomedical applications
CO04- Different types of read-out devices used
CO05- Use of timers and counters

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content:
UNIT-I   **9**
LINER INTEGRATED CIRCUITS
Introduction to liner integrated circuits, operational amplifiers, characteristics, application, Op amp circuits, Bio medical applications. Rectifiers op amp circuits using diodes, SMPS basic ECG amp, was form generation using Op amps.

UNIT-II
SAFETY INSTRUMENTATION   **9**
interference and instability of biomedical signals. Electrical and magnetic components – leads as path of resistance – minimizing interference. Introduction – Physiological effects micro shock. Macro shock – electrical accidents in hospitals – Electrical Hazards – Safety Measures.

UNIT-III
FILTERS   **9**
Carrier current and line noise HP,BP, BR – radio frequency interference, RF power, measurement – base line shift.

UNIT-IV
READ OUT DEVICES   **9**
Recorders – types –Strip chart – XY Recorders, Magnetic tape Recorders – UV recorders – direct recording – other types.

UNIT-V
TIMERS AND COUNTERS   **9**
Delay timer, interval timer, design of ADC and DAC circuits, frequency counters, multivibrator, flip flop.

L = 45 TOTAL: 45 PERIODS

Text Books:
1. *Ramakant A. Gayakwad, op Amps and Linear Integrated circuits "Prentice Hall of India, New Delhi, 3rd Edition , 1997.*
2. *Roy choudhury and Shah Jain, 'Linear Integrated circuits', 1995.*

References:
1. *Milam's and Halkias, "Electronic devices and circuits" Tata McGraw Hill publishing Co. Ltd., Delhi, 1996.*
2. *Joseph Dubay, Introduction to Bio medical electronics, McGrew Hill book Co., 2008.*
3. *Terra behilla "Bio medical and clinical Engineering" Brent ice hall inc., 2001*
4. *Geddas I.A and Baker I.JF. Principles of applied biopmedical instrumentation" , John Wiley and Sons,1992.*

BEI501   **DIGITAL SIGNAL PROCESSING**   **L T P C**
                                                            3 0 0 3

OBJECTIVES:
1. To learn discrete Fourier transform and its properties
2. To know the characteristics of IIR and FIR filters learn the design of infinite and finite impulse
3. response filters for filtering undesired signals
4. To understand Finite word length effects
5. To study the concept of Multi-rate and adaptive filters

OUTCOMES:
Upon completion of the course, students will be able to
CO01- Apply DFT for the analysis of Digital Signals & Systems
CO02- Design IIR and FIR Filters
CO03- Characterize finite word length effect on filters
CO04- Design the Multi-Rate Filters

CO05- Apply Adaptive Filters to equalization

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content:
UNIT-1   9

DISCRETE TIME SIGNALS AND SYSTEMS
Periodic and Pulse signals-eg.'s for sequences-Pulse,Step,Impulse,Ramp,Sine and exponential-Differential equations-Linear time invariant-Stability,casuality-DT systems-Time domain analysis.

UNIT-2   9

Discrete Time Systems - Z TRANSFORM
Z transform and its properties-Convolution, Inverse.Z transform-Discrete Fourier series Properties-Sampling the Z transform-Discrete Fourier transform-Properties for frequency domain analysis-Linear Convolution using discrete Fourier transform-Overlap save method.

UNIT-3   9

Frequency Analysis of Signals - FAST FOURIER TRANSFORMS
Introduction to Radix to FFT's-decimation in the FFT Algorithm-Decimation in frequency FFT Algorithm-Computing inverse DFT using FFT-mixed radix FFT algorithm, Periodogram Techniques.

                                                                         9
UNIT-4

IIR FILTER DESIGN
Classification-Reliability constraints-IIR design-Butterworth and Chebyshev Filters, Bilinear Transform Method-Impulse Invariant Method-Step Invariance Method.

FIR FILTER DESIGN
FIR design-Fourier Series Method –Window function Method, triangular window, rectangular window, Hamming window, Hanning window functions, Kaiser window. Applications of Signal Processing in Biomedical Engineering.

L = 45 TOTAL: 45 PERIODS

Textbook:
1. Openheim.A.V & Shaefer.R.S. " Discrete Time Signal Processing " Prentice Hall , N.J , 1980.
2. Proakis .J.G & Manolakis.D.G " Introduction to Digital Signal Processing " Maxwell Mc.Williams International Edition London 1989.

References :
   1. Antonla.A "Digital Filter Analysis and Design", TataMcGraw Hill publishing Co., NewDelhi, 1998.
   2. Stranneby "Digital Signal Processing & Applications" CBS Publishers. Chennai 2006
         3. Biomedical Digital Signal Processing by Tompkins.

BBM502	**BIOFLUIDS AND BIOMECHANICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:
To provide the students:
1.   An understanding on the physiology and anatomy of studied systems,
2.   A capability to analyze cardiac, respiratory, soft tissue and orthopedic mechanics

OUTCOMES:
At the end of the course, the student should be able to:
1.   The fundamental concepts and definitions related to Biomechanics
2.   Discuss on Cardiovascular and pulmonary system in human body
3.   Explain blood properties, especially the anatomy and physiology of blood vessels.
4.   Explain the laws concerning bio-fluid mechanics
5.   Various mechanical properties of tissues, bone, ligaments and cartilage

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

   Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content
UNIT-I Biomechanics   9

Newton's law, Stress, Strain, Hookes-law, Elasticity, Shear, Tension, Compression, Bone – Cancellous and cortical bone,structure, Mechanical Properties and mechanical testing of bone, UTM, creep and Fatigue.

UNIT II BIOFLUID MECHANICS   9

Viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic, Vascular tree, Flow properties of Blood, Physical, Chemical and Rheological properties of blood, Apparent and Relative and Viscosity, Problems associated with extra corporeal blood flow

UNIT-III   Respiratory and cardiac Mechanics   9

Alveoli mechanics, PV curve of lung, Breathing Mechanism, Airway resistance, Physics of Lung Diseases. Cardio vascular system, Mechanical properties of blood vessels – arteries, arterioles, capillaries, veins, blood flow: laminar and turbulent.

UNIT IV SOFT TISSUE MECHANICS   9

Tissue Mechanics-Mechanical Properties of Tissues, Biological materials, Pseudo elasticity, nonlinear stress-strain relationship, viscoelasticity, structure, function and mechanical properties of skin, ligaments and tendons, Mechanical testing of Soft tissue.

UNIT V ORTHOPAEDIC MECHANICS   9

Mechanical properties of cartilage, diffusion properties of articular cartilage, kinetics and kinematics of joints, lubrication of joints analysis of force in orthopaedic implants. Biomechanics of Elbow Shoulder hip and Knee.

TOTAL : 45

REFERENCES:
1. Y.C.Fung, "Biomechanics: Mechanical properties of living tissues", Springer, verlag, New York, 1981.

2. D.Dawson & Right, "Introduction to bio-mechanics of joints and joint replacement", Mechanical Engineering Publication Ltd, 1989.

3. Jacob Kline, "Handbook of biomedical engineering", Academic press Inc., Sandiego, 1988.

4. Basic Biomechanics by Susan J Hall

5. Jay D Humphrey and Sherry L. Delange, "An Introduction to Biomechanics" Springer
6. Donald R Pieterson and Joseph Bronzino" Biomechanics – principles and applications" CRC Press, 2008.

BBM503	BIOMEDICAL INSTRUMENTATION II	L	T	P	C
		3	0	0	3

OBJECTIVES:
The student should be made to:
• Gather basic knowledge about measurements of parameters related to respiratory system
• Learn measurement techniques of sensory responses
• Understand different types and uses of diathermy units.
• Know ultrasound imaging technique and its use in diagnosis
• Know the importance of patient safety against electrical hazard

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Explain about measurements of parameters related to respiratory system
CO02- Describe the measurement techniques of sensory responses
CO03- Analyze different types and uses of diathermy units
CO04- Discuss ultrasound imaging techniques and its usefulness in diagnosis
CO05- Outline the importance of patient safety against electrical hazard

<div align="center">

CO/PO Mapping
S – Strong, M – Medium, W – Weak

</div>

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content
UNIT-I 9
HEART LUNG MACHINE

Condition to be satisfied by the H/L system, different type of Oxygenators, pumps- Blood handling system.

UNIT-II 9
CARDIAC ASSIST DEVICES
Synchronous counter pulsation, right ventricular bypass pump, left ventricular bypass pump, Intra aortic balloon pumping and veno arterial pumping.

UNIT-III 9
ARTIFICIAL KIDNEY
Indication and Principle of Haemodialysis, different types of dialysis, monitoring systems, artificial kidney.

UNIT-IV 9
PROSTHETIC AND ORTHODIC DEVICES
Hand and arm replacement- different types of models, externally powered Prosthesis feed back in orthodic system, materials for prosthetic and orthodic devices

UNIT-V 9
RESPIRATORY AND HEARING AIDS
Intermittent positive pressure breathing apparatus, operating sequence, audiograms, types of deafness hearing aids, impedance matching -BERA Test.

L = 45 TOTAL: 45 PERIODS

Textbook:
1. Albert-N. Cook & Webster. J. G. Therapeutical medical devices, Prentice hall INC, New Jersey, 1982.

References:
1. *Khanpur, R.S., Handbook of Bio medical instruments and measurements, Tata Mc-Graw Hill, 1987.*
2. *Scott / Mathur "Textbook of Biomedical Instrumentation" CBS Publishers. Chennai 2007.*

BBM504	**MEDICAL PHYSICS**	L T P C
		3 0 0 3

OBJECTIVES:
• To Study effects of sound and light in human body
• To study effects of radiation in matter and how isotopes are produced

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Analyze mechanics involved with various physiological systems.
CO02- Perform derivation of mathematical models related to blood vessels
CO03- Understand the principle of radioactivity and uses of some radio-isotopes
CO04- Physics relating the interaction of radiation with matter
CO05- Radiation effects in human tissues and organs

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content

UNIT I - ELECTROMAGNETIC SPECTRUM AND ITS MEDICAL APPLICATION
Light - Physics of light, Intensity of light, limits of Vision and color vision Sound - Physics of sound , Normal sound levels – Ultrasound fundamentals- Generation of ultrasound (Ultrasound Transducer) – Interaction of Ultrasound with Materials-Reflection and Refraction – Absorption and Scattering Non- ionizing Electromagnetic Radiation Tissue as a leaky dielectric – Relaxation Processes – Overview of non – ionizing radiation effects -Low Frequency Effect – Higher frequency effect.

UNIT II
Radioactive Decay – Spontaneous Emission – Isometric Transition - Gamma ray emission, alpha, beta, positron decay, electron capture Principles of Nuclear Physics – Natural radioactivity, Decay series, Half life period, type of radiation and their applications. Production of radionuclides – Cyclotron produced Radionuclide - Reactor produced

Radionuclide – fission and electron Capture reaction, Radionuclide Generator – Milking Process - Linear accelerator , Radionuclide used in Medicine and technology.

UNIT III - INTERACTION OF RADIATION WITH MATTER

Interaction of charged particles with matter – Specific ionization , linear energy Transfer Range, Bremsstrahlung , Annihilation Interaction of Gamma radiations with matter – Photoelectric effect, Compton Scattering , pair Production, Attenuation of Gamma Radiation, Interaction of neuron with matter

UNIT IV - PHYSICS OF CARDIOPULMONARY SYSTEM

The Airways, - blood and lung interaction – measurement of lung volume – pressure air flow volume relation ships of lungs – physics of alveoli – the breathing mechanism – Major components of cardiovascular system – O2 and CO2 exchange in the capillary system – Physical activity of heart – transmural pressure – Bernolli's principles applied to cardiovascular system - Blood flow – laminar and turbulent

UNIT V - RADIATION EFFECTS

Acute Radiation Effects - The concept of LD 50 – Radiation syndromes- Central nervous system syndrome - Gastro-intestinal syndrome –Bone Marrow syndrome Delayed Effects of Radiation - Stochastic and Deterministic effects – Late Deterministic effect in different organs and tissues.

TOTAL : 45 PERIODS

TEXT BOOKS
1. B.H Brown , PV Law ford, R H Small wood , D R Hose , D C Barber , "Medical Physics and Biomedical Engineering", CRC Press, 1999.
2. Gopal B.Saha "Physics and Radiobiology of Nuclear Medicine" Springer, 3rd ed, 2006

REFERENCES:
1. John R. Cameron and James G. Skofronick, "Medical Physics", John–Wiley & Sons, 978.
2. RF Farr and PJ Allisy –Roberts, "Physics for Medical Imaging" Saunders, 1997.
3. P.Uma Devi, A. Nagarathnam, B S Satish Rao, "Introduction to Radiation Biology" B.I .Churchill Livingstone pvt ltd, 2000.
4. S.Webb, "The Physics of Medical Imaging", Taylor and Francis, 1988.

BBM505   BIOMATERIALS AND IMPLANTABLE DEVICE   L   T   P   C
**   3   0   0   3**

OBJECTIVES:
The student should be made to:
1. Learn characteristics and classification of Biomaterials
2. Understand different metals and ceramics used as biomaterials
3. Learn polymeric materials and combinations that could be used as a tissue replacement implants
4. Know the various artificial organs developed using these materials

OUTCOMES:
At the end of the course, the student should be able to:
CO01- Analyze different types of Biomaterials and its classification**.**
CO02- Perform combinations of materials that could be used as a tissue replacement implant.
CO03- Know about the various polymeric materials used for medical applications
CO04- About bio-ceramics and its applications in medicine

CO05- Applications and properties of materials in orthopedics

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Content
Unit 1   **9**

Biocompatibility and hemocompatibility, Overview of Biomaterials used as medical devices, Classification of biomaterials, Impact and future of biomaterials, performance of implants, Interfacial phenomena and tissue response to biomaterials, Metals and alloys for orthopaedic implants- Stainless steel, Cobalt chromium alloy, Titanium and its alloys. Electrokinetic factors. Types of orthopaedic fixation devices- pins, screws and plates, IM nails and spinal.

Unit 2   **9**
Bioelectric effect, Wolff's law. Interface problems with artificial joints and various fixation methods. Failure of implantation materials- metallic corrosion, wear, metallic implant fractures and their impact on biological systems. Hard tissue replacements- total hip and knee joint replacements

Unit 3   **9**
Polymers in biomedical use, Hydrogels, silicone rubber, biodegradable polymers, microorganisms in polymeric implants and polymer sterilization.Biopolymers, Synthetic polymers.
Composites- Types and Applications. Contraceptive devices.

Unit 4   **9**
Orthopaedic implants.   Ophthalmology – introduction, contact lenses, eye shields and artificial tears. Biological Tests. Material surface characterization. Corrosion. Standards on biomaterials.

Unit 5   **9**

Bioceramics, types – bioactive, resorbable, non-resorbable. Stoichiomety and Ca/P ratio of various forms calcium phosphates, bioceramic coatings on metallic implants and bone bonding reactions on implantation. Hydroxyapatite –properties and applications. Bone cements and bio glasses. Dental implants- materials, types and designs.

L = 45 TOTAL: 45 PERIODS

References:
1. "Biomaterials", Sujata V Bhat., Narosa Publishing House, New Delhi, 2002.
2. A.F. Von Recum, "Handbook of Biomaterials Evaluation - Scientific, Technical and Clinical Testing of Implant Materials", 2nd Edn., Taylor & Francis, Philadelphia, 1999.
3. F. Silver and C. Dillon, " Biocompatibility: Interactions of Biological and Implantable Materials" Vol.1, VCH Publishers, New York, 1989.
4. *Park. J.B. "Biomaterials: An Introduction", CBS Publishers, 2007.*
4. L.L. Hench and E.C. Ethridge "Biomaterials: An Interfacial Approach", Academic press, New York, 1982.
5. F.H. Silver, "Biomaterials, Medical Devices and Tissue Engineering: An Intergrated Approach" 1st Edn., Chapman & Hall, London, 1994.
6. Buddy Ratner *etal.,* " Biomaterials Science – An Introduction to Materials in Medicine", Academic Press, San Diego, 2004.

BBM506   PHYSIOLOGICAL CONTROL SYSTEMS   L   T   P   C
3   0   0   3

OBJECTIVES:
1. To study the concept and different mathematical techniques applied in analyzing any given system
2. To learn the analysis of given system in time domain and frequency domain
3. To study the stability analysis of the given system
4. To study the concept of physiological control system

OUTCOMES:
The learner will be able to:
CO01- Analyze the time and frequency domains of the given system using different mathematical techniques
CO02- Learn the basics of control systems
CO03- Time and frequency response analysis
CO04- Bio-control system definition and modeling
CO05- Study the model of eye, respiratory system, etc

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

1. CONTROL SYSTEM MODELLING   9

System concept, Differential Equations, Transfer functions, Modelling of electrical systems, Translational and rotational mechanical systems, Electro-mechanical systems, physiological systems, block diagram modelling, signal flow graphs.

2. TIME RESPONSE ANALYSIS   9

Time domain specifications, step and Impulse response analysis of first order and second order systems, steady state errors, stability, Routh-Hurwitz criteria, Root locus techniques, construction of root locus, stability, dominant poles, applications of Root locus diagram.

3. FREQUENCY RESPONSE ANALYSIS   9

Frequency response, Bode plot-Nyquist plots, Nyquist stability criterion, Relative stability, Gain margin, phase margin, bandwidth magnitude plots, constant circles, Nichol's chart

4. PHYSIOLOGICAL CONTROL SYSTEMS   9

Introduction to physiological control systems, modelling of human movements, parameter estimation, linearizing

5. STUDY OF BIOLOGICAL SYSTEMS   9

Human Thermal system, Neuro muscular system, Respiratory system, occulomotor system.

                                                L = 45 TOTAL: 45 PERIODS

REFERENCES :
1. M.Gopal, "Control Systems", Principles and Design, Tata McGraw-Hill, 1997.
2. Benjamin. C.Kuo, ' Automatic Control Systems', Prentice Hall of India, 1995.
3. Manfreclyner and John H.Milsum, Bio Medical engineering system, McGraw-Hill and Co., New York, 1970.

BBM5L1   BIOMEDICAL INSTRUMENTATION LAB   L T P C
                                                0 0 3 2

OBJECTIVES:
The students will be exposed to electrical and non-electrical physiological measurements and bioamplifiers.

OUTCOMES:
At the end of the course, the student will:
CO01- Understand the purpose of measurement, the methods of measurements, errors associated with measurements.
CO02- Know the principle of transduction, classifications and the characteristics of different transducers and study its biomedical applications.
CO03- Know the different display and recording devices for various biosignals
CO04- Know the measurement techniques for blood flow measurement and cell counting
CO05- Learn the uses of pH, spectrometers and auto-analyzer

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

LIST OF EXPERIMENTS:
1. ECG recording and Analysis.
2. EEG recording and analysis.
3. Respiratory Analysis.
4. Blood Pressure Measurement System.
5. Nerve Conduction Study.
6. Digital Heart Monitor.
7. EOG system
8. Study of ESU – cutting and coagulation modes
9. pH Measurement and conductivity test.
10. Spectrophotometer.
11. Flame photometer.
12. ELIZA.
13. Plotting of human auditory response using audiometer
14. Analysis of bio signals using FFT Spectrum Analyser
15. Ultra Sound Dopplers.
16. Defibrillators and Pacemakers (Demo)

17. Ventilators and Humidifiers

18. Nebuliser

19. Pacemaker(Demo)

20. Physiotherapy equipment - Digi laser, Indsonic, Indotherm – 500W

21. Electrical safety measurements.

22. Mini project.

BBM5L2   **LINEAR AND DIGITAL INTEGRATED CIRCUITS**   L T   P   C
                                                                 0   0   3   2

OBJECTIVES:
To study the application of analog ICs in the designing circuit.
To study the applications of these Digital ICs.
To understand the basic of the Digital systems.
To study the design of the various functional circuits using these ICs.

OUTCOMES:
CO01- Basics of number systems, conversion and filters
CO02- Basics of Logic gates and Boolean algebra
CO03- Full adder and Half adder and its implementation using ICs
CO04- Different types of ICs and sequential circuits
CO05- Details about RAM, ROM, EPROM and types of memories

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M			M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S									S		

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

1. Inverting, non-inverting amplifier and comparator
2. Active filter – first order LPF and HPF
3. Schmitt trigger using IC741
4. Instrumentation amplifier using IC741
5. Wein bridge oscillator
6. Multivibrator using IC555 Timer
7. Study of logic gates, Half adder and Full adder
8. Encoder and BCD to 7 segment decoder
9. Multiplexer and demultiplexer using digital ICs

10. Universal shift register using flipflops
11. Design of mod-N counter
12. Study of operational amplifier IC 741.
13. Characteristics of operational amplifier IC 741.
14. Inverting and non inverting mode of operation.
15. Operational amplifier as summer and subtractor.
16. Operational amplifier as integrator and differentiator.
17. Active high pass filter(second order)
18. Active low pass filter(second order)
19. Narrow band pass filter.
20. RC phase shift oscillator.
21. Comparator.
22. Squaring circuit.
23. Halfwave rectifier.
24. Current to voltage converter.
25. Voltage to current converter

| BBM601 | C++ and Java Programming | L | T | P | C |
| | | 3 | 1 | 0 | 4 |

OBJECTIVES:
To learn C++ programming language, be exposed to the different data structures and be familiar with applications using different data structures.
OUTCOMES:
At the end of the course, the students would
CO01- Have a fundamental knowledge of the basic concepts of C++
CO02- Have a well-founded knowledge of programming in C++
CO03- Acquire skills in handling the file with different operation
CO04- Have a fundamental knowledge of the basic concepts of Java
CO05- Able to understand the concepts of Java.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M	M		M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S		M							S		

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT I - INTRODUCTION   **9**

Object-oriented paradigm, elements of object oriented programming – Merits and demerits of OO methodology – C++ fundamentals – data types, operators and expressions, control flow, arrays, strings, pointers and functions.

UNIT II - PROGRAMMING IN C++   9

Classes and objects – constructors and destructors, operator overloading – inheritance, virtual functions and polymorphism

UNIT III - FILE HANDLING   9

C++ streams – console streams – console stream classes-formatted and unformatted console I/O operations, manipulators - File streams - classes file modes file pointers and manipulations file I/O – Exception handling

UNIT IV - JAVA INTRODUCTION   **9**

An overview of Java, data types, variables and arrays, operators, control statements, classes, objects, methods – Inheritance.

UNIT V - JAVA PROGRAMMING   **9**

Packages and Interfaces, Exception handling, Multithreaded programming, Strings, Input /Output.

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003 (Unit I, Unit II, Unit III)
2. Herbert Schildt, "the Java 2 : Complete Reference", Fourth edition, TMH, 2002 (Unit IV, Unit-V)(Chapters 1-11,13,17)

REFERENCES
1. Ira Pohl, "Object oriented programming using C++", Pearson Education Asia, 2003
2. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, 2000
3. John R.Hubbard, "Progranning with C++", Schaums outline series, TMH, 2003
4. H.M.Deitel, P.J.Deitel, "Java : how to program", Fifth edition, Prentice Hall of India private limited.

BBM602   **REAL TIME PROCESSOR AND BIOMEMS**   **L   T   P   C**
                                                           3   0   0   3

OBJECTIVE:
1. To introduce microcontroller, the role of microcontrollers .Types and selection,its application and examples.
2. To study the microcontroller resources and Family members, bus widths program and data memory parallel ports. D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations
3. To study Interrupt structures programmable timers, real time clock, latency, interrupt, density and interval constraints.
4. To study CPU register- structure- addressing modes- instruction sets- assembly languages-assemblers.
5. To study Queues, tables and strings, program organisation, microcontroller expansion methods, I/O hardware alternatives, development tools, RTOS.

COURSE OUTCOMES

CO01 - To learn introduce microcontroller the role of microcontrollers. The Types and selection.

CO02 - To learn D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.

CO03 - To have a clear view Interrupt structures programmable timers, real time clock.

CO04 –To learn CPU register its structure and its addressing modes and instruction sets.

CO05- To learn I/O hardware alternatives, development tools, RTOS, motorola MC68HC11.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M						
CO2		S			S	S						
CO3		S					S		M			
CO4	S			S							S	`
CO5			S		M					S		

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-I

Introduction to Digital Signal Processing Devices   **9**
Architecture of TMS 320C54XX Digital Signal Processor-18. Addressing Modes and Instruction sets of TMS 320C54XX DSP-19. TMS 320VC5416 Assembly Language Programming-. Interfacing and Real Time C Programming with TMS 320C54XX- TMS 320C6713 Floating Point Processor Architecture and Real Time C Programming

UNIT-II
Programmable embedded system-on-chip (PSoC) Processor   9
Architecture- Designer- Developing tools- biomedical applications

UNIT-III
Introduction to real-time imaging   **9**
Basic Hardware Architecture.-Linear Image Processing Algorithms-Compression by Matrix Transforms-Nonlinear Image Processing Algorithms-Parallel Architectures-Programming Languages-Optimization Techniques

UNIT IV   **9**
MEMS AND MICROSYSTEMS
Working principle of Microsystems, materials for MEMS and Microsystems, micromachining, System modeling and properties of materials

UNIT V
BIOMEMS   **9**
Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA hybridization, Electronic nose, Bio chip.

       L = 45 TOTAL: 45 PERIODS

REFERENCES

1. **UDAYASHANKARA, V. ,**Real time digital signal processing : fundamentals, algorithms and implementation using tms processor,phi 2007.
2. Technical Reference Manuals,Cyprus Semiconductors,USA 2008
3. Edward R. Dougherty, Phillip A. Laplante ,Introduction to Real-Time Imaging ISBN: 978-0-8194-1789-3,February 1995, Wiley-IEEE Press.
4. Tai Ran Hsu , " MEMS and Microsystems design and manufacture", Tata McGraw Hill Publishing Company, New Delhi, 2002

BBM603   PATHOLOGY AND MICROBIOLOGY   **L T P C**
                                                    3 0 0 3

OBJECTIVES:
- To learn about the cell structure and its disorders
- To gain knowledge about the fundamental structure of virus, bacteria and its causes

OUTCOMES:
At the end of the course, the students would
CO01- Have a Fundamental Knowledge about the cell and concepts of tumor.
CO02- Have to learn about the fluid present in the body and hemodynamic derangement

CO03- Have a fundamental knowledge of real time imaging with basic hardware architecture, algorithms and transform techniques
CO04- Have knowledge about basic concepts of infection and immunity of the human body
CO05- Acquire the fundamental knowledge of structure of Bacteria, virus and its causes.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			S	M			M				M
CO2			M									
CO3	M			S						S		
CO4		M			S		M					
CO5		S	M							S		

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-I 9
NORMAL CELL STRUCTURE
Introduction. Cell Degeneration and Regeneration- apoptosis, Neoplasia, Classification-Difference between benign and malignant- Etiology of tumors-Spread of tumors.

UNIT-II 9
FLUID AND HAEMODYNAMIC DELANGEMENT
Edema, Shock, Hemorrhage- Thrombus- Embolism- Disseminated intravascular coagulation-Hematological disorders- Bleeding disorders- Leukemia lymphoma

UNIT-lll ` 9
INFECTION AND IMMUNITY
Normal Flora of the body- Host and Parasite relationship- Types of immunity-Innate and adaptive immunity- Important Bacterial, Viral, Protozoan and Helminthic Diseases.

UNIT-IV 9
Structure of Bacteria and Virus – Methods of Isolation of Bacteria viz Streak Plate, Pour plate and Spread plate methods, viral cell- Growth and cultivation of bacteria.
Microscopy- Light microscopy- Dark field microscopy- Phase contrast microscopy- Electron microscopy.

UNIT-V 9
Identification of disease producing organism simple, gram, AFB stain, fluorescent techniques, Ag-Ab techniques like Double diffusion, electro immune diffusion and agglutination techniques.

L = 45 TOTAL: 45 PERIODS

Text Book:

1. *Pillai / Qadry "Biochemistry and Clinical Pathology" CBS Publishers. Chennai. 2008.*
2. *Sharma "Biochemical Engineering, Biochemistry, Biotechnology & Microbiology" CBS Publishers. Chennai 2007*
3. *Jain P.C "Microbiology & Biotechnology for Sustainable Development" CBS Publishers. Chennai 2004.*
4. *Paul "Soil Microbiology, Ecology & Biochemistry" CBS Publishers. Chennai 2009.*

BBM604	DIGITAL AND MEDICAL IMAGE PROCESSING	L	T	P	C
		3	1	0	4

OBJECTIVES:

The aim of the courses to show how to extract, model, and analyze information from medical data and application in order to help diagnosis , treatment and monitoring of diseases through computer sciences.

OUTCOMES:

At the end of the course, the students would

CO01- Have a Fundamental Knowledge of digital image processing with Fourier transforms.

CO02- Acquire knowledge about the image sampling, Modeling and quantization

CO03- Have a fundamental knowledge of image enhancement, its process and types of filters used in image processing

CO04- Have knowledge about image analysis, classification and reconstruction of act and MRI images

CO05- Acquire the skills in the transmission of biological images.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			S	M			M				M
CO2		S	M									
CO3	M			S						S		
CO4			S		S		M					
CO5		S	M							S		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content

UNIT-I   9
DIGITAL IMAGE FUNDAMENTAL

Elements of digital image processing systems, Elements of Visual perception, Image formation model, Image sampling and quantization, aliasing, zooming and shrinking of digital images. Monochrome Vision Model, Colour Vision Model. Image transforms – Discrete Fourier transform, Properties of Fourier transform, Fast Fourier transform and inverse fast Fourier transform

UNIT-II Image Fundamentals   9

Image sampling and quantization, Matrix and Singular Value representation of discrete images. Image pre-processing, point operation, Histogram modelling, spatial operations, transform operations.

UNIT-III Image Enhancement   9
Enhancement by point processing –Simple intensity transformation –Histogram processing – Image subtraction –Image averaging. Spatial filtering –Smoothing filters, sharpening filters. Enhancements in frequency domain-Low pass filtering –High pass filtering.

UNIT-IV   9
IMAGE ANALYSIS, CLASSIFICATION AND RECONSTRUCTION OF ACT AND MRI IMAGES
lmage analysis, Spatial feature extraction, edge detection, Image segmentation.Image reconstruction from projections, Random transform, filter back projection algorithm, reconstruction of CT images, Imaging methods in MF images, fourier reconstruction of MRI.

UNIT-V
TRANSMISSION OF MEDICAL IMAGES   9
Medical Image, data compression of transmission, transform coding, pixel
Coding, predictive coding, Interference coding.

L = 45 TOTAL: 45 PERIODS

Text Book:
1. *Kavyan Najarian and Robert Splerstor "Biomedical Signals and Image Processing", CRC – Taylor and Francisn, New York, 1991.*
2. *John L. Semmlow, "Biosignal and Biomedical Image Processing Matlab Based applications" Marcel Dekker Inc., New York, 2004.*

BBM605	BIO SIGNAL PROCESSING	L	T	P	C
		3	1	0	4

OBJECTIVES:
 The aim of the courses to show the introduction to biomedical signal, data acquiring system, Filtering and event detection in the biomedical signals.

OUTCOMES:
At the end of the course, the students would
CO01- Have a fundamental knowledge of biomedical signal.
CO02- Acquire knowledge about the filtering the biomedical signal.

CO03- Have fundamental knowledge event detection, ECG, EEG, EMG and the detection of waveform
CO04- Have knowledge about Biosignal processing using Fourier transformation.
CO05- Acquire the skills Pattern classification and diagnostic Decision.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			S	M			M				M
CO2		S	M									
CO3	M			S						S		
CO4			S		S		M					
CO5		S	M							S		

Course Assessment Methods

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content

Unit – 1 9
Introduction to Biomedical signals
The nature of biomedical signals, Examples of Biomedical signals-The action potential, The Electroneurogram(ENG), The Electromyogram (EMG), The Electro Cardiogram (ECG), Event related potentials (ERPs), The Electroencephalogram (EGG), The Phonocardiogram (PCG), The speech signal.

Unit-2 9
Filtering For Removal of Artifacts
Time –domain Filters-synchronized averaging. Moving Average Filters, Derivative-based operators to remove low frequency artifacts. Frequency- domain filters-Removal of High Frequency noise; Butterworth, Low pass filters. Removal of low frequency noise; Butterworth, high pass filters. Removal of periodic artifacts: Notch and comb Filters.

Unit-3 9
Event Detection
Detection of Events and waves: Derivative-based methods for QRS detection, The Pan-Topkins algorithm for QRS detection. Correlation Analysis of EEG channels: Detection of EEG rhythms , Template matching for EEG spike and- Wave detection. Cross Spectral Techniques-Coherence analysis of EEG channels. The matched Filters- Detection of EEG spike and wave Complexes. Homomorphic Filtering-Generalised linear filtering, Homomorphic deconvolution.

Unit 4 9
Analysis of Non stationary signals

Time variant system-characterization of non stationary signals and dynamic systems. Fixed Segmentation- The short time Fourier transform. Adaptive segmentation-Spectral error measure, ACF distance. Application- Adaptive segmentation of EEG signals, Time Varying analysis of Heart –rate Variability.

Unit-5   **9**
Pattern classification and diagnostic Decision
Pattern classification: supervised pattern classification-Discriminate and decision functions, distance functions. Unsupervised Pattern classification: cluster seeking methods. Logistic Regression analysis. Neural networks.

L = 45 TOTAL: 45 PERIODS

TEXT BOOKS
1. John G. Proakis and Dimitris G.Manolakis, Digital *Signal Processing, Algorithms and App*lications, PHI of India Ltd., New Delhi, 3rd Edition, 2000.
2. Rangaraj.M.Rangayyan , *Biomedical signal processing, IEEE Press, 2003.*

REFERENCES
1. Sanjit K.Mitra 'Digital Signal Processing', A Computer Based Approach, Tata McGraw-Hill, New
Delhi, 1998.

BBM6L1   BIOSIGNAL AND IMAGE PROCESSING LAB   L   T   P   C

0   0   3   2

OBJECTIVES:
To study about the characteristics ,working and applications of various devices in the field of bio sensors and transducers .

Lab Outcomes:
CO01: To understand the computation of convolution.
CO02: To learn the Response of a difference equation to initial conditions.
CO03: To learn the DFT computation.
CO04: To perform Computational experiments with digital filtering.
CO05. To learn Sampling and waveform generation.
CO06. To learn FIR and IIR filters implementation.
CO07. To learn the characteristics of ECG signals, EEG signals and EMG signals.
CO08. To learn the Image arithmetic operations.
CO09. To learn the Gray level transformation.
CO10.To learn the characteristics of Spatial Filters and Gaussian Filter.
CO11.To learn about FFT Discrete Fourier transform.
CO12. To learn the Properties of Fourier transform- FFT SHIFT, IFFT SHIFT.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S			S			M			
CO2					M					S		W
CO3	M		M					M				
CO4		W								W		
CO5				M			M					M
CO6							S		S			
CO7	M				M			S				
CO8											S	
CO9			M			S			S			
CO10												
CO11	S			S					M		M	
CO12		M				S					S	

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

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. Simulation of Biosignals and Analysis of ECG signals, EEG signals and EMG signals.
8. Image arithmetic operations – Addition, Subtraction, Multiplication and Division of 2 images.
9. Gray level transformation – Log transformation, Power law transformation and Histogram equalization.
10. Spatial Filters-Salt and pepper noise, speckle noise, Average Filter and Gaussian

    Filter

11. Properties of Fourier transform – zeros, FFT Discrete Fourier transform, Two

    dimensional Discrete Fourier transform.

12. Properties of Fourier transform- FFT SHIFT, IFFT SHIFT

BBM6L2   **C++ Programming and Java Lab**   L T P C
                                                             0 0 3 2

OBJECTIVES:
To learn C++ programming language, be exposed to the different data structures and be familiar with applications using different data structures.
OUTCOMES:
At the end of the course, the students would
CO01- Have a fundamental knowledge of the basic concepts of C++
CO02- Have a well-founded knowledge of programming in C++
CO03- Acquire skills in handling the file with different operation
CO04- Have a fundamental knowledge of the basic concepts of Java
CO05- Able to understand the concepts of Java.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			M	S		M	M		M		M
CO2			M									
CO3	M			S						M		
CO4					S		S					
CO5	S		M							S		

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

C++ PROGRAMMING
      1. Simple C++ Program.
      2. Function overloading.
      3. Operator overloading.
      4. Inheritance.
      5. Virtual functions and Dynamic binding.
      6. Templates.
      7. File Handling.
      8. Exception handling.
Java Programming
      1. Simple Java programs.
      2. Inheritance.
      3. Event handling programs

BBM701   **MEDICAL INFORMATICS**   **L   T   P   C**
                                                                                3   0   0   3

OBJECTIVES:
  To learn about the historical information of hospitality and recent trends in the Hospital information system.

OUTCOMES:
At the end of the course, the students would
CO01- Have Knowledge about the historical information of hospital.
CO02- Have a well-founded knowledge of overview of computer hardware used in the Hospital Information system
CO03- Have a fundamental knowledge of Hospital Information system
CO04- Have a skills about the visual programming and multimedia information.
CO05- Acquire the skills integrated medical information system.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2			M									
CO3	M			S								
CO4					S		M			S		
CO5	M		M			M						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content
UNIT-1
BIOMEDICAL INFORMATION SYSTEM   **9**
Historical Highlights of health care information system-Biomedical information system-problems and pitfalls-History and evolution of Electronic resources, Multimedia components.

UNIT-2
OVERVIEW OF COMPUTER HARDWARE   **9**
Motherboard and its logic-Memory and I/O interfacing/memory and input output mapping-I/O peripherals and Add-on cards.

UNIT-3   **9**
HOSPITAL INFORMATION SYSTEM
Concept of HIS its position in hospital-introduction of a computerized HIS Automation of medical record-cost and Benefits of HIS-Modems and Networking in Hospitals.

UNIT-4   **9**
VISUAL PROGRAMMING AND MULTIMEDIA INFORMATION
Visual Basic Principles and Programming-Design, Production and Testing of Multimedia based HIS.

UNIT-5   **9**
INTEGRATED MEDICAL INFORMATION SYSTEM
Integration of inter and intra hospital information system. Role of expert systems-web based Multimedia information system-Video-conferencing-PowerPoint Presentation.

L = 45 TOTAL: 45 PERIODS

Text book:
 15. R.D.Lele '"Computer in Medicine" Tata McGraw Hill, Newyork, 1999.

References:
 16. S.K.Chauhan "PC Organisation", S.K.Kataria and Sons, Delhi 2000.
 17. Harold Sackamn "Bio Medical Information Technology", Academic Press, Newyork.

BBM702   **NEURAL NETWORKS AND PATTERN RECOGNITION**
                                                          L T   P   C
                                                          3 1   0   4

OBJECTIVES:
- To learn about the Neurophysiology and biological network
- To extract the model of network and its process

OUTCOMES:
At the end of the course, the students would
CO01- Have to know about the process of neurophysiology.
CO02- Have to gain knowledge about the neural networking process such as back propagation
CO03- Have a fundamental knowledge of pattern recognition
CO04- Have a skills about the manipulating, transforms using classifiers theorems.
CO05- Acquire the skills cluster analysis and feature extraction

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2			M									
CO3	M			S								
CO4					S		M			S		
CO5	M		M			M						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry

4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content

UNIT I 9

ADAPTIVE LINEAR COMBINER

Elementary neurophysiology and biological neural network-Artificial neural network, Adeline and Madeline.

UNIT II 9

BACK PROPOGATION AND ASSOCIATE MEMORY

Back propogation network, generalized delta rule, Bidirectional associate memory, Hopefield memory architecture.

UNIT III 9

PRINCIPLES OF PATTERN RECOGNITION

Patterns and features, training and learning in pattern recognition, pattern recognition approach, different types of pattern recognition.

UNIT IV 9

DECISION MAKING

Bayer's theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimaters, nearest neighbor classification, maximum distance pattern classifier, adaptive decision boundaries.

UNIT V 9

CLUSTER ANALYSIS AND FEATURE EXTRACTION

Unsupervised learning, hierarchical clustering, Graph theories approach to pattern clustering, fuzzy pattern classifier, application of pattern recognition in medicine.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK:
1. J.A. Freeman & David.M. Skapura, Neural networks, Algorithms applications and programming techniques, Addison Wesley, 1991. ISE Reprint, 1999.

2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

BBM703   **HEALTH, HOSPITAL AND**   **L T P C**
                      EQUIPMENT MANAGEMENT   **3 0 0 3**

OBJECTIVES:
 To learn about the health, hospital and equipment management.

OUTCOMES:
At the end of the course, the students would
CO01- Have Knowledge about the health organization of the country.
CO02- Have a well-founded knowledge hospital organization and management
CO03- Have a fundamental knowledge of regulatory requirement and health care codes
CO04- Have a skills about the equipment maintenance management
CO05- Acquire the skills Function, role of Clinical Engineer.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2												
CO3	M						S					
CO4					S		M			S		
CO5	M		M								S	

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content
UNIT-I   **9**
HEALTH SYSTEM
Health organisation of the country, the state, the cities and the region, Health Financing System, Organisation of Technical Section.

UNIT-II   **9**
HOSPITAL ORGANISATION AND MANAGEMENT
Management of Hospital Organisation. Nursing section Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transactional Analysis Human relation in Hospital. Importance to Team Work, Legal aspect in Hospital Management

UNIT-III   **9**
REGULATORY REQUIREMENT AND HEALTH CARE CODES
FDA Regulation, joint commission of Acredation for Hospitals, National Fire Protection Association Standard, IRPC.

UNIT-IV   **9**
EQUIPMENT MAINTENANCE MANAGEMENT
Organising Maintenance Operations, Paperwork Control, Maintenance Job, Planning Maintenance Work Measurement and Standards, Preventive Maintenance, Maintenance Budgeting and Foirecating, Maintenance Training, Contract Mainframe.

UNIT-V   **9**
TRAINED TECHNICAL PERSONNEL
Function of Clinical Engineer, Role to be performed in Hospital, Man power Market, Professional Registration, Structure in Hospital.

L = 45 TOTAL: 45 PERIODS

References:
1. *Cesar A. Caceres and Albert Zara, The Practice of Clinical Engineering. Academic Press, 1977.*
2. *Webster, J. G. and Albert M. Cook, Clinical Engineering Principles and Practices, Prentice Hall Inc. Eng/ewood Cliffs, 1979.*
3. *Antony Kelly, Maintenance planning and control, Butterworths London, 1984.*
4. *Hans Pfeiff Vera Dammann (Ed.) Hospital Engineering In Developing Countries, Z report Eschborn, 1986.*
5. *Jacob Kline, Handbook of Bio Medical Engineering, Academic Press. San Diego 1988.*
6. *R.C.Goyal. Handbook of Hospital Personal Management. Prentice Hall of India. 1993.*

BBM704	MODELLING OF PHYSIOLOGICAL	L	T	P	C
	SYSTEMS	3	0	0	3

OBJECTIVES:
 To design the physiological systems

OUTCOMES:
At the end of the course, the students would
CO01- Have Knowledge about the physiological process in the biological system.
CO02- Have a skills to modeling of human thermal regulatory system
CO03- Have a fundamental basis for respiratory system
CO04- Have a skills to design the Ultra Filtration system
CO05- To design the Model of body dynamics

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2			M									
CO3	M			S								
CO4					S		M			S		

CO5	M		M		M							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content

UNIT I   **9**

Physiological processes and principles of their control flow, gas exchange Ultra filtration, biochemical reactions, pneumatic transport, digestion, Energy utilization and waste disposal, linear and nonlinear control systems, principles of open loop and feedback systems techniques for system Response characterization.

UNIT II   **9**

Modeling of human thermal regulatory system o. Parameters involved, control system model etc. biochemistry of digestion, types of heat loss from body, models of heat transfer between subsystems of human body like skin core, etc. and systems like within body, body environment etc.

UNIT III   9

Respiratory system: Modeling oxygen uptake by RBC and pulmonary capillaries, mass balancing by lungs, gas transport mechanism of lungs, oxygen and carbon dioxide transport in blood and tissues.

UNIT IV   **9**

Ultra Filtration system Transport through cells and tubules, diffusion, factated diffusion and active transports, methods, of waste removal, counter current model of urine formation in nephron, moellir Henle's loop.

UNIT V   **9**

Modeling body dynamics: Principles of mechanical modeling of bone, tissues etc.modeling stress were propagation in bones, hills, model of muscle mechanisms Current trends : Pharmacokinetic modeling with illustrated example like drug diffusion, computer aided modeling etc.

                                L = 45 TOTAL: 45 PERIODS

TEXT BOOKS:
1. Advanced Methods of Physiological System Modeling by V.Z. Marmarelis
2. Applied mathematical model in Human Physiology, by Johnny T. Ottesen, Mette S. Olufsen, Jesper K.Larsen

REFERENCE BOOKS:
1. Physiological basis of Ventilatory Support, By John. J. Marini, Arthur S. Slutsky
2. Pharmacokinetic and Pharmacodynamic Data Analysis: Concepts and Applications**,** By Daniel (Weiner, Johan Gabrielsson).

BBM7L1   **PATHOLOGY AND MICROBIOLOGY LAB**   L   T   P   C
                                                          0   0   3   2

OBJECTIVES:
- To learn about the cell structure and its disorders
- To gain knowledge about the fundamental structure of virus, bacteria and its causes

OUTCOMES:
At the end of the course, the students would
CO01- Have a Fundamental Knowledge about the cell and concepts of tumor.
CO02- Have to learn about the fluid present in the body and hemodynamic derangement
CO03- Have a fundamental knowledge of real time imaging with basic hardware architecture, algorithms and transform techniques
CO04- Have knowledge about basic concepts of infection and immunity of the human body
CO05- Acquire the fundamental knowledge of structure of Bacteria, virus and its causes.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S			S	M			M				M
CO2			M									
CO3	M			S						S		
CO4		M			S		M					
CO5		S	M							S		

	Direct		Indirect
1	Observation Book	1	Course and Survey
2	Record Book	2	Faculty Survey
3	Model Examination	3	Industry
4	Viva Voce	4	Alumni
5	End Semester Examinations		

LIST OF EXPERIMENTS:
1. Haemoglobin Estimation-Lyanmeth Haemoglobin method.
2. Peripheral smear study (i) Morphology.
                          (ii) Different count,
                          (iii) Total count.
3. Cross matching of Blood-ABO blood grouping.
4. Cytopathic effect.
5. Study on inclusion bodies.
6. Antigen-Antibody reaction Immuno electrophoresis.
7. Simple staining.
8. Gram staining.

9. Acid-fast staining.
10. IMVIC test.
11. Oxidase-Citrate.
12. Hydrogen sulphide test.
13. Cutting section and staining.

BBM801 **REHABILITATION ENGINEERING** **L T P C**
                                              3 0 0 3

OBJECTIVES:
  To learn about the rehabilitation engineering and its process.
OUTCOMES:-
At the end of the course, the students would
CO01- Have basic Knowledge about the principles of rehabilitation engineering.
CO02- Have a well-founded knowledge of mechanics of wheel chair and its type
CO03- Have a fundamental knowledge about the applications of Orthopedic Prosthetics
CO04- Have a skills about the Sensory Rehabilitation Systems.
CO05- Acquire the skills applications of rehabilitaion.
CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2						S						
CO3	M			S				M				
CO4					S		M			S		
CO5	M		M			M						

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content
Unit 1   **9**
Introduction to Rehabilitation:
Principles involved in the study of Rehabilitation Engineering, HAAT – Human Activity
Assistive Technology.

Unit 2   **9**
Rehabilitation Engineering Science & Technology:
Rehabilitation engineering concepts in motor rehabilitation engineering concepts in
communication disorders.Wheel chairs: Categories of Wheelchairs, Wheelchair structure and
Component design, Ergonomics of Wheelchair Propulsion, Power Wheelchair Electrical

Systems. Personal Transportation for the Handicap: Vehicle Selection, Lift Mechanisms, Hand Controls, Wheelchair restraint Mechanisms.

Unit 3
Orthopedic Prosthetics & Orthotics in Rehabilitation Technology: **9**
Fundamentals, Function, Structure and Cosmesis of Orthotic or Prosthetic device. Computer-Aided engineering in customized component design, Example- Intelligent prosthetic knee, hierarchically controlled Prosthetic Hand, Myoelectric hand and arm prosthesis – block diagram, signal flow diagram and functions.

Unit 4   **9**
Sensory Rehabilitation Systems:
Engineering concepts in sensory rehabilitation, Sensory Augmentation & substitution: Visual System, Auditory system, Tactual system.

Unit 5   **9**
Réhabilitation Engineering Technologies: Principles of Application:
Conceptual frameworks, Education and Quality Assurance, Specific Impairments and Related technologies, Future Developments – Rehabilitation Robotics, and Brain computer interface systems.

                            L = 45 TOTAL: 45 PERIODS

Text Book:
1. *Robinson C.J Rehabilitation Engineering, Handbook of Electrical Engineering, CRC Press, Bocaration 1993.*

Reference:
1. *Reswick. J, What is Rehabilitation Engineering, Annual Reviews of Rehabilitaion – Volume.*
2. *Springer – veriag, New York, 1982.*
3. *Leon Goldman m.d.r James Rockwell. J.r. Lasers in medicine.*
4. *K.Wolbarsht M. L. Laser application in Medicine and biology, Plenum Press, New York.*

BBM051   TISSUE ENGINEERING AND ARTIFICIAL ORGANS   L   T   P   C
                                                                 3   1   0   4

OBJECTIVES:
  To learn about the basic mechanics of Tissue Engineering, model of artificial organs and it process.

OUTCOMES:
At the end of the course, the students would
CO01- Have Fundamental Knowledge about the tissue Engineering.
CO02- Have a well-founded knowledge of cell mechanics and its effect
CO03- Have a basic concepts of tissue barriers to molecular and cellular transport
CO04- Have a skills about the tissue replacement implant.
CO05- Have a fundamental knowledge about the artificial organs.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2			M				S		M			
CO3				S								
CO4					S		M			S		
CO5	M		M			M						

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content
UNIT I   FUNDAMENTAL OF TISSUE ENGINEERING   9

Tissue Exchange and Tissue Development, objectives of Tissue engineering, Element of Tissue development.

UNIT II   CELLULAR STUDIES   9

Cell growth and differentiation, Cell and tissue mechanism, cell adhesion, cell migration, cell aggregation and tissue equivalent.

UNIT III   TISSUE   BARRIERS   TO   MOLECULAR   AND   CELLULAR TRANSPORT   9

Cell delivery and recirculation, Delivery molecular agents in tissue engineering, control releaser agents in time and space.

UNIT IV   TISSUE REPLACEMENT IMPLANTS   9

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

UNIT V   ARTIFICIAL ORGANS   9

Artificial Heart, Prosthetic Cardiac Valves, Limb prosthesis, Externally Powered limb Prosthesis, Dental Implants.

L = 45 TOTAL: 45 PERIODS

REFERENCES:

1. PARK J.B., "Biomaterials Science and Engineering", Plenum Press, 1984.
2. W Mark Saltzman Tissue Engineering – Engineering principles for design of replacement organs and tissue –- Oxford University Press Inc New York 2004.
3. Gray E Wnek, Gray L Browlin – Encyclopaedia of Biomaterials and Biomedical Engineering – Marcel Dekker Inc New York 2004.

BBM052	BIOLOGICAL EFFECTS OF RADIATION	L	T	P	C
		3	1	0	4

OBJECTIVES:
  To learn about effects of radiation in the biological system.
OUTCOMES:-
At the end of the course, the students would
CO01- Have Knowledge about the theory related to radiation in the living cell.
CO02- Have a well-founded knowledge somatic application of radiation.
CO03- Have a fundamental knowledge of genetic effects of radiation
CO04- Have a skills about effect of microwave and RF with matters.
CO05- Acquire the skills radiation effects.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S				M			M				M
CO2						M	S					
CO3				S								
CO4					S		M			S		
CO5	M		M			M					M	

Course Assessment Methods:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I   9
ACTION OF RADIATION IN LIVING CELLS

Various theories related to radiation at cellular level. DNA and chromosomal damages.

UNIT – II   9
SOMATIC APPLICATION OF RADIATION

Radio sensitivity protocols of different tissues of human. LD50/30 effective radiation on skin. Bone marrow, eye, endocrine glands, and basis of radio therapy.

UNIT – III   **9**
GENETIC EFFECTS OF RADIATION

Threshold and linear dose, gene control hereditary diseases effect of dose.

UNIT – IV   **9**
EFFECT OF MICROWAVE AND RF WITH MATTERS

Effects of various human organs and systems, Wavelength in tissue, non thermal interaction. Standards of protection, national, and international standards and precautions.

UNIT – V   **9**
UV RADIATION

Classification of sources, measurement, photo medicine, UV radiation, safety visible and infrared Radiation.

L = 45 TOTAL: 45 PERIODS

Reference:
1. Paul Fryer, Duncan Ward, Radiatiom, White Cube Publishers (2008).

2. Steve Forshier, Essential of Radiation Biology and Protection, Delmar Publishers (2008).

BBM053	**DATA MINING**	**L**	**T**	**P**	**C**
		3	**1**	**0**	**4**

OBJECTIVE:
1. To introduce data mining.Its concepts and class description.
2. To study the Data Mining Primitives-Languages & system Architecture-Data mining query language-Designing graphical user interfaces. Data Warehousing-Introduction-Data marts
3. Introduction to mining association rules in target databases.
4. Basics of classification &prediction-Cluster analysis.Types of data in cluster analysis. Developing a Data Warehouse-Design considerations

COURSE OUTCOMES
CO01 - To learn the concepts of data mining and a clear description about the class.
CO02 - To learn data mining query language, architecture of data mining systems.
CO03 - To have a clear Basics of classification &prediction, Cluster analysis,Types of data in cluster analysis.
CO04 –To learn Data Warehousing, Introduction,Data marts Online analytical processing OTLP-OLAP tools.
CO05- To learn Data Warehouse, design considerations, Data content-Meta data, Distribution of data.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S										
CO2			S	S	M							
CO3		M		S	S							
CO4	S	M	M									`
CO5		S			S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content:

UNIT-I   9

What is data mining? Data mining, on what kind of data? Relational databases-Transactionaldatabases-concepts/class description-Characterization-Association analysis-cluster analysis-Outier analysis-Evolution analysis-Data preparation-Data cleaning-Data Integration&transformation-Data reduction-Discretization&concept hierchy generation.

UNIT-II   9

Data Mining Primitives-Languages&system Architecture-Data mining query language-Designing graphical user interfaces based on data mining query language-Architecture of data mining systems-Introduction to mining association rules in targe databases.

UNIT-III   9

Basics of classification&prediction-Cluster analysis-Types of data in cluster analysis-Partitioning methods-Neural neworks&decision trees-Nearest neighbour induction rule.

UNIT-IV   9

Data Warehousing-Introduction-Data marts(loading,meta data, data model, maintenence, nature&software components)-Online analytical processing0OTLP-OLAP tools.

UNIT-V   9

Developing a Data Warehouse-Design considerations-Data content-Meta data-Distribution of data-Performance considerations-Applications - National data warehouses;

L = 45 TOTAL: 45 PERIODS

REFERENCE:

1."Data Warehousing-Concepts, Techniques, Products&Applications", C.S.R. Prabhu, Prentice_Hall of India

2."Data Mining-Concepts&Techniques,"Ulaweilhan & Micheline, Morgan Kauffman Publications

3."Data Warehouse Project Management,"Sid Ado/man & larissa T.Moss, Addison Wesley

BBM054	BIOINFORMATICS	L	T	P	C
		3	1	0	4

OBJECTIVE:
1. To introduce Bioinformatics-Elementary commands and Protocols, ftp, telnet, http. Primer on information theory.
2. To study Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence aligments.
3. To study Introduction to databases-database search-Algorithms issues in database search-sequence database search FASTA-BLAST.
4. Introduction to Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny.
5. DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment.

COURSE OUTCOMES
CO01 - To learn bioinformatics and the protocols.
CO02- To learn Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence alignments.
CO03 - To have a clear view on Amino acid substitution matrices PAM and BLOSSUM.
CO04 –To learn Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment.
 CO05- To DNA Mapping and sequencing-Map alignment-Large scale sequencing.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S									
CO2			S	S		M						
CO3		M		S		S						
CO4	S	M		S								`
CO5			S		S							

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey

2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content:

UNIT – 1: WHAT IS BIOINFORMATICS   9

Scope of Bioinformatics-Elementary commands and Protocols, ftp, telnet, http. Primer on information theory.

UNIT – 2: SEQUENCING ALIGNMENT AND DYNAMIC PROGRAMMING 9

Introduction-Strings-Edit distance two strings-string similarity local alignment gaps-parametric sequence aligments-suboptimal alignments-multiple alignment-commom miltiple alignment methods.

UNIT – 3: SEQUENCE DATABASE AND THEIR USE   9

Introduction to databases-database search-Algorithms issues in database search-sequence database searchFASTA-BLAST-Amino acid substitution matrices PAM and BLOSSUM.

UNIT – 4: EVOLUTIONARY TREES AND PHYLOGENY   9

Ultrasonic trees-parsimony-Ultrametric problem-perfect phylogeny-phylogenetic alignment-connection between multiple alignment and tree construction.

UNIT – 5: SPECIAL TOPICS IN BIOINFORMATICS   9

DNA Mapping and sequencing-Map alignment-Large scale sequencing and alignment-Shotgun-DNA sequencing-Sequence assembly-Gene predictions-Molecular predictions with DNA strings

L = 45 TOTAL: 45 PERIODS

Text book:
   1. *R.D.Lele '"Computer in Medicine" Tata McGraw Hill, Newyork, 1999.*

References:
   2. *S.K.Chauhan "PC Organisation", S.K.Kataria and Sons, Delhi 2000.*
   3. *Harold Sackamn "Bio Medical Information Technology", Academic Press, Newyork.*

BBM055   **TELEMEDICINE**

L T P C
3 1 0 4

OBJECTIVE:
1. To introduce telemedicine advancements in telemedicine .Benefits of telemedicine , Functional Block of a telemedicine system,Tele healthcare and E-medicine.
2. To study Communication infrastructure for telemedicine LAN and WAN technology Satellite communication Mobile hand held devices and mobile communication Internet technology and telemedicine using World Wide Web Video and audio conferencing.
3. Introduction to Network Configuration , circuit and packet switching.
4. Introduction Archives Electronic Documentation Business aspects Common Access to Biological Resources and Information (CABRI) Database indexing and search terms Nucleic and genome databases Molecular data base and servers.
5. To learn Ethical and legal issues of Telemedicine - Confidentiality and the law - Patient rights and consent - Access to medical Records.

COURSE OUTCOMES
CO01 - To learn introduce telemedicine advancements in telemedicine .Benefits of telemedicine ,Functional Block of a telemedicine system,Tele healthcare.
CO02 - To learn Mobile hand held devices and mobile communication - Internet technology and telemedicine using World Wide Web - Video and audio conferencing.
CO03 - To have a clear view on , medical images diagnosis and treatment - Hospital information - Doctors, paramedics, facilities available.
CO04 –To learn Protein Identification Resource(PIR) - Telemedicine in Neuroscience - Telecardiology – Teledermatology - Teleneurology
CO05- To learn Telemedicine technology and Health care delivery for rural population - Use of telemedicine technology for clinical diagnostic study.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1				M								
CO2		S	S	M		M						
CO3		M				S			M			S
CO4	S			S						S		`
CO5			S		S							

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry

4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content:

UNIT I   FUNDAMENTALS OF TELEMEDICINE   9
History and advancements in telemedicine - Benefits of telemedicine – Functional Block of a telemedicine system - Tele-healthcare and E-medicine - Use of computers in distance mode of healthcare delivery - Familiarizing with technology of telemedicine – scanner, electro stethoscope - data reception equipment - Scope for telemedicine - Cyber laws related to telemedicine - Telemedicine access to health care services - Limitations of telemedicine.

UNIT II   COMMUNICATION   SYSTEMS   AND   NETWORKS   IN TELEMEDICINE   9
Communication infrastructure for telemedicine - LAN and WAN technology - Satellite communication - Mobile hand held devices and mobile communication - Internet technology and telemedicine using World Wide Web - Video and audio conferencing - Types of information - Audio, Video, Still images, Text and data, fax - Types of communication and network - PSTN, POTS, ANT, ISDN, Internet, Wireless communication - GSM satellite, and Microwave – Signal Modulation techniques - Data compression and transfer - Capturing Medical Signals - Types of antennas depending on requirements, Integration and operational issues - System integration, store –and - forward operation, Real-time Telemedicine – Remote Sensing.

UNIT III   DATA EXCHANGE, MANAGEMENT, SECURITY AND STANDARDS IN   TELEMEDICINE   9
Network Configuration - circuit and packet switching - H. 320 series (Video phone based ISBN) - T. 120, H.324 (Video phone based PSTN) - Encryption - Cryptography - Mechanisms of encryption - phases of Encryption - Protocols - TCP/IP, ISO-OSI Standard - DICOM, HL7 - Medical information storage and management for telemedicine - Patient information medical history - Test reports, medical images diagnosis and treatment - Hospital information - Doctors, paramedics, facilities available - Pharmaceutical information – Information Security and confidentially of medical records and access control

UNIT IV   APPLICATIONS OF TELEMEDICINE   9
Introduction - Archives - Electronic Documentation - Business aspects - Common Access to Biological Resources and Information (CABRI) - Database indexing and search terms - Nucleic and genome databases - Molecular data base and servers - Array express - Gateway to archives - Sequential retrieval system - Protein Identification Resource(PIR) - Telemedicine in Neuroscience - Telecardiology – Teledermatology - Teleneurology - Teleophthalmology – Telepathology – Teleoncology - Telepediatrics – Telepharmacy – Telepsychiatry and mental health – Teleradiology – Telesurgery – Veterinary – Other specialties

UNIT V   ETHICAL ASPECTS AND CASE STUDIES IN TELEMEDICINE 9
Ethical and legal issues of Telemedicine - Confidentiality and the law - Patient rights and consent - Access to medical Records - Consent treatment - Jurisdictional Issues - Intellectual property rights - Telemedicine technology and Health care delivery for rural population - Use of telemedicine technology for clinical diagnostic study - Conceptual frame work on home telemedicine.

TEXT BOOKS

- Olga (EDT) Ferrer – Roca, M.Sosa (EDT) Iudicissa Hand book of Telemedicine IOS press 2002.

- A.C. Norris, Essentials of Telemedicine and Telecare John Sons & Ltd, 2002.

- Marilyn J. Field, "A Guide to Assessing Telecommunications in Health Care",NATIONAL ACADEMY PRESS,1996.

- Bashshur , R. L. , Sanders, J. H and Shannon, G. W.,"Telemedicine: Theory and Practice", Volume 27, Number 2,Springer Netherlands,1999,

REFERENCES

1. Norris, A.C. Essentials of Telemedicine and Telecare. Wiley (ISBN 0-471-53151-0), 2002

2. Wootton, R., Craig, J., Patterson, V. (Eds.), Introduction to Telemedicine. Royal Society of Medicine Press Ltd (ISBN 1853156779), 2006

3. Ferrer-Roca, O., Sosa-Iudicissa, M. (editors), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54). (ISBN 90-5199-413-3), 2002.

4. Simpson, W. 2006. Video over IP. A practical guide to technology and applications. Focal Press (Elsevier). ISBN-10: 0-240-80557-7

5. Bemmel, J.H. van, Musen, M.A. (Eds.) (1997). Handbook of Medical Informatics. Heidelberg, Germany: Springer. (ISBN 3-540-63351-0)

BEI057   MICROCONTROLLER BASED SYSTEM DESIGN   L T   P   C

3   0   0   3

OBJECTIVE:
1. To introduce microcontroller, the role of microcontrollers **.**Types and selection,its application and examples.
2. To study the microcontroller resources and Family members, bus widths program and data memory parallel ports. D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations
3. To study Interrupt structures programmable timers, real time clock, latency, interrupt, density and interval constraints.
4. To study CPU register- structure- addressing modes- instruction sets- assembly languages-assemblers.
5. To study Queues, tables and strings, program organisation, microcontroller expansion methods, I/O hardware alternatives, development tools, RTOS.

 COURSE OUTCOMES

CO01 - To learn introduce microcontroller the role of microcontrollers. The Types and selection.

CO02 - To learn D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.

CO03 - To have a clear view Interrupt structures programmable timers, real time clock.

CO04 –To learn CPU register its structure and its addressing modes and instruction sets.

CO05- To learn I/O hardware alternatives, development tools, RTOS, motorola MC68HC11.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1						M						
CO2		S			S	S						
CO3		S					S		M			
CO4	S			S							S	`
CO5			S		M					S		

COURSE ASSESSMENT METHODS:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-1: THE ROLE OF MICROCONTROLLERS   **9**

Types and selection- application example

UNIT-2 : MICROCONTROLLER RESOURCES   **9**

Family members, bus widths program and data memory parallel ports. D/A and A/D convertors, reset circuitry, watchdog timers, power down considerations.

UNIT-3 : REAL TIME CONTROL   **9**

Interrupt structures programmable timers, real time clock, latency, interrupt, density and interval constraints.

UNIT-4 : PROGRAMMING FRAMEWORK FOR 8051 AND PC16F877   **9**

CPU register- structure- addressing modes- instruction sets- assembly languages- assemblers.

UNIT-5 : SOFTWARE BUILDING BLOCKS   **9**

Queues, tables and strings, program organisation, microcontroller expansion methods, I/O hardware alternatives, development tools, RTOS, motorola MC68HC11 and intel 8051.

                                                L = 45 TOTAL: 45 PERIODS

Textbooks:

1. S Ghoshal, "Microprocessor Based System Design", MacMillan Publisher, 1996.

BEI062	**VLSI DESIGN**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVE:
1. To introduce NMOS, PMOS, CMOS devices and their characteristics.
2. To study CMOS inverter design principles, design layout rules, construction of multiplexers
3. To study Combinational logic and sequential logic circuits.
4. To study Design concepts- design tools, simulators, introduction to VHDL- sequential and concurrent descriptions- signal port and variable statements **.**

COURSE OUTCOMES

CO01 - To learn NMOS, PMOS, CMOS devices characteristics, linear saturating modes, bulk effect capacitances, device models for simulation CMOS device fabrication principles.
CO02 - To learn CMOS inverter design principles, design layout rules, construction of multiplexers, transmission gates, latches, flip flops, timing and fan out considerations.
CO03 - To have a clear view on Combinational logic and sequential logic circuits. Data path circuits. Adder multiplier architecture and accumulators.
CO04 –To learn simulation of VHDL code,VHDI,functions, procedures,packages and libraries,introduction to verilog and brief comparison with VHDL.

CO05- To learn FPGA design flow for logic gates, ALU, multiplexer, flip flop, counter.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S							
CO2		M		M		S						
CO3			S			S			S			
CO4	S				S						S	`
CO5			M		M					S		

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course content:

UNIT-1: BASIC DEVICE CHARACTERISTICS   9

NMOS, PMOS, CMOS devices characteristics, linear saturating modes, bulk effect capacitances, device models for simulation CMOS device fabrication principles.

UNIT-2: BASIC CIRCUITS FOR DIGITAL SYSTEMS   9

CMOS inverter design principles, design layout rules, construction of multiplexers, transmission gates, latches, flip flops, timing and fan out considerations.

UNIT-3 : BUILDING BLOCKS OF DIGITAL SYSTEMS   9

Combinational logic and sequential logic circuits. Data path circuits. Adder multiplier architecture and accumulators.

UNIT-4: DIGITAL DESIGN USING VHDL   9

Design concepts- design tools, simulators, introduction to VHDL- sequential and concurrent descriptions- signal port and variable statements- case and other sequential statements- compilation and simulation of VHDL code- VHDI, functions- procedures - packages and libraries- introduction to verilog and brief comparison with VHDL

UNIT-5 : FPGA DESIGN   9

VHDL model for combinational networks- routing procedures in FPGA and CPLD programming, methods for FPGA and CPLD- simulation and synthesis issues- FPGA architecture - FPGA design flow for logic gates, ALU, multiplexer, flip flop, counter.

L = 45 TOTAL: 45 PERIODS

References:

1. A. Shanthi, A. Kavitha, VLSI Design. New Age International Publishers, 2006.
2. Sabih H Gerez, Algorithm VLSI Design Automation, Wiley Publishers, 2006.

BEI063 **DIGITAL SYSTEM DESIGN:** **L T P C**

3 0 0 3

OBJECTIVE:
1. To introduce Circuit diagram of Til, CMOS, NMOS, ECL, GaAs building blocks, operating conditions, interfacing between different families.
2. To study CAN bus characteristics. Bus interface for R8422 and RS485.
3. To study Principles of PAL's PLD's GAL's CPLD and their design considerations.
4. To study Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO's flash memories
5. To study Multiphase clock generators, LCD display controller.

COURSE OUTCOMES

CO01 - To learn interpreting data sheet of 74 series, CD 4000 series, ECL 10000 series- power supply considerations for digital IC.
CO02 - To learn RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485
CO03 - To have a clear view on Principles of PAL's PLD's GAL's CPLD and their design considerations.
CO04 – To learn Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO's flash memories.
CO05- To learn Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-1: DIGITAL LOGIC FAMILIES 9

Circuit diagram of Til, CMOS, NMOS, ECL, GaAs building blocks, operating conditions, interfacing between different families- interpreting data sheet of 74 series, CD 4000 series, ECL 10000 series- power supply considerations for digital IC.

UNIT-2: DIGITAL SYSTEM BUS CHARACTERISTICS 9

RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485

UNIT-3 : PROGRAMMABLE LOGIC DEVICES 9

Principles of PAL's PLD's GAL's CPLD and their design considerations

UNIT-4: DIGITAL MEMORIES 9

Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO's flash memories.

UNIT-5: DIGITAL SYSTEM DESIGN CASE STUDIES 9

Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

L = 45 TOTAL: 45 PERIODS

Textbooks:

1. Balakrishnan, "Digital System Design", Oxford University Press, USA 2007.
2. Mark Zwolinski, "Digital System Design with VHDL", Prentice Hall, 2003.

BEI064   **VIRTUAL INSTRUMENTATION**   **L T   P   C**

3   0   0   3

OBJECTIVE:
1. To introduce Historical perspectives, advantages, block diagram and arcitecture of a virtual instrument, data flow techniques.
2. To study CAN bus characteristics. Bus interface for R8422 and RS485.
3. To study Principles of PAL's PLD's GAL's CPLD and their design considerations.
4. To study Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO's flash memories
5. To study Multiphase clock generators, LCD display controller.

COURSE OUTCOMES

CO01 - To learn interpreting data sheet of 74 series, CD 4000 series, ECL 10000 series- power supply considerations for digital IC.
CO02 - To learn RS-232, RS-485, R8422, ISA, PCL, HC, SPI, CAN bus characteristics. Bus interface for R8422 and RS485
CO03 - To have a clear view on Principles of PAL's PLD's GAL's CPLD and their design considerations.
CO04 –To learn Principles and design considerations of specific PROM, EPROM, SRAM, SDRAM. Dual ported memories, FIFO's flash memories.
CO05- To learn Multiphase clock generators, LCD display controller, PRBS generator, watch dog timer, interfacing with SPI bus, interfacing with flash memory.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT-1: REVIEW OF VIRTUAL INSTRUMENTATION   **9**

Historical perspectives, advantages, block diagram and arcitecture of a virtual instrument, data flow techniques. Graphical programming in data flow, comparison with conventional programming.

UNIT-2 : VIRTUAL INSTRUMENTATION PROGRAMMING TECHNIQUES 9

VIS and subVIS loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O.

UNIT-3: DATA ACQUISITION BASICS   9

ADC, DAC, DIO, counters and timers. PC hardware structure, timing, interrupts, DMA, software and hardware installation.

UNIT-4: COMMON INSTRUMENT INTERFACES   9

CurCurrent loop, RS232C/RS485, GPIB, system buses, interface buses: USB, PCMCIA, VXI, SCXI, PXI etc., networkign basics for offica and industrial applications, visa and IVI, image acquisition and processing, motion control.

UNIT-5: USE OF ANALYSIS TOOLS   9

Fourier transforms, power spectrum correlation methods, wondowing utttering, VI application in various fields.

L = 45 TOTAL: 45 PERIODS

Textbooks:

1. Anand M M S, Electronic Instruments and Instrumentation Technology, PHI Publishers, 2007.
2. Stephen Bennett, Emagic Logic Virtual Instruments, PC Publishing, 2003.

BBM056	BIOPROCESS TECHNOLOGY	L	T	P	C
		3	1	0	4

OBJECTIVE: To   learn   introduction`   and   technology   of   bioprocess, screening,preservation. To clear view of Bioreactor design. Batch, fed batch and continuous cultivation. Growth rate parameters : Specific growth rate, doubling time. Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilisation

COURSE OUTCOMES

CO01 – To learn introduction` and technology of bioprocess, screening,preservation
 CO02 – To clear view of Bioreactor design. Batch, fed batch and continuous cultivation.

CO03 – To learn about Growth rate parameters : Specific growth rate, doubling time
CO04 – To learn Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilisation,
CO05- To clear view methods of on-line and off-line biomass estimation; Flow injection analysis for measurement of substrates.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

1. INTRODUCTION OF BIOPROCESS TECHNOLOGY   9

Introduction to bioprocess technology, Screening, preservation and improvement of industrially important microorganisms, Raw material and media formulation for fermentation process, Influence of environmental factors on growth and product formation.

2. BIOREACTORS   9

Bioreactor design. Batch, fed batch and continuous cultivation. Solid state cultivation. Sterilization of media reactor and air. Agitation and aeration and mass transfer of oxygen. Inoculum development, addition and sampling.

3. GROWTH RATE ANALYSIS   9

Growth rate parameters : Specific growth rate, doubling time, validity of exponential growth law, growth yield, metabolic quotient, Effect of substrate concentration, Monod Kinetics, Determination of Ks, Definition of lag period.

4. ENZYME TECHNOLOGY   9

Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilisation, basic design and configuration of immobilised enzyme reactors, applications of immobilised enzyme technology.

5. BIOPROCESS ESTIMATIONS   9
Methods of on-line and off-line biomass estimation; Flow injection analysis for measurement of substrates. Product and other metabolites; State and parameter estimation techniques for biochemical processes; Computer-based data acquisition, monitoring and control-LABVIEW Software.

L = 45 TOTAL: 45 PERIODS

Reference Books :
1. Principles of Fermentation Technology : Whitekar & Stanbury
2. Industrial Microbiology – Casida
3. Shule and Kargi, " Bioprocess Engineering ", Prentice Hall, 1992.

BBM057   **ROBOTICS AND NANOTECHNOLOGY**   **L T P C**
                                                                  3 1 0 4

OBJECTIVE: To learn about origin of robotics, different types of robotics, various generations of robots, Hydraulic, pneumatic and electric drives determination of HP of motor and gearing ratio variable speed arrangements,Construction of manipulators manipulator dynamics and force control

COURSE OUTCOMES

CO01 – To learn about origin of robotics, different types of robotics, various generations of robots
CO02 – To clear view of Hydraulic, pneumatic and electric drives determination of HP of motor and gearing ratio variable speed arrangements
CO03 – To learn about Construction of manipulators manipulator dynamics and force control
CO04 –To clear view of Basic concepts of Nano science and technology,Quantum wire, Quantum well ,Quantum dot
CO05- To learn about Material processing by Sol,Gel method, Chemical Vapor deposition and Physical Vapor deposition

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M			S				S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

UNIT – I   9

BASIC CONCEPTS

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

UNIT – II   9

POWER SOURCES AND SENSORS

Hydraulic, pneumatic and electric drives determination of HP of motor and gearing ratio variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT – III   9

MANIPULATORS, ACTUATORS AND GRIPPERS

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV   9

NANO MATERIALS AND NANOTECHNOLOGY

Basic concepts of Nano science and technology – Quantum wire – Quantum well – Quantum dot – Properties and technological advantages of Nanomaterials – Carbon Nanotubes and applications

UNIT V   9

MATERIALS PROCESSING AND CHRARCTERISATION:

Material processing by Sol – Gel method, Chemical Vapor deposition and Physical Vapor deposition – Microwave Synthesis of materials – Principles of SEM, TEM and AFM - Fluorescence Microscopy and Imaging.

                                                    L = 45 TOTAL: 45 PERIODS

TEXT BOOK

1. Niku Saeed B, Introduction to Robotics: Analysis, System, Applications, PHI Publishers.
2. Tony Hyland, Scientific and Medical Robotics, Smart Apple Media Publishers, 2007.
3. Hari Singh Nalwa, "*Nanostructured Materials and Nanotechnology*", Academic Press, 2002.

BBA702	PROFESSIONAL ETHICS	L	T	P	C
		3	1	0	4

OBJECTIVE: To learn about nature of management, management science or art, origin of robotics, different types of robotics and historical evolution of management

COURSE OUTCOMES:
CO01 – To learn about nature of management, management science or art
CO02 – Have clear view of origin of robotics, different types of robotics
CO03 – To learn about historical evolution of management
CO04 – Have a clear idea on planning, important steps,types and objects. mbo- swot- concept
CO05- to learn about social responsibility of managers- benefits of professional ethics

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents
UNIT I   **9**
CONCEPTUAL HUMAN ISSUES AND HUMAN VALUES
Nature of Management- Management science or art- Management as profession- Universality of Management- Technical, human and conceptual- Manager Vs Entrepreneurs- Managers Vs Leaders- Guidelines for managerial success.

UNIT II   **9**
HISTORICAL EVOLUTION OF MANAGEMENT
Taylor and scientific Management- principles of Management- Contributions of Henry Fayol, Barnad, Herbet simon, Peter Drucker, Hawthorne Experiments and human relations.

UNIT III 9

PLANNING AND ORGANIZING

Planning- important steps- types and objects. MBO- SWOT- Concept and features of strategy- policy and strategy- Forecasting and decision making – creativity and decision making- Organizing- Organizing structure- Organization Chart- Span of management- Authority and responsibility- Measure for effective delegation- Centralization and decentralization- Line and staff relationships.

UNIT IV 9

DIRECTING AND CONTROLLING

Direction- concept of direction- effective supervision- concept of leadership- Control- concept of control- quantitative and qualitative measures of control- TQM- Quality circle- ISO 9000 quality systems- PCMM level

UNIT V 9

CONTEMPORARY MANAGEMENT ISSUES AND HUMAN VALUES

Social responsibility of managers- benefits of professional ethics- Values, value system of Indian managers- Ethics- Business, nature, importance in organization- Managing ethical dilemmas- shaping and maintaining the ethical culture- protection of stake holders- Whistle blowing.

L = 45 TOTAL: 45 PERIODS

Reference:

1. Herald Knootz and Heinz Weihrich, "Essentials of Management" McGraw Hill Publishing Company, Singapore International edition, 1980.
2. Ties AF, Stoner and R. Edward Freeman" Management' Prentice Hall of India Pvt. Ltd., New Delhi, 1992.
3. Ian Stoodley "Professional Ethics", VDM Verlag Publisher, 2009.
4. Raju Ramachandran "Professional Ethics", Lexis Nexis India Publisher, 2004.

OBJECTIVE: To learn about Hospital Organization and the Role of Clinical Engineering, Clinical Engineering Programs To clear view of The Health Care Delivery System, Strategic Technology Planning, Technology Assessment,To learn about Quality Improvement, Standard Database, Measurement Indicators

COURSE OUTCOMES:

CO01 – To learn about hospital organization and the role of clinical engineering, clinical engineering programs
CO02 – To get a clear view of the health care delivery system, strategic technology planning, technology assessment
CO03 – To learn about quality improvement, standard database, measurement indicators.
CO04 –To clear view Deming's 14 Points, Zero Defects, TQM (Total Quality Management) and tools
CO05- To learn about quality improvement, standard database, measurement indicators.

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents
UNIT – 1 CLINICAL ENGINEER   9

Definition, Evolution of Clinical Engineering – interactions of a clinical engineer , Hospital

Organization and the Role of Clinical Engineering, Clinical Engineering Programs

UNIT -2 MANAGEMENT AND ASSESSMENT OF MEDICAL TECHNOLOGY AND

RISK FACTORS   9

The Health Care Delivery System, Strategic Technology Planning, Technology Assessment, Equipment Assets Management. Risk Management – Strategies, Risk Management: Application

UNIT -3 QUALITY OF IMPROVEMENT AND TEAM BUILDING   9

Deming's 14 Points, Zero Defects, TQM (Total Quality Management) and Tools Used for Quality Improvement, Standard Database, Measurement Indicators.

UNIT -4   9

Standards Regulatory and Assessment Agencies, Standards for clinical Engineers, Regulatory Agnecies, Technology Assessment Agencies

UNIT -5 APPLICATIONS OFVIRTUAL INSTRUMENTS IN HEALTH CARE   9

Application with Examples , Trending, Relationships, and Interactive Alarms, Data Modeling,0 Medical Equipment Risk Criteria, Peer Performance Reviews

L = 45 TOTAL: 45 PERIODS

REFERENCES

1. Handbook of Biomedical Engineering-Joseph Bronzino, 2000
2. Principles of Biomedical Engineering-Joseph Bronzino.

| BBM059 | COMPUTER NETWORKS | L T P C |
| | | 3 1 0 4 |

OBJECTIVE: To learn about Transmission media, Data encoding, Interface and Modems, Multiplexing clear view ISO – OSI layered architecture ,learn about Frames relay operation – layers and traffic control; ATM networks .LAN topology ,Ethernet ,Token bus ,Token ring, FDDI ,Wireless LAN

COURSE OUTCOMES:

CO01-To learn about transmission media,data encoding,interface and modems, Multiplexing
CO02 – To get a clear view of ISO – OSI layered architecture
CO03 – To learn about Frames relay operation – layers and traffic control; ATM networks
CO04 –To clear view LAN topology, Ethernet ,Token bus ,Token ring, FDDI ,Wireless LAN
CO05- To learn about Transport layer issues, session layer,Synchronization ,Presentation layer

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1			M			S					
CO2	S		S				M				
CO3		M				S			S		
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents

1. DATA COMMUNICATION CONCEPTS 9
Transmission media – Data encoding – Interface and Modems – Multiplexing – Error detection and correction – Digital subscriber line – Circuit switching – Packet switching – Message switching.

2. WIDE AREA NETWORKS 9
ISO – OSI layered architecture – Function of the layers – Data link protocols – HDLC, LAPB, LAPD, Inter networking devices – Repeaters, Bridges, Routers, Routing algorithms – Distance vector routing, link state routing, X.25 protocol, congestion control.

3. FRAME RELAY AND ATM NETWORKS 9
Frames relay operation – layers and traffic control; ATM networks – Architecture switching, layers service classes.

4. LOCAL AREA NETWORK 9
LAN topology – Ethernet – Token bus – Token ring – FDDI – Wireless LAN, ATM LAN – IEEE 802 Medium access control layer standard – Random access protocols – ALOHA – Slotted ALOHA.

5. OSI LAYERS 9
Transport layer issues – Session layer – Synchronization – Presentation layer – Encryption, decryption, Application layer – Message handling system, file transfer, virtual terminal – E-mail.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK
1. William Stallings, "Data and Computer Communication", sixth edition, Pearson education Asia, 2000.

REFERENCES

1. Behrouz A, Forouzan, "Data Communication and Networking", second edition, Tata McGraw-Hill, 2000.
2. Fred Halsall, "Data Communication, Computer networks and Open Systems", Fourth edition, Addison Wesley, 1995.
3. Andrew S.Tanenbaum, "Computer networks", Third edition, PHI, 1996, Chapter 4.

BBM060   **MEDICAL IMAGING TECHNIQUES**   **L   T   P   C**
                                                         3   1   0   4

OBJECTIVE

To learn about Quality assurance and image improvement in diagnostic radiology with X-Rays. view Radio isotopic imaging equipments, radiation detectors. Learn about Development of NMR, relaxation processes and their measurements, MRI-Image

COURSE OUTCOMES

CO01-Tolearn about Quality assurance and image improvement in diagnostic radiology with X-Rays

CO02 – To clear view Radio isotopic imaging equipments, radiation detectors

CO03 – To learn about Development of NMR, relaxation processes and their measurements, MRI-Image

CO04 –To clear view Concept of object and image, general image processing problem,

CO05- To learn about Single / multi user system, transferring of images, processing speed

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents

UNIT I 9
DIFFERENT MODES OF MEDICAL RECORDING

Quality assurance and image improvement in diagnostic radiology with X-Rays, specific Quality assurance tests for X-rays, need for sectional images, principles of sectional images recording, computer tomography with different trajectories.

UNIT II   9
RADIOISOTOPIC IMAGES
Radio isotopic imaging equipments, radiation detectors, radionuclide for imaging, static and dynamic planar scintillography.

UNIT III   9
NUCLEAR MAGNETIC RESONANCE IMAGING
Development of NMR, relaxation processes and their measurements, MRI-Image acquisition and reconstruction, MRI safety.

UNIT IV   9

MATHEMATICS OF IMAGE FORMATION AND IMAGE PROCESSING

Concept of object and image, general image processing problem, discrete fourier representation and models for imaging, image restoration, image sampling, perception of moving images.

UNIT V   9
COMPUTER REQUIREMENT FOR IMAGING SYSTEM
Single / multi user system, transferring of images, processing speed, display of medical images, 3-D image display and its clinical applications.

L = 45 TOTAL: 45 PERIODS

TEXT BOOK
1. Steve Webb, "The physics of medical imaging", Adam Hilger, Bristol, England, Philadelphia, USA, 1988.

BBM061	BIOSTATISTICS	L	T	P	C
		3	0	0	3

OBJECTIVE
To learn about Handling univariate and bivariate data – Measures of central tendency. Probability concepts – conditional probability – Baye's theorem.Chi-square test for goodness of fit, independence of attributes. Small sample tests based on t and F distribution - Test for, single mean, difference between means, Paired t-test, test

COURSE OUTCOMES

CO01-Tolearn about Handling univariate and bivariate data – Measures of central tendency
CO02 – To clear view Probability concepts – conditional probability – Baye's theorem
CO03 – To learn about Chi-square test for goodness of fit, independence of attributes.
CO04 –To clear view Small sample tests based on t and F distribution - Test for, single mean, difference between means, Paired t-test, test
CO05- To learn about Introduction – Process control – control charts for variables - X and R,

CO/PO Mapping
S – Strong, M – Medium, W – Weak

COs	Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M			S						
CO2	S		S				M					
CO3		M				S			S			
CO4		M		S							S	`
CO5			M		S			M		S		

COURSE ASSESSMENT METHODS:

	Direct		Indirect
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents

UNIT I - INTRODUCTION TO BIO-STATISTICS (numerical problems only)   9
Handling univariate and bivariate data – Measures of central tendency – Measures of
dispersion –Skewness &
Kurtosis – Correlation and Regression .

UNIT II – PROBABILITY & THEORETICAL DISTRIBUTIONS   9
Probability concepts – conditional probability – Baye's theorem – one – dimensional random
variables – expectation,
variance, moments.
Theoretical distributions : Binomial, Poisson, Normal (Problems only).

UNIT III - TESTING OF HYPOTHESIS   9
Introduction – Large sample tests based on normal distribution - Test for single mean,
difference between means,
proportion, difference between proportion, standard deviation, difference between standard
deviation. Chi-square test
for goodness of fit, independence of attributes.

UNIT IV - ANALYSIS OF VARIANCE   9
Small sample tests based on t and F distribution - Test for, single mean, difference between
means, Paired t-test, test
for equality of variances. ANOVA– one –way classification, Two-way classification.

UNIT V - STATISTICAL QUALITY CONTROL   9
Introduction – Process control – control charts for variables - X and R, X and s charts control
charts for attributes : p chart, np chart, c chart.

                                                    TOTAL: 60 PERIODS
TEXT BOOKS

1. S.C.Gupta & V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi , 2003.
2. W.Ewans & G.Grant, Statistical Methods in Bio informatics – An Introduction.

BBM062   **INTELLECTUAL PROPERTY RIGHTS**   **L T P C**
                                                    3 0 0 3

OBJECTIVES:
1. Introduction to IPR.
2. To know Intellectual Property, General Agreement on Trade and Tariff (GATT) and WIPO mission.
OUTCOMES:
The learner will be able to:
CO01- To learn Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property) of IPR.
CO02- Learn the Industrial Designs and Integrated circuits of IP patents.
Protection of Geographical Indications at national and International levels.
CO03- To learn International convention relating to Intellectual Property and Establishment of WIPO.
CO04- To learn Indian Position , WTO,their difference and Strategies and Indian IPR legislations.
CO05- Case Studies on Patents.
<div align="center">

CO/PO Mapping
S – Strong, M – Medium, W – Weak
</div>

Cos	Programme Outcomes (Pos)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		M			S			M			S
CO2				S			M			M		
CO3		M			M	S		S	M			
CO4			M								S	M
CO5	S		M		M	M				M		

Course Assessment Methods:

Direct		Indirect	
1	Internal Tests	1	Course and Survey
2	Assignments	2	Faculty Survey
3	Seminar	3	Industry
4	Quiz	4	Alumni
5	Online test		
6	End Semester Examinations		

Course Contents

UNIT I
Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property).

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL : 45 PERIODS

TEXT BOOK
1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.
REFERENCES
1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].