



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
B.Tech –Bio Medical Instrumentation Engineering (Full Time)
Curriculum and Syllabus
2018 Regulation

I SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BEN18001	Technical English - I	Ty	1	0/0	2/0	2
2	BMA18001	Mathematics - I	Ty	3	1/0	0/0	4
3	BPH18001	Engineering Physics - I	Ty	2	0/1	0/0	3
4	BCH18001	Engineering Chemistry - I	Ty	2	0/1	0/0	3
5	BES18001	Basic Electrical and Electronics Engineering	Ty	2	0/1	0/0	3
6	BES18002	Basic Mechanical and Civil Engineering	Ty	2	0/1	0/0	3
PRACTICALS*							
1	BES18L01	Basic Engineering Workshop	Lb	0	0/0	2/0	1
2	BES18ET1	Orientation to Entrepreneurship and Project Lab	ETL	0	0/0	2/0	1

Credits Sub Total: 20

II SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BMA18003	Mathematics – II	Ty	3	1/0	0/0	4
2	BPH18002	Engineering Physics –II	Ty	2	0/1	0/0	3
3	BCH18002	Engineering Chemistry – II	Ty	2	0/1	0/0	3
4	BES18003	Environmental Science*	Ty	NON CREDIT COURSE			
PRACTICALS*							
1	BEN18ET1	Communication Lab	ETL	1	0/0	2/0	1
2	BES18ET2	Basic Engineering Graphics	ETL	1	0/0	2/0	2
3	BES18L02	Integrated Physical Science Lab	Lb	0	0/0	2/0	1
4	BES18ET3	C Programming And Lab	ETL	1	0/0	2/0	2

Credits Sub Total: 16

TOTAL CREDITS: 36

C: Credits L: Lecture T: Tutorial S.Lr: Supervised Learning P: Problem / Practical R: Research
Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab * Internal Evaluation



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18001	Human Anatomy and Physiology	Ty	3	1/0	0/0	4
2	BEI18002	Circuit Theory	Ty	3	1/0	0/0	4
3	BEE18003	Electromagnetic Field Theory	Ty	3	0/0	0/0	3
4	BBI18002	Medical Physics	Ty	3	0/0	0/0	3
5	BEC18I06	Analog and Digital ICs	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BBI18L01	Human Anatomy and Physiology Lab	Lb	0	0/0	3/0	1
2	BEI18L02	Electric Circuits Lab	Lb	0	0/0	3/0	1
3	BEC18IL4	Analog and Digital ICs Lab	Lb	0	0/0	3/0	1

Credits Sub Total: 20

IV SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BMA18011	Numerical Methods for Electrical Engineers	Ty	3	1/0	0/0	4
2	BEI18005	Transducer Engineering	Ty	3	1/0	0/0	4
3	BBI18003	Pathology and Microbiology	Ty	3	0/0	0/0	3
4	BBT18I02	Bio-Chemistry	Ty	3	0/0	0/0	3
5	BHS18NC1 / BHS18NC2	The Indian Constitution*/ The Indian Traditional Knowledge*	Ty	2	0/0	0/0	NC
PRACTICALS*							
1	BBI18ET1	Advancement in Electronics *	ETL	1	0/1	3/0	3
2	BBI18L02	Pathology and Microbiology Lab	Lb	0	0/0	3/0	1
3	BEI18L03	Transducer Lab	Lb	0	0/0	3/0	1
4	BBT18IL2	Bio- Chemistry Lab	Lb	0	0/0	3/0	1
5	BBI18TS1	Technical Skill 1	Lb	0	0/0	3/0	1
6	BEN18SK1	Soft Skill I (Career and Confidence Building)	ETL	0	0/0	3/0	1

Credits Sub Total: 22

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Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab * Internal Evaluation



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V SEMESTER

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18004	Diagnostic and Therapeutic Equipments - I	TY	3	1/0	0/0	4
2	BBI18005	Biomedical Instrumentation	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective I	TY	3	0/0	00	3
4	BXX18OEX	Open Elective 1	TY	3	0/0	00	3
PRACTICALS*							
1	BEI18ET1	Measurements and Instrumentation	ETL	1	0/1	3/0	3
2	BBI18L03	Biomedical Instrumentation Lab	Lb	0	0/0	3/0	1
3	BBI18L04	Diagnostic and Therapeutic Equipments - I Lab	Lb	0	0/0	3/0	1
4	BEI18L05	Microprocessor, Microcontroller and its Applications Lab	Lb	0	0/0	3/0	1
5	BBI18TS2	Technical Skill 2	Lb	0	0/0	3/0	1

Credits Sub Total: 20

VI SEMESTER

S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18006	Diagnostic and Therapeutic Equipments II	Ty	3	1/0	0/0	4
2	BBI18007	Troubleshooting of Biomedical Equipments	Ty	3	1/0	0/0	4
3	BXX18EXX	Elective II	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective 2	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BBI18ET2	Bio-Mechanics	ETL	1	0/1	3/0	3
2	BBI18L05	Troubleshooting of Biomedical Equipments Lab	Lb	0	0/0	3/0	1
3	BBI18L06	Diagnostic and Therapeutic Equipments II Lab	Lb	0	0/0	3/0	1
4	BEN18SK2	Soft Skill II (Qualitative and Quantitative Skills)	ETL	0	0/0	3/0	1
5	BBI18L07	Mini Project/In plant Training/Industrial training	Lb	0	0	3/0	1
6	BBI18TS3	Technical Skill 3	Lb	0	0/0	3/0	1

Credits Sub Total: 22 C: Credits L: Lecture T: Tutorial S. Lr : Supervised Learning P : Problem / Practical R : Research Ty/Lb/ETL: Theory/Lab/Embedded Theory and Lab *Internal evaluation



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VII SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18008	Medical Image Processing	Ty	3	1/0	0/0	4
2	BXX18EXX	Elective III	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective IV	Ty	3	0/0	0/0	3
4	BMG18009	Total Quality Management for Biomedical Engineers	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BBI18ET3	Virtual Instrumentation for Medical Application	ETL	1	0/1	3/0	3
2	BBI18L08	Bio- Signal Acquisition Lab	Lb	0	0/0	3/0	1
3	BBI18L09	Biomedical Image Processing Lab	Lb	0	0/0	3/0	1
4	BBI18L10	Project Phase – I	Lb	0	0/0	3/3	2
5	BHS18FLX	Foreign Language	Lb	0	0/0	3/0	1
6	BXX18OLX	Open Lab	Lb	0	0/0	3/0	1

Credits Sub Total: 22

VIII SEMESTER							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18010	Medical Waste Management	Ty	3	1/0	0/0	4
2	BBI18011	Bioprocess Technology	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective V	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BBI18L11	Project Phase – II	Lb	0	0/0	12/12	8

Credits Sub Total: 18

C: Credits L: Lecture T: Tutorial S.Lr: Supervised Learning P: Problem / Practical R: Research
Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab * Internal Evaluation



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ELECTIVE -I							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18E01	Bio Control System	Ty	3	0/0	0/0	3
2	BBI18E02	Rehabilitation Engineering	Ty	3	0/0	0/0	3
3	BBI18E03	Biomaterials and Implantable Devices	Ty	3	0/0	0/0	3
4	BEI18E05	Embedded System	Ty	3	0/0	0/0	3

ELECTIVE -II							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18E04	Laser and Ultrasonic Application in Medicine	Ty	3	0/0	0/0	3
2	BBI18E05	Computer based Medical Instrumentation	Ty	3	0/0	0/0	3
3	BBI18E06	Biomedical MEMS and Nano Technology	Ty	3	0/0	0/0	3
4	BBI18E07	Computer Networks	Ty	3	0/0	0/0	3

ELECTIVE -III							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18E08	Neuroscience for Biomedical Applications	Ty	3	0/0	0/0	3
2	BBI18E09	Biological Effects of Radiation	Ty	3	0/0	0/0	3
3	BBI18E10	Drug Delivery Systems	Ty	3	0/0	0/0	3
4	BEI18E12	Artificial Intelligence and Expert Systems	Ty	3	0/0	0/0	3



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ELECTIVE –IV							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18E11	Medical Informatics	Ty	3	0/0	0/0	3
2	BEI18E16	Principles of Robotics	Ty	3	0/0	0/0	3
3	BBI18E12	Biomedical Signal processing	Ty	3	0/0	0/0	3
4	BBI18E13	Bio-Materials and Artificial Organs	Ty	3	0/0	0/0	3
ELECTIVE –V							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BBI18E14	Recent Advances Applied to Hospital Engineering	Ty	3	0/0	0/0	3
2	BBI18E15	Hospital Management	Ty	3	0/0	0/0	3
3	BBI18E16	System Theory Applied to Biomedical Engineering	Ty	3	0/0	0/0	3
4	BBI18E17	Special Transducer and Instrumentation	Ty	3	0/0	0/0	3

CREDIT SUMMARY

Semester: 1 : 20 Credits
Semester: 2 : 16 Credits
Semester: 3 : 20 Credits
Semester: 4 : 22 Credits
Semester: 5 : 20 Credits
Semester: 6 : 22 Credits
Semester: 7 : 22 Credits
Semester: 8 : 18 Credits
TOTAL CREDITS - 160



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OPEN ELECTIVE							
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BEE18OE1	Electrical Safety for Engineers	Ty	3	0/0	0/0	3
2	BEE18OE2	Energy Conservation Techniques	Ty	3	0/0	0/0	3
3	BEE18OE3	Electric Vehicle Technology	Ty	3	0/0	0/0	3
4	BEE18OE4	Biomedical Instrumentation	Ty	3	0/0	0/0	3
5	BEE18OE5	Introduction to Power Electronics	Ty	3	0/0	0/0	3
6	BEE18OE6	Industrial Instrumentation	Ty	3	0/0	0/0	3
7	BEE18OE7	Solar Energy Conversion System	Ty	3	0/0	0/0	3
8	BEE18OE8	Wind Energy Conversion System	Ty	3	0/0	0/0	3
9	BEE18OE9	Energy Storage Technology	Ty	3	0/0	0/0	3
OPEN LAB							
1	BEE18OL1	Transducer LAB	Lb	0	0/0	3/0	1
2	BEE18OL2	PLC and SCADA LAB	Lb	0	0/0	3/0	1
3	BEE18OL3	Electrical Maintenance LAB	Lb	0	0/0	3/0	1
4	BEE18OL4	Power Electronics LAB	Lb	0	0/0	3/0	1
5	BEE18OL5	Bio Medical Instrumentation LAB	Lb	0	0/0	3/0	1



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF ENGLISH

Subject Code: BEN18001	Subject Name : TECHNICAL ENGLISH - I	Ty/Lb/ETL	L	T/SLr	P/R	C
	Prerequisite : None	Ty	1	0/0	2/0	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Use appropriate vocabulary and structure in academic communication
- Use structural and functional grammar in academic writings.
- Give instructions, suggestions and recommendations.
- Interpret Charts, diagrams, advertisements, etc
- Take notes, summarize and make power point presentations.

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course would be able to

CO1	Use appropriate vocabulary and structure in academic communication
CO2	Use structural and functional grammar in academic writings.
CO3	Give instructions, suggestions and recommendations.
CO4	Interpret Charts, diagrams, advertisements, etc
CO5	Take notes, summarize and make power point presentations.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										H		
CO2										H		
CO3										H		
CO4										H		
CO5										H		

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives		Open Electives	Practical / Project	Internship	Soft Skills
			✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEN18001 **TECHNICAL ENGLISH - I** **1 0/0 2/0 2**

UNIT I VOCABULARY BUILDING 6

The concept of Word Formation-Root words and affixes from foreign languages and their use in English to form derivatives.-Homophones- Words often confused-Verbal analogy

UNIT II BASIC WRITING SKILLS 6

Using Idioms and phrases in sentences-Sentence structures: statements, interrogative and imperative-Use of Conditional/if clauses in sentences-Importance of proper punctuation-Creating coherence with sentence markers-Organizing coherent paragraphs in essays

UNIT III IDENTIFYING COMMON ERRORS IN WRITING 6

Subject-verb agreement-Noun-pronoun agreement- Misplaced modifiers-Articles-Prepositions-Redundancies and Clichés

UNIT IV WRITING PRACTICE- NATURE AND STYLE OF TECHNICAL WRITING 6

Describing Gadgets- Defining Concepts-Classifying data-Comprehension-Essay Writing-Informal and Formal Letter Writing:

UNIT V ORAL COMMUNICATION AND INTERACTIVE LEARNING 6

(This unit involves interactive practice sessions in Language Lab)

Activities to develop knowledge in Word formation, Vocabulary and analytical thinking-Instructions and –Recommendations-Formal and Informal Registers in Speech-Listening and taking notes

Total No of Periods: 30

TEXT BOOK :

Quest : A Textbook of Communication Skills, Vijay Nicole, 2017.
Pushkala, R, Padmasani Kannan S, Anuradha V, Chandrasena M Rajeswaran

SUGGESTED READINGS:

- (i) Practical English Usage. Michael Swan. OUP. 1995.
- (ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
- (iii) On Writing Well. William Zinsser. Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (v) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
- (vi) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (vi) Pronunciation in Use, Mark Hancock. Cambridge University Press. 2012



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF MATHEMATICS

Subject Code: BMA18001	Subject Name :MATHEMATICS – I	Ty/L b/ET L	L	T/SL r	P/R	C
	Prerequisite: None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Apply the Basic concepts in Algebra
- Use the Basic concepts in Matrices
- Identify and solve problems in Trigonometry
- Understand the Basic concepts in Differentiation
- Apply the Basic concepts in Functions of Several variables

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Find the summation of the given series of binomial, exponential & logarithmic
CO2	Transform a non – diagonal matrix into an equivalent diagonal matrix using orthogonal transformation.
CO3	Find expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts.
CO4	Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function.
CO5	Evaluate the partial / total differentiation and maxima / minima of a function of several variables.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			M	M			H	H		H
CO2	H	H			H	L						H
CO3	H	H			M				M	H		L
CO4	H	H			L				M	H		M
CO5	H	H				M			M	M		H

H/M/L indicates strength of correlation H – High, M – Medium, L – Low



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMA18001

MATHEMATICS – I

3 1/0 0/0 4

UNIT I ALGEBRA

12

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

UNIT II MATRICES

12

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem(without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

UNIT III TRIGONOMETRY

12

Expansions of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$ and $\cos\theta$ – Expansion of $\tan n\theta$ – Expansions of $\sin^n\theta$ and $\cos^n\theta$ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

UNIT IV DIFFERENTIATION

12

Basic concepts of Differentiation – Elementary differentiation methods – Parametric functions – Implicit function – Leibnitz theorem(without proof) – Maxima and Minima – Points of inflection.

UNIT V FUNCTIONS OF SEVERAL VARIABLES

12

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

Total No of Periods: 60

TEXT BOOKS:

1. Kreyszig E., Advanced Engineering Mathematics (10th ed.), John Wiley & Sons, (2011).
2. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).

REFERENCE BOOKS:

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).
2. John Bird, Basic Engineering Mathematics (5th ed.), Elsevier Ltd, (2010).
3. P.Kandasamy, K.Thilagavathy and K. Gunavathy, Engineering Mathematics Vol. I (4th Revised ed.), S.Chand & Co., Publishers, New Delhi (2000).
4. John Bird, Higher Engineering Mathematics (5th ed.), Elsevier Ltd, (2006).



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF PHYSICS

Subject Code: BPH18001	Subject Name :ENGINEERING PHYSICS - I	TY/ Lb/ ETL	L	T/S Lr	P/R	C
	Prerequisite : None	Ty	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Outline the relation between Science, Engineering & Technology.
- Demonstrate competency in understanding basic concepts.
- Apply fundamental laws of Physics in Engineering & Technology.
- To identify & solve problems using physics concepts.
- Produce and present activities associated with the course through effective technical communication

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing this course were able to

CO1	Demonstrate competency in understanding basic concepts.
CO2	Utilize scientific methods for formal investigations & demonstrate competency with experimental methods and verify the concept to content knowledge.
CO3	Identify and provide solutions for engineering problems.
CO4	Relate the technical concepts to day to day life and to practical situations.
CO5	Think analytically to interpret concepts.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H		M	M	M						
CO2	H	H	M	M	M	M			M	M		
CO3	H	H	H	M	M	M				M		M
CO4	H	H	M	M		M			M	M		M
CO5	H	H	M			M		M				L

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BPH18001

ENGINEERING PHYSICS - I

2 0/1 0/0. 3

UNIT I MECHANICS & PROPERTIES OF MATTER 9

Mechanics : Introduction- scalar and vector quantities - rigid body - moment of inertia - forces in nature - Newton's laws of motion - derivation of Newton's second law of motion - motion of rocket – dynamical concepts - kinematics - conservation of energy and momentum - conservative and non-conservative forces - mechanics of continuous media - friction and its applications.

Properties of Matter: Elasticity - stress, strain and Hook's law - Poisson's ratio - three moduli of elasticity - twisting couple on a wire - viscosity - flow of liquid through a narrow tube: Poiseuille's law - Ostwald's viscometer - flow of blood in human body.

UNIT II SHM AND ACOUSTICS 9

SHM: Simple harmonic motion - differential equation of SHM - graphical representation of SHM - average kinetic energy of vibration - total energy of vibration - free and forced vibrations - damped and undamped vibrations - resonance - transverse wave on a string - law of transverse vibration of string - verification of the laws of transverse vibration of string - standing waves.

Acoustics : Fundamentals of acoustics - reverberation- reverberation time - factors affecting acoustics
Ultrasonics - Production of ultrasonic waves - detection of ultrasonic waves - acoustic grating - application of ultrasonic waves.

UNIT III WAVE OPTICS 9

Huygen's principle - interference of light - wavefront splitting and amplitude - airwedge - Newton's rings - Michelson interferometer and its applications - Fraunhofer diffraction from a single slit - Rayleigh criterion for limit of resolution - diffraction grating and resolving power of a telescope.

UNIT IV ELECTROMAGNETIC THEORY 9

Electric field - coulomb's law - alternating emf - rms and average value of an alternating current & voltage - resistors, capacitors and inductor - energy stored in a capacitor - LCR circuit & resonance – magnetism- definition - types - Biot Savart law - energy stored in a magnetic field - Domain theory - electromagnetic induction - self and mutual inductance - Faraday's law of electromagnetic induction - Lenz law.

UNIT V LASER 9

Laser principle and characteristics - amplification of light by population inversion - properties of laser beams: mono-chromaticity, coherence, directionality and brightness - different types of lasers - Ruby laser-Nd-YAG laser-He-Ne laser-CO₂ laser - semiconductor laser - applications of lasers in science, engineering and medicine.

Total No of Periods : 45

TEXT BOOKS :

1. Brijlal, M. N. Avadhanulu & N. Subrahmanyam, Text Book of Optics, S. Chand Publications, 25th edition, 2012
2. R. Murugesan, Electricity and Magnetism, S.Chand Publications, 10th edition, 2017
3. R. Murugesan & Kiruthiga Sivaprasath, Modern Physics, S.Chand Publications, 2016

REFERENCE BOOKS:

1. Dr. Senthil Kumar Engineering Physics I VRB Publishers, 2016
2. N Subrahmanyam & Brijlal, Waves and Oscillations, Vikas Publications, New Delhi, 1988
3. N Subrahmanyam & Brijlal, Properties of Matter, S. Chand Co., New Delhi, 1982
4. N Subrahmanyam & Brijlal, Text book of Optics, S. Chand Co., New Delhi, 1989
5. R. Murugesan, Electricity and Magnetism, S. Chand & Co., New Delhi, 1995
6. Thygarajan K & Ajay Ghatak, Laser Theory and Applications, Macmillan, New Delhi, 1981



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF CHEMISTRY

Subject Code: BCH18001	Subject Name :ENGINEERING CHEMISTRY – I	Ty/ Lb/ ETL	L	T/S Lr	P/R	C
	Prerequisite : None	Ty	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Providing an insight into basic concepts of chemical thermodynamics.
- To create awareness about the water quality parameters, water analysis and softening of water from industrial perspective.
- Imparting fundamentals of emf, storage and fuel cells.
- Creating awareness about corrosion and its control methods.
- Introducing modern materials such as composites along with basic concepts of polymer chemistry and plastics.

COURSE OUTCOMES (Cos) : (1– 5)

CO1	Gain a clear understanding of the basics of chemical thermodynamics which include concepts such as Enthalpy, Entropy and Free energy.
CO2	Obtain an overall idea of Water quality parameters, Boiler requirements, problems, Water softening and Domestic Water treatment.
CO3	Improving the basic knowledge in electrical conductance and emf and also understand the chemical principles of storage devices.
CO4	Observe the information about corrosion and understand the mechanisms of corrosion and the methods of corrosion control.
CO5	Articulate the science of polymers and composites.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H										M
CO2	H	H	M	H		H	H					M
CO3	H	M	H				L					L
CO4	H		L	H								L
CO5	H											M

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
	√								



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BCH18001

ENGINEERING CHEMISTRY – I

2 0/1 0/0 3

UNIT I CHEMICAL THERMODYNAMICS 8

Introduction, Terminology in thermodynamics –System, Surrounding, State and Path functions, Extensive and intensive properties. Laws of thermodynamics – I and II laws-Need for the II law. Enthalpy, Entropy, Gibbs free energy, Helmholtz free energy - Spontaneity and its criteria. Maxwell relations, Gibbs - Helmholtz equation (relating E & A) and (relating H & G), Van't Hoff equations.

UNIT II TECHNOLOGY OF WATER 9

Water quality parameters – Definition and expression. Analysis of water – alkalinity, hardness and its determination (EDTA method only). Boiler feed water and Boiler troubles-Scales and sludges, Caustic embrittlement, Priming and Foaming and Boiler corrosion. Water softening processes – Internal and external conditioning – Lime soda, Zeolite, Demineralisation methods. Desalination processes-RO and Electrodialysis .Domestic water treatment.

UNIT III ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES 10

Conductance – Types of conductance and its Measurement. Electrochemical cells – Electrodes and electrode potential, Nernst equation – EMF measurement and its applications. Types of electrodes-Reference Books electrodes-Standard hydrogen electrode- Saturated calomel electrode-Quinhydrone electrode – Determination of p^H using these electrodes. Reversible and irreversible cells– Fuel cells- H_2 - O_2 fuel cell, Batteries-Lead storage battery,Nickel– Cadmium and Lithium-Battery.

UNIT IV CORROSION AND PROTECTIVE COATING 9

Introduction–Causes of Corrosion–Consequences- Factors affecting corrosion. Theories of corrosion-Chemical corrosion and Electrochemical corrosion. Methods of corrosion control – corrosion inhibitors, Sacrificial anode and Impressed current cathodic protection.

Protective coatings- Metallic coatings- Chemical conversion coatings-paints-Constituents and functions.

UNIT V POLYMERS AND COMPOSITES 9

Monomers – Functionality – Degree of polymerization-Tacticity.Polymers – Classification, Conducting Polymers,Biodegradable polymers- Properties and applications.Plastics – Thermoplastics and thermosetting plastics,Compounding of plastics – Compression moulding, injection moulding and extrusion processes. Polymer composites-introduction-Types of composites-particle reinforced-fiber reinforced-structural composites-examples. Matrix materials, reinforcement materials-Kevlar, Polyamides, fiber glass, carbon fibers, ceramics and metals .

Total No of Periods: 45

TEXTBOOKS:

1. P.Udhayakala., S.Dinakar&L.Sankar., “Chemistry for Engineers”, Charulatha Publications(2018).
2. C.SreekuttanUnnithan, “Applied Chemistry”, Sreelakshmi Publications, (2007).
3. Dr.R.Sivakumar, Dr.R.Jayaprakasam and Dr.N.Sivakumar, “Engineering Chemistry – I & II”, Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

REFERENCE BOOKS:

1. P.C. Jain & Monika Jain, “Engineering Chemistry”, Dhanpat Rai publishing Co., (Ltd.) (2013).
2. J. C. Kuriacose& J. Rajaram, “Chemistry in Engineering & Technology”, Tata Mc Graw Hill (1996).
3. B.R.Puri, L.R.Sharma&M.S.Pathania, “Principles of Physical Chemistry”, Vishal publishing co., (2013).



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code: BES18001	Subject Name :BASIC ELECTRICAL AND ELECTRONICS ENGINEERING						Ty/ Lb/ ETL	L	T/S Lr	P/R	C	
	Prerequisite : None						Ty	2	0/1	0/0	3	
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : - Understand the concepts of circuit elements, circuit laws and coupled circuits. - Acquire knowledge on conventional &non conventional energy production. - Gain information on measurement of electrical parameters. - Identify basic theoretical principles behind the working of modern electronic gadgets. - Demonstrate digital electronic circuits and assemble simple devices.												
COURSE OUTCOMES (Cos) : (3 – 5)												
CO1	Students understand Fundamental laws and theorems and their practical applications											
CO2	Predict the behavior of different electric and magnetic Circuits.											
CO3	Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution.											
CO4	Identify & Apply schematic symbols and understand the working principles of electronic devices											
CO5	Analyze basics of digital electronics and solving problems and design combinational circuits											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H							M	L
CO2	H	H	H	M	M		M				M	
CO3	H	M	H	M	H		M		M			L
CO4	H	M		M			M				M	L
CO5	H	M	H	M	H				M		M	L
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills			



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18001	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	2	0/1	0/0	3
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UNIT I	ELECTRIC CIRCUITS	9
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Electrical Quantities – Ohms Law – Kirchhoff's Law – Series and Parallel Connections – Current Division and Voltage Division Rule - Source Transformation – Wye (Y) – Delta (Δ) , Delta (Δ) – Wye (Y) Transformation – Rectangular to Polar and Polar to Rectangular.

UNIT II MACHINES & MEASURING INSTRUMENTS 9

Construction & Principle of Operation of DC motor & DC Generator – EMF equation of Generator – Torque Equation of Motor – Construction & Principle of operation of a Transformer – PMMC – Moving Iron types of meter – Single Phase Induction Type Energy Meter.

UNIT III BASICS OF POWER SYSTEM 9

Generation of Electric Power (Thermal, Hydro, Wind and Solar) – Transmission & Distribution of Electric Power – Types of Transmission & Distribution Schemes – Representation of Substation.

UNIT IV ELECTRON DEVICES 9

Passive Circuit Components-Classification of Semiconductor-PN Junction Diode-Zener diode-Construction and Working Principle –Applications--BJT-Types of configuration-JFET.

UNIT V DIGITAL SYSTEM 9

Number System – Binary, Decimal, Octal, Hexadecimal – Binary Addition Subtraction, Multiplication & Division– Boolean Algebra – Reduction of Boolean Expressions – Logic Gates - De-Morgan's Theorem , Adder – Subtractor.

Total No of Periods: 45

TEXT BOOKS:

1. D P Kothari, I J Nagrath, Basic Electrical Engineering, Second Edition, , Tata McGraw-Hill Publisher
2. A Course In Electrical And Electronic Measurements And Instrumentation,A.K. Sawhney, publisher DHANPAT RAI&CO
3. Text Book of Electrical Technology: Volume 3: Transmission, Distribution and Utilization,B.L.Theraja, A.K.Theraja, publisher S.CHAND
4. Morris Mano, M. (2002) Digital Logic and Computer Design. Prentice Hall of India
5. Millman and Halkias1991, Electronic Devices and Circuits , Tata McGraw Hill,

REFERENCE BOOKS:

1. R.Muthusubramanian, S.Salivahanan, K A Muraleedharan, Basic Electrical, Electronics And Computer Engineering, Second Edition, ,Tata McGraw-Hill publisher.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Code: BES18002	Subject Name : BASIC MECHANICAL AND CIVIL ENGINEERING	Ty/ Lb/ ETL	L	T/SLr	P/R	C
	Prerequisite : None	Ty	2	0/1	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Learn Basics of Internal Combustion Engines, power plants and boilers
- Demonstrate How metals are formed, joined, using machining operations Lathe, Milling and Drilling machines
- To identify & solve problems in Engineering Mechanics
- Learn basics of Building materials and construction
- Know the basic process of concrete, types of masonry Construction of Roads, Railways, Bridges and Dams

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Demonstrate the working principles of power plants, IC Engines and boilers..
CO2	Utilize the concept of metals forming, joining process and apply in suitable machining process
CO3	Identify and provide solutions for problems in engineering mechanics
CO4	Utilize the concept of Building materials and construction able to perform concrete mix and masonry types
CO5	Demonstrate how Roads, Railways, dams, Bridges have been constructed

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H					M		H	H	H		H
CO2	H				L	M		M	M	M		M
CO3	H	H			L	L		M	M	M		M
CO4	H				L	L			M	M		M
CO5	H				L	L		M	M	M		M

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
		√							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18002 BASIC MECHANICAL AND CIVIL ENGINEERING 2 0/1 0/0 3

UNIT I THERMAL ENGINEERING 9

Classification of internal combustion engine – two stroke, four stroke petrol and diesel engines. Classification of Boilers – Cochran boiler – Locomotive boilers – Power plant classification – Working of Thermal and Nuclear power plant

UNIT II MANUFACTURING PROCESS 13

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing. Casting process – Patterns -Moulding tools - Types of moulding - Preparation of green sand mould -Operation of Cupola furnace.

Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature

UNIT III MECHANICS 9

Stresses and Strains – Definition – Relationship – Elastic modulus – Centre of gravity – Moment of Inertia – Problems. (Simple Problems Only).

UNIT IV BUILDING MATERIALS AND CONSTRUCTION 7

Materials: Brick - Types of Bricks - Test on bricks - Cement – Types, Properties and uses of cement – Steel - Properties and its uses – Ply wood and Plastics.

Construction: Mortar – Ingredients – Uses – Plastering - Types of mortar - Preparation – Uses – Concrete – Types – Grades – Uses – Curing – Introduction to Building Components (foundation to roof) – Masonry – Types of masonry (Bricks & Stones)

UNIT V ROADS, RAILWAYS, BRIDGES & DAMS 7

Roads – Classification of roads – Components in roads – Railways -Components of permanent way and their function – Bridges – Components of bridges – Dams – Purpose of dams – Types of dams.

Total No of Periods : 45

TEXT BOOKS:

1. S. Bhaskar, S. Sellappan, H.N.Sreekanth,, (2002), “Basic Engineering” –Hi-Tech Publications
2. K. Venugopal, V. Prabhu Raja, (2013-14), “Basic Mechanical Engineering”, Anuradha Publications.
3. K.V. Natarajan (2000), Basic Civil Engineering,Dhanalakshmi Publishers
4. S.C. Sharma(2002),Basic Civil Engineering,Dhanpat Raj Publications

REFERENCE BOOKS:

1. PR.SL. Somasundaram, (2002), “Basic Mechanical Engineering” –, Vikas Publications.
2. S.C. Rangawala(2002), Building Material and Construction, S. Chand Publisher



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ENGINEERING SCIENCES

Subject Code: BES18L01	Subject Name : BASIC ENGINEERING WORKSHOP	Ty / Lb/ ETL	L	T/ SL r	P/ R	C
	Prerequisite : None	Lb	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Familiarize the plumbing tools, fittings, carpentry tools, etc.
- Identify basic electrical wiring and measurement of electrical quantities.
- Identify Electronic components ,logic gates and soldering process
- Display simple fabrication techniques
- Execute a project independently and make a working model

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Demonstrate fitting tools and carpentry tools, & Perform the process of Filing, Chipping, Cutting.
CO2	Perform the process of fabrication of tray, cones and funnels, Tee Halving Cross, Lap Joint Martise& Joints
CO3	Demonstrate various types of wirings and other equipments.
CO4	Measure fundamental parameters using the electronic instruments

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	M			L	M			L
CO2	H		H	L	M			L	L			
CO3	H		M	L				L	L			
CO4	H	H	M	L				L	L			M
CO5												

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical /	Internships / Technical Skills	Soft Skills
							✓		



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18L01

BASIC ENGINEERING WORKSHOP

0 0/0 2/0 1.

MEP PRACTICE

1. FITTING :

Study of fitting tools and Equipments – Practicing, filing, chipping and cutting – making V-joints, half round joint, square cutting and dovetail joints.

2. CARPENTRY:

Introduction – Types of wood – Tools – Carpentry processes – Joints – Planning practice – Tee Halving Joint – Cross Lap Joint – Maritse and Tenon Joint – Dovetail Joint

3. SHEET METAL:

Study of tools and equipments – Fabrication of tray, cones and funnels.

CIVIL ENGINEERING PRACTICE

1. Study of Surveying and its equipments
2. Preparation of plumbing line sketches for water supply and sewage lines
3. Basic pipe connection using valves, laps, couplings, unions, reduces and elbows in house hold fittings

ELECTRICAL ENGINEERING PRACTICE

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

ELECTRONIC ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak- peak, rms period, frequency) using CRO
2. Soldering practice – Components Devices and Circuits – Using general purpose P



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ABDUL KALAM COE FOR INNOVATION & ENTREPRENEURSHIP

Subject Code : BES18ET1	Subject Name : ORIENTATION TO ENTREPRENEURSHIP AND PROJECT LAB	Ty / Lb/ ETL	L	T/SL r	P/R	C
	Prerequisite : None	ETL	0	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Understand how entrepreneurship Education transforms individuals into successful leaders.
- Identify individual potential & S have career dreams
- Understand difference between ideas & opportunities
- Identify components & create action plan.
- Use brainstorming in a group to generate ideas.

COURSE OUTCOMES (Cos) : (3 – 5)

CO1	Develop a Business plan & improve ability to recognize business opportunity
CO2	Do a self analysis to build a entrepreneurial career.
CO3	Articulate an effective elevator pitch.
CO4	Analyze the local market environment & demonstrate the ability to find an attractive market
CO5	Identify the required skills for entrepreneurship & develop

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	M	H	M	M	M		M	M	M	L
CO2	H	M		H	M	H	M	H	H	H	M	M
CO3		M	M	M		H		H	H	H		
CO4		H	M	M	M	M		H	M	M	H	
CO5		M	M	H	M	M	H	H	M	M	H	L

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
							✓		



Dr.M.G.R.
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(DEEMED TO BE UNIVERSITY)
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Maduravoyal, Chennai - 600 095



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18ET1 ORIENTATION TO ENTREPRENEURSHIP AND PROJECT LAB 0 0/0 2/0 1

UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR 3

Introduction to entrepreneurship education – Myths about entrepreneurship – How has entrepreneurship changed the country – Dream it. Do it - Idea planes - Some success stories – Global Legends – Identify your own heroes.

UNIT II ENTREPRENEURIAL STYLE 3

Entrepreneurial styles – Introduction, concept & Different types - Barrier to Communication – Body language speaks louder than words

UNIT III DESIGN THINKING 3

Introduction to Design thinking – Myth busters – Design thinking Process - Customer profiling – Wowing your customer – Personal selling – concept & process – show & tell concept – Introduction to the concept of Elevator Pitch

UNIT IV RISK MANAGEMENT 3

Introduction to risk taking & Resilience – Managing risks (Learning from failures, Myth Buster) – Understanding risks through risk takers – Why do I do? – what do I do ?

UNIT V PROJECT 3

How to choose a topic – basic skill sets necessary to take up a project – creating a prototype – Pitch your project – Project presentation.

Total No of Periods : 15

REFERENCE BOOKS & WEBSITE:

1. Encyclopedia of small Business (2011) – (e book)
2. Oxford Handbook of Entrepreneurship (2014) (ebook)
3. lms.learnwise.org



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF MATHEMATICS

Subject Code : BMA18003	Subject Name : MATHEMATICS – II	Ty / Lb/ ETL	L	T/SLr	P/R	C
	Prerequisite : None	Ty	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Understand the Basic concepts in Integration
- Identify the Basic concepts in Multiple integrals
- Use the Basic concepts in Ordinary Differential equations
- Apply the Basic concepts of Analytical Geometry
- Analyze the Basic concepts of Vector Calculus

COURSE OUTCOMES (Cos) : (3 – 5)

CO1	Integrate given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation.
CO2	Evaluate the multiple integrals / area /volume and to change the order of integration.
CO3	Solve the ordinary differential equation and to solve Eulers differential equation.
CO4	Find the equation of planes, lines and sphere and to find the shortest distance between to skew lines.
CO5	Find the gradient, maximum directional derivative and work done by a force and to verify Green/ Stokes/ Gauss divergence theorem

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			M	M			M	M		H
CO2	H	H			M	H			H	H		M
CO3	H	H			M	H			H	H		M
CO4	H	H			L	M			M	H		M
CO5	H	H			M	M			M	H		M

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships /	Soft Skills
	✓								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMA18003

MATHEMATICS – II

3 1/0 0/0 4

UNIT I INTEGRATION

12

Basic concepts of Integration – Methods of Integration– Integration by substitution – Integration by parts – Definite integrals– Properties of definite integrals – Problems on finding Area and Volume using single integrals (simple problems).

UNIT II MULTIPLE INTEGRALS

12

Double integral in Cartesian and Polar Co-ordinates – Change of order of integration – Triple integral in Cartesian Co-ordinates – Spherical Polar Co-ordinates – Change of variables (simple problems).

UNIT III ORDINARY DIFFERENTIAL EQUATIONS

12

First order differential equations – Second and higher order linear differential equations with constant coefficients and with RHS of the form: e^{ax} , x^n , $\sin ax$, $\cos ax$, $e^{ax}f(x)$, $x f(x)$ where $f(x)$ is $\sin bx$ or $\cos bx$ – Differential equations with variable coefficients (Euler's form) (simple problems).

UNIT IV THREE DIMENSIONAL ANALYTICAL GEOMETRY

12

Direction Cosines and Ratios – Equation of a straight line – Angle between two lines – Equation of a plane – Co-planar lines – Shortest distance between skew lines – Sphere – Tangent plane.

UNIT V VECTOR CALCULUS

12

Scalar and Vector functions – Differentiation – Gradient, Divergence and Curl – Directional derivatives – Irrotational and Solenoidal fields– Line, Surface and Volume integrals – Green’s, Stoke’s and Gauss divergence theorems (statement only) – Verification.

Total No of Periods : 60

TEXTBOOKS:

1. Kreyszig E., Advanced Engineering Mathematics (10th ed.), John Wiley & Sons, (2011).
2. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).

REFERENCE BOOKS:

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).
2. John Bird, Basic Engineering Mathematics (5th ed.), Elsevier Ltd, (2010).
3. P.Kandasamy, K.Thilagavathy and K. Gunavathy, Engineering Mathematics Vol. I (4th Revised ed.), S.Chand & Co., Publishers, New Delhi (2000).
4. John Bird, Higher Engineering Mathematics (5th ed.), Elsevier Ltd, (2006).



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF PHYSICS

Subject Code : BPH18002	Subject Name : ENGINEERING PHYSICS –II						Ty / Lb/ ETL	L	T/ SL _r	P/R	C	
	Prerequisite : None						Ty	2	0/1	0/0	3	
L : Lecture T : Tutorial SL _r : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : • Design, conduct experiment and analyze data. • Develop a Scientific attitude at micro and nano scale of materials • Understand the concepts of Modern Physics • Apply the science of materials to Engineering & Technology												
COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to												
CO1	Demonstrate skills necessary for conducting research related to content knowledge and laboratory skills.											
CO2	Apply knowledge and concepts in advanced materials and devices.											
CO3	Acquired Analytical, Mathematical skills for solving engineering problems.											
CO4	Ability to design and conduct experiments as well as function in a multi disciplinary teams.											
CO5	Generate analytical thought to interpret results & place them within a broader context											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	M	M	L				M		L
CO2	H	H		M	M							L
CO3	H	H	H	H	M					M		
CO4	H	H	H	H	M				H	M		L
CO5	H	M	M	M	M	L			M	M		L
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project			Internships /	Soft Skills	
	√											



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
BPH18002 **ENGINEERING PHYSICS - II** **2 0/1 0/0 3**

UNIT I QUANTUM PHYSICS 9

Quantum free electron theory - deBroglie waves - derivation of deBroglie waves - Davisson and Germer experiment - uncertainty principle - electron microscope - scanning electron microscope - physical significance of wave function - Schrodinger wave equation and its applications - Fermi energy- effective mass - phonons - Fermi function-density of states - origin of bandgap in solids - 1D scattering of electrons in periodic potential.

UNIT II SEMICONDUCTORS 9

Introduction - properties of semiconductors - classification of semiconductor - effect of temperature in semiconductor - hole current - carrier concentration in intrinsic semiconductor (electron and hole density) - variation of Fermi energy level and carrier concentration with temperature in an intrinsic semiconductor - carrier transport - diffusion - drift - mobility - Hall effect - determination of Hall coefficient and its applications - diodes.

UNIT III LIGHT SEMICONDUCTOR INTERACTION 9

Types of electronic materials: metals, semiconductors and insulators - qualitative analysis of extrinsic semiconductor & its applications - optical transition in bulk semiconductors: absorption, spontaneous and stimulated emission - exciton and its types - traps and its types - colour centers and its types and importance - luminescence - classifications of luminescence based on excitation - optical loss and gain - Photovoltaic effect - Photovoltaic potential - spectral response - solar energy converters - solar cells.

UNIT IV OPTO ELECTRONIC DEVICES 9

Photodetectors - photoconductors - photodiodes principle, construction, working and characteristics - Phototransistors - Laser diodes - LED theory, construction and working - seven segment display, advantages of LED - LCD theory, construction and working.

UNIT V ENGINEERED MATERIALS 9

Classification of engineered materials - nano phase materials - its synthesis and properties - shape memory alloys and its applications - biomaterials - non linear materials - metallic glasses - metamaterials - homo and hetero junction semiconductors - semiconducting materials for optoelectronic devices - quantum wells, wires and dots.

Total No of Periods: 45

TEXT BOOKS :

1. P.K. Palanisamy, Semiconductor Physics and Optoelectronics, Scitech Publications, 2010
2. Jyoti Prasad Bandyopadhyay, Semiconductor Devices, S. Chand Publications, 2014
3. Charles Kittel, Introduction to Solid State Physics, Wiley Publications, 2012

REFERENCE BOOKS:

1. S. Shubhashree, S. Bharathi Devi & S. ChellammalMadhusudanan, Engineering Physics, Sree Lakshmi Publications, 2004
2. G. Senthil Kumar, N. Iyandurai, & G. Vijayakumar, Material Science, VRB Publishers, 2017
3. R.Murugeshan&Kiruthigasivaprakash, Modern Physics, 14th edition, S. Chand & Co, 2008
4. Pallab Bhattacharya, Semiconductor optoelectronic devices, second edition, Pearson Education, 2003



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF CHEMISTRY

Subject Code : BCH18002	Subject Name: ENGINEERING CHEMISTRY – II						Ty / Lb/ ETL	L	T/SLr	P/R	C	
	Prerequisite : None						Ty	2	0/1	0/0	3	
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : • Imparting the basic concepts of phase rule and apply the same to one and two component systems. • Introducing the chemistry of engineering materials such as cement, lubricants,abrasives, refractories, alloys and nano materials. • To impart a sound knowledge on the principles of chemistry involving different application-oriented topics • Introducing salient features of fuels and combustion. • To give an overview on modern analytical techniques												
COURSE OUTCOMES (Cos) : (1 – 5)												
CO1	Understand the science of phase equilibria and apply the phase rule to different systems.											
CO2	Gain an overview of Engineering Materials such as Lime, Cement, Lubricants, Abrasives, Refractories,Alloys and Nanomaterials.											
CO3	Recognize the essential information about consumer products such as Soaps and Detergents,also gaining the basic knowledge about Explosives and Propellants.											
CO4	Discover the fuel Chemistry and Combustion process.											
CO5	Inferring few important Analytical Techniques and their applications.											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											L
CO2	H		H			L	H					L
CO3	H					H						L
CO4	H	M	H	H			H					M
CO5	H				M							H
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills			
	√											



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
BCH18002 **ENGINEERING CHEMISTRY – II** **2 0/1 0/0 3**

UNIT I PHASE EQUILIBRIA 8

Introduction – Definition of terms involved in phase rule. Derivation of Gibbs phase rule – Applications to one component system – water system. Binary system – Eutectic system – Pb – Ag system, Bi – Cd system. Thermal analysis – Cooling curves

UNIT II MATERIAL CHEMISTRY 10

Cement – Manufacture, Chemistry of setting and hardening. Lubricants – Requirements of good lubricants, Mechanism, Properties of lubricants, Classification – Examples. Abrasives–Classification –Moh’s scale–Hard and soft abrasives, Preparation of artificial abrasives (silicon carbide, boron carbide), Applications of abrasives. Refractories – Classification, Properties–Refractoriness, RUL, Porosity, Thermal spalling Alloys Classification of alloys – Purpose of making alloys - Ferrous and non-Ferrous alloys - Heat treatment Nano materials – properties, carbon nano tubes – properties, fabrication – carbon arc method, laser vapourization method

UNIT III APPLIED CHEMISTRY 9

Soaps and detergents : Soaps – Saponification of oils and fats, manufacture of soaps, classification of soap – soft soap, medicated soap, herbal soap, shaving soap and creams.

Detergents – Anionic detergents – manufacture and applications, Comparison of soaps and detergents.

Rocket propellants and explosives: Rocket propellants – characteristics, solid and liquid propellants – examples. Explosives- Introduction, characteristics, classification, Oxygen balance, preparation, properties and uses of detonators, low explosives and high explosives, Dynamites, Gun cotton, Cordite.

Food adulterants- Common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages, Contamination with toxic chemicals – pesticides and insecticides.

UNIT IV FUELS & COMBUSTION 9

Introduction to Fuels – classification – Calorific value – GCV, LCV. Solid Fuels–Coal–Proximate Analysis, Metallurgical Coke–Manufacture of Metallurgical Coke – Liquid Fuel–Refining of Petrol, Synthetic Petrol–Manufacturing Process–Hydrogenation of Coal, Polymerization, Cracking–Knocking–Octane Number–Leaded Petrol (or) Anti–knocking – Cetane Number–Ignition Lag–Gaseous fuels–CNG–LPG–Water Gas, Producer gas–Biogas- Combustion– Flue Gas analysis– Orsat’s method.

UNIT V ANALYTICAL AND CHARACTERIZATION TECHNIQUES 9

Electron microscopes: Scanning electron microscope & Transmission electron microscope, instrumentation and applications Absorption and Emission Spectrum - Beer - Lambert’s law. Visible and UV Spectroscopy – instrumentation – Block diagram - working. IR Spectroscopy – instrumentation - Block diagram – molecular vibrations – stretching and bending – H₂O, CO₂. –Characterization of some important organic functional groups. Chromatographic techniques – column, thin layer and paper.

Total No of Periods : 45

TEXTBOOKS :

1. P.Udhayakala., S.Dinakar&L.Sankar., “Chemistry for Engineers”. Charulatha Publications (2018).
2. Dr.R.Sivakumar and Dr.N.Sivakumar” Engineering Chemistry” Tata McGraw Hill Publishing Company Ltd, Reprint 2013.
3. C. S.Unnithan, T. Jayachandran& P. Udhayakala, “Industrial Chemistry”, Sreelakshmi Publications (2009).

REFERENCE BOOKS:

1. P.C. Jain & Monika Jain, “Engineering Chemistry”, DhanpatRai publishing Co., (Ltd.) (2013).
2. B. R. Puri ,L.R. Sharma &M.S.Pathania, “Principles of Physical Chemistry”, Vishal publishing co., (2013).



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF ENGINEERING SCIENCES

Subject Code : BES18003	Subject Name : ENVIRONMENTAL SCIENCE (Non- Credited)						Ty / Lb/ ETL	L	T/S Lr	P/R	C	
	Prerequisite : None						Ty	-	-	-	-	
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : - To acquire knowledge of the Environment and Ecosystem & Biodiversity - To acquire knowledge of the different types of Environmental pollution - To know more about Natural Resources - To gain understanding of social issues and the Environment - To attain familiarity of human population and Environment												
COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to												
CO1	To known about Environment and Ecosystem & Biodiversity											
CO2	To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest, water, and food resources											
CO3	To discover water conservation and watershed management											
CO4	To identify its problems and concerns climate change, global warming, acid rain, ozone layer depletion etc.,											
CO5	To explain family welfare programmes and role of information technology in human health and environment											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO 4	PO 5	PO 6	PO7	PO8	PO 9	PO1 0	PO1 1	PO1 2
CO1						M	H	M				M
CO2						M	H			M		M
CO3						M	H	M				M
CO4						M	H	M		M		M
CO5						M	H			M		M
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills			
			√									



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
BES18003
ENVIRONMENTAL SCIENCE

UNIT I ENVIRONMENT AND ECOSYSTEM

Definition, Scope and Importance of environment – need for public awareness – concept, structure and function of an ecosystem - producers, consumers and decomposers – energy flow in the ecosystem. Biodiversity at national and local levels – India

UNIT II ENVIRONMENT POLLUTION

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards (g) E-Wastes and causes, effects and control measures

UNIT III NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns climate change, global warming, acid rain, ozone layer depletion, nuclear accidents ,central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion, environment and human health – human rights – value education – HIV/AIDS – women and child welfare – role of information technology in environment and human health

TEXT BOOKS:

1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGrawHill,NewDelhi, (2006).

REFERENCE BOOKS:

1. Vairamani, S. and Dr. K. Sankaran. **Elements of Environmental and Health Science**.Karaikudi: KPSV Publications, 5th Edition, July, 2013.
2. Ifthikarudeen, Etal, **Environmental Studies**, Sooraj Publications,2005.
3. R.Murugesan, **Environmental Studies**, Millennium Publishers and Distributors, 2nd Edition, July, 2009.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF ENGLISH

Subject Code: BEN18ET1	Subject Name :COMMUNICATION LAB						Ty / Lb/ ETL	L	T/S Lr	P/R	C	
	Prerequisite : None						ETL	1	0/0	2/0	1	
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : The student should be able to • Use appropriate vocabulary and structure for effective interpersonal and academic communication. • Interpret charts, diagrams, advertisements, etc.. • Participate in group discussions and present projects effectively. • Present projects and ideas effectively • Attend interviews												
COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to												
CO1	Use appropriate vocabulary and structure for effective interpersonal and academic communication											
CO2	Interpret charts, diagrams, advertisements, etc.											
CO3	Participate in group discussions and present projects effectively											
CO4	Present projects and ideas effectively											
CO5	Attend interviews											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										H		
CO2										H		
CO3										H		
CO4										H		
CO5										H		
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills			
			√									



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BET18ET1 **COMMUNICATION LAB** **1 0/0 2/0 1**

UNIT I **6**

Listening and Speaking- Informal and Formal Contexts

UNIT II **6**

Interpretation of charts / Diagrams – Group Discussion

UNIT III **6**

Compeering -Anchoring -Group Discussion

UNIT IV **8**

Formal Presentation -Power point presentation of charts/ Diagrams

UNIT V **4**

Interview

Total No of Periods :30

SUGGESTED READINGS:

- (i) *Practical English Usage*. Michael Swan. OUP. 1995.
- (ii) *Remedial English Grammar*. F.T. Wood. Macmillan.2007
- (iii) *Study Writing*. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- (iv) *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
- (v) *Exercises in Spoken English*. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- (vi) *Pronunciation in Use* ,Mark Hancock. Cambridge University Press. 2012



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Code: BES18ET2	Subject Name : BASIC ENGINEERING GRAPHICS	Ty / Lb/ ETL	L	T/SLr	P/R	C
	Prerequisite : None	ETL	1	0/0	2/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :

- Learn to know what kind of pencils to be used to sketch lines, numbers, Letters and Dimensioning in drawing sheet.
- Draw Projection of points, line, planes and solids using Drafters
- To identify the angle of projection and development of surfaces, isometric projection and Orthographic projection
- Know the basics of elevation and plan of building.
- Learn the basics of Drafting using AutoCAD Software

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards
CO2	Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in engineering applications.
CO3	Identify basic sketching techniques of engineering equipments
CO4	Demonstrate the projections of Points, Lines, Planes and Solids.
CO5	Draw the sectional view of simple buildings and utilize Auto CAD Software.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	M	M	M			H	H		H
CO2	H	H	H	M	M	M			H	H		H
CO3	H	H	H	L		M			M	M		M
CO4	H	H	M	M		H		M	H	H		H
CO5	H	H	H	M	H	L		M	H	H		H

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
							✓		



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18ET2

BASIC ENGINEERING GRAPHICS

1 0/0 2/0 2

CONCEPTS AND CONVENTIONS (Not for examination)

3

Introduction to drawing, importance and areas of applications – BIS standards – IS: 10711 – 2001 : Technical products Documentation – Size and layout of drawing sheets – IS 9606 – 2001: Technical products Documentation – Lettering – IS 10714 & SP 46 – 2003: Dimensioning of Technical Drawings – IS : 15021 – 2001 : Technical drawings – Projections Methods – drawing Instruments, Lettering Practice – Line types and dimensioning – Border lines, lines title blocks Construction of polygons – conic sections – Ellipse, Parabola, Hyperbola and cycloids.

UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES

6

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – projection of polygonal surface and circular lamina in simple position only.

UNIT II PROJECTION OF SOLIDS

6

Projection of simple solids like prism, pyramid, cylinder and cone in simple position
Sectioning of above solids in simple vertical position by cutting plane inclined to one Reference Books plane and perpendicular to the other.

UNIT III DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTION

6

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders, and cones.
Principles of isometric projection – isometric scale – isometric projections of simple solids, like prisms pyramids, cylinders and cones.

UNIT IV ORTHOGRAPHIC PROJECTIONS

6

Orthographic projection of simple machine parts – missing views

BUILDING DRAWING

Building components – front, Top and sectional view of a security shed.

UNIT V COMPUTER AIDED DRAFTING

3

Introduction to CAD – Advantages of CAD – Practice of basic commands – Creation of simple components drawing using CAD software.

Total No of Periods :30

Note:First angle projection to be followed.

TEXT BOOKS:

1. Bhatt, N.D. and Panchal, V.M. (2014) Engineering Drawing Charotar Publishing House
2. Gopalakrishnan, K.R. (2014) Engineering Drawing (Vol.I& II Combined) Subhas Stores, Bangalore.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BES18L02	Subject Name : INTEGRATED PHYSICAL SCIENCE LAB					Ty / Lb/ ETL	L	T/SL r	P/R	C		
	Prerequisite : None					Lb	0	0/0	2/0	1		
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : • Demonstrate the ability to make physical measurements & understand the limits of precision in measurements. • Display the ability to measure properties of variety of electrical, mechanical, optical systems. • To help learners measure conductivity and EMF using electrical equipment. • To understand the analytical skills through chromatography &viscometry • To familiarize the concepts of cheminformatics												
COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to												
CO1	Recognize the correctness and precision in the results of measurements.											
CO2	Construct and compare the properties of variety of mechanical, optical, electrical and electronic systems.											
CO3	Familiarizing the titration methods using conductometry & potentiometry											
CO4	Developing the Research spirit through the knowledge of Cheminformatics & Analytical skills.											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	L	H	H							
CO2	H	H	M	H	H					M		
CO3	H	H	M	H	H				H			
CO4	H	H	H	H	H				H		H	M
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills			
							✓					



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18L02

INTEGRATED PHYSICAL SCIENCE LAB

0 0/0 2/0 1

LIST OF EXPERIMENTS

1. Determination of Coefficient of Viscosity of a given liquid by Poiseuille's method.
2. Particle Size determination using Laser Source.
3. Determination of Numerical Aperture of an Optical Fiber.
4. Spectrometer- Refractive Index/Dispersive power/i-d curve.
5. Potentiometer - Resistance of a wire.
6. Transistor Characteristics - Input Resistance, Output Resistance and Gain .
7. Studies on acid-base conductometric titration.
8. Determination of redox potentials using potentiometry.
9. Determination of R_f values of various components using thin layer chromatography.
10. Viscosity studies using Digital capillary viscometer.
11. Compute the structures of the given polymers, drugs, biomolecules using Chem Draw.
12. Studies on potential energy surface of the given molecules.
13. Estimate NMR spectra from a Chem Draw structure.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

Subject Code : BES18ET3	Subject Name : C PROGRAMMING AND LAB						Ty / Lb/ ETL	L	T/S Lr	P/R	C	
	Prerequisite : None						ETL	1	0/0	2/0	2	
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab												
OBJECTIVES : - Outline the basics of C Language. - Apply fundamentals in C programming. - Produce and present activities associated with the course.												
COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to												
CO1	Acquire knowledge how to write and execute c programs											
CO2	Understand the fundamental expression and statements of C Language.											
CO3	Work with arrays, functions, pointers, structures, Strings and Files in C.											
CO4	Identify and provide solutions for engineering problems in C programming											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H			M	M		H	M			H
CO2	H	M			H	M		M	H			M
CO3	H			H		M		M	H			M
CO4	H			M		M		H	M			M
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												
Category	Basic Sciences	Engg Sciences	Humaniti es & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internship s / Technical Skills	Soft Skills			
							√					



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
BES18ET3 **C PROGRAMMING AND LAB** **1 0/0 2/0 2**

UNIT I INTRODUCTION **6**
Fundamentals, C Character set, Identifiers and Keywords, Data Types, Variables and Constants, Structure of a C Program, Executing a C Program.

UNIT II EXPRESSION AND STATEMENT **6**
Operators, Types-Complex and Imaginary, Looping Statement-For, While, Do, Break, continue, Decision Statement-If, If else, Nested if, Switching Statement, Conditional Operator.

UNIT III ARRAYS AND FUNCTIONS **6**
Defining an Array, Using Array elements as counters, Generate Fibonacci number, Generate Prime Numbers, Initializing Arrays, Multidimensional Arrays, Defining a Function, Function call -types of Function calls - Function pass by value -Function pass by Reference Books, Write a Program in Recursive Function.

UNIT IV STRUCTURES AND POINTERS **6**
Working with Structures -Introduction -Syntax of structures -Declaration and initialization -Declaration of structure variable -Accessing structure variables, Understanding Pointers -Introduction -Syntax of Pointer.

UNIT V STRINGS AND FILE HANDLING **6**
Strings -Syntax for declaring a string -Syntax for initializing a string -To read a string from keyboard, Files in C -File handling functions -Opening a File closing a file --example: fopen, fclose -Reading data from a File- Problem solving in C

Total No of Periods: 30

REFERENCE BOOKS:

1. Stephen G. Kochen“ Programming in C- A complete introduction to the C Programming Language. Third Edition, Sams Publishing -2004
2. Ajay Mital, “ Programming in C: A Practical Approach”, Pearson Publication-2010

LIST OF PROGRAMS

1. Write a program to check 'a' is greater than 'b' or less than 'b' Hint: use if statement.
2. Write another program to check which value is greater 'a', 'b' or 'c'. Hint: use else-if statement. (Take values of a, b, c as user inputs)
3. Write a Program to find the sum of the series : $x + X^3/3! + X^5/5! + \dots + X^n/n!$
4. Write a C Program to solve a Quadratic Equation by taking input from Keyboard
5. Write a C Program to arrange 20 numbers in ascending and descending Order. Input the Numbers from Keyboard
6. Write a C Program to Multiply a 3 x 3 Matrix with input of members from Keyboard
7. Write a program that takes marks of three students as input. Compare the marks to see which student has scored the highest. Check also if two or more students have scored equal marks.
8. Write a program to display records of an employee. Like name, address, designation, salary.
9. Write a C program, declare a variable and a pointer. Store the address of the variable in the pointer. Print the value of the pointer.
10. Write a C program to concatenate String 'best' and String 'bus'. Hint: strcat(char str1, char str2);
11. Explore the other functions in string library.
12. Write a program to create a file TEST. Write your name and address in the file TEST. Then display it on the console using C program.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18001	Subject Name: HUMAN ANATOMY AND PHYSIOLOGY	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : To learn basics of human body, cell and blood

- To study about the positioning and functioning of the cardiovascular
- To study about the positioning and functioning of the respiratory systems
- To study about the positioning and functioning of the nervous system
- To study about the positioning and functioning of the musculoskeletal system

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the basics of human body, cell, and blood
CO2	Capable to analyze the positioning and functioning of the cardiovascular
CO3	Acquires knowledge on the positioning and functioning of the respiratory systems
CO4	Understands the positioning and functioning of the nervous system
CO5	Acquires the positioning and functioning of the musculoskeletal system

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	H	H	H	H	M	L	M	H	M
CO2	H	H	H	M	L	H	M	L	H	M	L	M
CO3	M	M	H	L	M	H	M	L	H	M	L	M
CO4	H	H	M	H	M	H	M	H	H	M	H	M
CO5	H	M	L	H	M	H	L	H	M	M	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	M	H	M							
CO2	H	H	M	H	M							
CO3	L	M	L	H	H							
CO4	M	H	M	H	L							
CO5	H	M	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
	✓											



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18001 HUMAN ANATOMY AND PHYSIOLOGY 3 1/0 0/0 4

UNIT I INTRODUCTION 12

Cell structure and Organelles Description-Circulatory System-Heart-Pericardium-Chambers-Major Blood Vessels-Blood supply

UNIT II DIGESTIVE SYSTEM, EXCRETORY AND UROGENITA SYSTEM 12

Digestive System- GI Tract, parts, stomach -Intestine -Liver and Pancreas -Respiratory System- Trachea and Lungs- Parts, Reproductive System -Male and Female Reproductive Organs - Nervous System - Functions of Neurons -Synapse -Reflexes and Receptors -Brain -Brainstem -Ventricles and Spinal cord- Peripheral Automatic Nervous System

UNIT III MUSCULAR SYSTEM AND ENT 12

Musculo -Skeletal System - Muscle Tissue -Structure of Skeletal Muscle -Types of Muscle -Types of Joints -Major Muscles of Limbs and their actions -Eye -Ear, Endocrine Glands

UNIT IV CELL, CARDIAC SYSTEM 12

Structure of Cell - Function of each components of the cell - Membrane Potential - Action Potential - Generation and Conduction - Electrical Stimulation - Blood Cell - Composition - Origin of RBC - Blood groups - Estimation of RBC - WBC and platelet- Cardiac Cycle - ECGT - Blood Pressure - Feedback Control for Blood Pressure - Nervous control of Heart - Cardiac output - Coronary and Peripheral Circulation

UNIT V NERVOUS, RESPIRATORY, DIGESTIVE AND EXCRETORY SYSTEM 12

Structure and function of Nervous tissue - Reflex action - Velocity of Conduction of Nerve Impulses - Electro Encephalograph - Autonomic Nervous System- Physiological aspects of respiration - Exchange of gases - Regulation of Respiration- Disturbance of respiring function - Pulmonary function test- Organization of GI system -Digestion and absorption - Movement of GI tract - Structure of Nephron - mechanism of Urine formation - Urine Reflex - Skin and Sweat Gland - Temperature regulation.

Total No of Periods: 60

TEXT BOOKS:

1. Ranganathan, T.S., "Text Book of Human Anatomy", S.Chand and Co. Ltd., Delhi, 1996
2. Sarada Subramanyam, K. MadhavanKutty and H.D. Singh "Text book of Human Physiology", S.Chand and Company, 1996
3. Sujit K. Chaudhuri, "Concise Medical Physiology" New Central Book agency, 1997

REFERENCE BOOKS:

1. Tobin, C.E., "Basic Human Anatomy", McGraw Hill Publishing Co. Ltd., Delhi, 1997
2. J.Gibson, "Modern Physiology and Anatomy for Nurses", Blackwell SC Publishing 1981
3. Arthur.C.Guyton, "Textbook of Medical Physiology", Prism Book (p) Ltd., 1996
4. Cyril A. Keele Eric Neil Norman Joels Samson Wrights, "Applied Physiology", Oxford University Press, 1983



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18002	Subject Name :CIRCUIT THEORY	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Enabling the students to acquire knowledge about the basic of circuit analysis, network theorems, ac circuits and transient analysis
- The graduate will learn the analysis of complex circuits using mesh current and nodal voltage methods.
- Students to analyze complex circuits using network theorems.
- Understanding the concept of complex frequency & free and forced response of RL, RC & RLC circuits.
- Enabling to understand about different parameters of two networks.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands basics of circuit analysis, network theorems, ac circuits and transient analysis.
CO2	The graduate will be able to analysis complex circuits using mesh current and nodal voltage methods
CO3	Ability to analyse complex circuits using network theorems
CO4	Understands the concept of complex frequency & free and free and forced response of RL, RC & RLC circuits.
CO5	Acquire the knowledge about different parameters of two networks

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	H	L	M	H	M	L	H	H	M	L
CO2	M	H	H	L	M	M	H	H	L	L	H	M
CO3	M	H	H	L	M	M	H	H	L	M	H	M
CO4	H	H	M	M	H	H	L	H	H	M	L	L
CO5	H	H	M	M	H	H	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	H	L	L	L	M							
CO2	H	M	L	M	L							
CO3	H	M	M	L	L							
CO4	H	M	L	L	M							
CO5	H	M	M	L	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEI18002	CIRCUIT THEORY	3	1/0	0/0	4
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UNIT I	BASIC OF CIRCUITS ANALYSIS	12
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Resistive elements - Ohm's Law Resistors in series and parallel circuits -Kirchoffs laws - Mesh current and node voltage - methods of analysis

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC CIRCUITS 12

Network reduction: voltage and current division, source transformation - star delta conversion
-Thevenins and Norton Theorems - Superposition Theorem - Maximum power transfer theorem
- Reciprocity Theorem -Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 12

L and C elements -Transient response of RL - RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input

UNIT IV RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance - their frequency response - Quality factor and Bandwidth - Self and mutual inductance - Coefficient of coupling - Tuned circuits - Single tuned circuits

UNIT V	THREE PHASE CIRCUITS	12
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A.C. circuits - Average and RMS value - Phasor Diagram - Power, Power Factor and Energy- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads - balanced and unbalanced - phasor diagram of voltages and currents - power measurement in three phase circuits

Total No of Periods : 60

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Mc.Graw Hill publishers, 8th Edition, New Delhi, 2013
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", 5th Edition, McGraw Hill, 2013
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", 5th Edition, Cengage Learning India, 2013

REFERENCE BOOKS:

1. Chakrabarti A, “Circuit Theory:Analysis and Synthesis” ,DhanpathRai& Sons, New Delhi, 2014
2. Jegatheesan R., “Analysis of Electric Circuits”, McGraw Hill, 2015
3. M Nahvi ,Joseph Edminister, K Rao, “Electric circuits,Schaum's Outline Series”,McGraw Hill, NewDelhi, 2017
4. M E Van Valkenburg, “Network Analysis”,PrenticeHall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., “Electric Circuits Analysis,” Prentice-Hall of India Pvt Ltd., New Delhi, 2015
6. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18003	Subject Name: ELECTROMAGNETIC FIELD THEORY	T /L/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

- To acquire knowledge in Electromagnetic field theory
- To provide a solid foundation in Electrostatics such as Dipole, Capacitance
- To attain familiarity in Boundary conditions and Magnetic field
- To understand the relation between field theory and circuit theory
- To identify the electromagnetic wave propagation in medium

COURSE OUTCOMES (Cos): (3-5)

CO1	Understand the fundamentals in Electromagnetic field theory
CO2	Foundation in Electrostatics such as Dipole, Capacitance
CO3	Familiarity in Boundary conditions and Magnetic field
CO4	Understand the relation between field theory and circuit theory
CO5	Determine the electromagnetic wave propagation in medium

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	M	H	M	H	M
CO2	H	M	H	M	M	M	M	M	H	M	H	M
CO3	H	H	H	H	H	H	H	M	H	M	H	M
CO4	M	M	M	M	M	M	M	L	M	M	M	L
CO5	H	H	H	H	H	H	H	M	H	M	H	M
Cos / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		H		H		H		H			
CO2	H		H		H		H		H			
CO3	M		M		M		M		M			
CO4	M		H		H		H		H			
CO5	M		H		M		H		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18003 ELECTROMAGNETIC FIELD THEORY 3 0/0 0/0 3

UNIT I ELECTROSTATIC FIELD 9

Introduction - Concepts of different co-ordinate systems -Electric field intensity-Electric flux density - electric fields due to charge distributions - Electric potential - potential gradient - Gauss law and Coulomb's law with Application

UNIT II ELECTROSTATICS 9

Field due to dipoles - Dipole moment - Current and Current density Boundary conditions at dielectric and conductor surfaces - Capacitor - Capacitance - Energy stored and energy density - Capacitance due to Spherical shell - Coaxial cable

UNIT III MAGNETOSTATICS 9

Introduction to Magnetic materials- Magnetic field intensity- Magnetic flux density (B) - B in free space, conductor, magnetic materials. Magnetization and Permeability - Boundary conditions- Lorentz Law of force -Biot-Savart Law - Ampere's Law - Magnetic field - Scalar and vector potential - Magnetic force - Torque - Inductance

UNIT IV ELECTRODYNAMIC FIELDS 9

Faraday's law - induced EMF - transformer and motional EMF - Maxwell's equations (differential and integral forms) - Displacement current - Relation between field theory and circuit theory

UNIT V ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION 9

Generation - electromagnetic wave equations - Wave parameters – velocity - intrinsic impedance - propagation constant - Wave propagation in free space - loss and lossless dielectrics - conductors - skin depth - Poynting vector

Total No of Periods: 45

TEXT BOOKS:

1. William Hayt, "Engineering Electromagnetics", 7thEdn,McGraw Hill, 2005
2. Matthew. N.O. Sadiku, "Elements of Electromagnetics", 4thedition, First Indian Edition,Oxford University Press, 2007
3. Ashutosh Pramanik,"Electromagnetism – theory and application",Prentice Hall of India Private Ltd., 2006

REFERENCE BOOKS:

1. David K. Cheng, "Field and Wave Electromagnetics",2nd Edition, Pearson Education, 2004
2. William H. Hayt Jr, John A. Buck, "Engineering Electromagnetics",7th Edition,Tata McGraw Hill Publishing Company Ltd., 2006
3. Edminister, J.A. Schaum's, "Theory and problems of Electromagnetics",2nd Edition, Special Indian Edition, Tata McGraw hill, 2006



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18002	Subject Name: MEDICAL PHYSICS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Introduction to Atomic Physics
- To understand the concept of Interaction with Living Cells
- To provide the knowledge about the Effects of Radiation

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the concept of Atomic Physics
CO2	Capable to understand the concept of Interaction with Living Cells
CO3	The graduates attain knowledge about the Effects of Radiation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	L	H	M	L	M	H	M	L
CO2	H	M	L	M	H	M	L	M	H	L	M	H
CO3	L	M	H	L	M	H	L	M	H	L	M	H
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	L	M	H	M	H							
CO2	M	H	M	L	H							
CO3	M	H	M	M	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Industrial Training	Soft Skills			
				✓								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18002	MEDICAL PHYSICS	3	0/0	0/0	3
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UNIT I ATOMIC PHYSICS 9

Traditional definition of atom -periodic system of elements -mechanical properties of atom -emission of light and its frequencies - Electromagnetic spectra - Principles of Nuclear Physics - Natural radioactivity - Decay series -type of radiation and their applications -Radio nuclides used in Medicine and technology

UNIT II INTERACTION WITH LIVING CELLS 9

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

UNIT III SOMATIC EFFECT OF RADIATION 9

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

UNIT IV GENETIC EFFECT OF RADIATION 9

Threshold of linear dose effect-factors affecting frequency of radiation induced mutation -Gene controlled hereditary diseases -biological effect of microwave and RF wave - Variation in dielectric constant and specific conductivity of tissues - Penetration and propagation of signals effects in various vital organs - Protection standards

UNIT V PHOTO MEDICINE 9

Synthesis of Vitamin D in early and late cutaneous effects -Phototherapy -Photo chemotherapy -exposure level, hazards and maximum permissible exposures - Laser physics - Characteristics of Laser radiation-biological effects - laser safety management

Total No of Periods: 45

TEXT BOOKS:

1. Moselly, "Non ionizing Radiation", Adam HilgarBrustol, 1988

REFERENCE BOOKS:

1. Branski.S and Cherski.P,“Biological effects of Microwave”, Hutchinson and ROSS Inc. Stroudsburg 1980
2. Glasser.O., “Medical Physics”, Vol.1, 2, Book Publisher Inc Chicago, 1980



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEC18I06	Subject Name: ANALOG AND DIGITAL IC'S	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To learn about operational amplifiers and applications
- To study about phase locked loop and applications D/A A/D converters
- To gain knowledge on number systems
- To learn about MSI combinational circuits
- To study about sequential circuits

COURSE OUTCOMES (COs) : (3- 5)

CO1	The graduate understands operational amplifiers and applications
CO2	Acquire the knowledge about phase locked loop and applications D/A A/D converters
CO3	Understands the analysis of on number systems
CO4	The graduate understands MSI combinational circuits
CO5	Acquire the knowledge about sequential circuits

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	M	L	L	L	M	H	M	H
CO2	M	H	M	L	M	H	M	L	M	H	L	M
CO3	H	M	H	L	M	H	M	H	L	L	M	M
CO4	M	H	M	L	L	H	M	L	M	H	M	L
CO5	H	M	L	L	L	M	H	L	M	H	M	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	H	M	L
CO2	H	M	M	H	M
CO3	H	M	L	M	H
CO4	M	M	H	H	L
CO5	H	H	M	M	L

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓										



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEC18I06 **ANALOG AND DIGITAL IC'S** **3** **0/0** **0/0** **3**

UNIT I OPERATIONAL AMPLIFIERS AND APPLICATIONS 9

Characteristics of ideal op amp - virtual short -differential amplifier -offset current and voltages -slew rate - 741IC specifications inverting and non-inverting amplifiers adder/subtractor -instrumentation amplifier - voltage to current and current to voltage converter

UNIT II PHASELOCKED LOOP AND APPLICATIONS D/A A/D CONVERTERS 9

Basic principles -phase comparator -voltage-controlled oscillators -lock range -capture range PLL IC 565 -functional block schematic of PLL -PLL applications-frequency multiplications -frequency translation – AM /FM detection -D/A converters successive approximation -parallel ADC -V to F ADC -counter ramp ADC

UNIT III NUMBER SYSTEMS 9

Number systems - Binary, octal, hexa decimal –BCD -Grey and excess-3 representations-R's and (R-1)'s complements -subtraction using 1's and 2's complement binary to grey -grey to binary conversions alpha numeric codes

UNIT IV MSI COMBINATIONAL CIRCUITS 9

Half and full adder's parallel binary adder BCD adder -half and full subtractors magnitude comparator decoder, encoder -multiplier, ROM -PLA

UNIT V SEQUENTIAL CIRCUITS 9

Flip flops-SR-JK -T -D characteristic equations -excitation tables design of counters using excitation tables -synchronous and asynchronous counters -7490, 74161 counters IC specifications -ring and Johnson counters shift registers -74194 shift IC specifications

Total No of Periods : 45

TEXT BOOKS:

1. Millman.J. Halkias., "Integrated Electronics", McGraw hill, 1972

REFERENCE BOOKS:

1. Ramakant. A. Gayakwad, "Op-amp and Linear IC's", Prentice Hall, 1994
2. MorrisMaNoM., "Digital Logic and Computer Design", Prentice Hall, 2001



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L01	Subject Name: HUMAN ANATOMY AND	TY /	L	T /	P/ R	C
	PHYSIOLOGY LAB	LB/		S.Lr		
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To understand the standard operating procedures of various anatomy instruments.
- To analyze the different biomolecules, present in the biological system using the analytical techniques

COURSE OUTCOMES (COs): (3- 5)

CO1	Understands the standard operating procedures of various anatomy instruments.
CO2	Capable to analyze the different biomolecules present in the biological system using the analytical techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	L	H	M	L	M	H	L	L
CO2	M	H	M	H	L	, M	L	L	M	M	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		M		L		H		M			
CO2	M		M		H		M		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18L01 HUMAN ANATOMY AND PHYSIOLOGY LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

1. Study the human respiratory system
2. Study the human skeleton system
3. Study the human muscular and nervous system
4. Study the human reproductive system
5. Study the human urinary system
6. Study the human joint system
7. Study the human sense organ system
8. Study of rate of Conduction of Nerve Impulses.
9. Testing of Hearing using Tuning Fork.
10. Testing of various parameters of Vision and Errors of Refraction.
11. Testing of Urine for presence of Sugar, Protein
12. Estimation using Spectrophotometer.

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18L02	Subject Name: ELECTRIC CIRCUITS LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Students will learn various network theorems
- Students will demonstrate the ability to Design and apply Hardware Implementation of what they have learnt theoretically in the field of Electronics, Electric circuits and network analysis using both analog techniques.
- Students will demonstrate the ability to Design and apply Hardware Implementation of what they have learnt theoretically in the field of Electronics, Electric circuits and network analysis using both digital techniques.
- To Design and implement the hardware of a voltage Regulator for AC inputs in hardware and Design a filter circuit for Active and passive components.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Students Understands various network theorems
CO2	The graduate gets the ability to design and apply Hardware Implementation of what they have learnt theoretically in the field of Electronics, Electric circuits and network analysis using both analog techniques.
CO3	The graduate gets the ability to design and apply Hardware Implementation of what they have learnt theoretically in the field of Electronics, Electric circuits and network analysis using both digital techniques.
CO4	Students will be able to Design and implement the hardware of a voltage Regulator for AC inputs in hardware
CO5	Students will be able to Design a filter circuit for Active and passive components.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	M	H	H	M	L	M	H	M
CO2	H	M	H	M	H	M	L	H	H	L	M	H
CO3	M	H	H	H	M	H	M	L	H	H	M	L
CO4	M	H	H	M	L	H	M	L	H	H	M	M
CO5	H	H	M	M	M	L	M	M	H	H	M	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	H	H	L
CO2	H	H	M	H	H
CO3	M	H	H	M	L
CO4	L	H	M	H	M
CO5	H	L	H	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

LIST OF EXPERIMENTS

1. Experimental verification of Kirchhoff's voltage and current laws
2. Experimental verification of Current and Voltage Division and Source Transformation
3. Experimental verification of network theorems (Thevenin's, Norton's, Superposition and maximum power transfer Theorem).
4. Determination of average value, RMS value, form factor, peak factor of sinusoidal wave, square wave using hard ware and digital simulation.

BEI18L02	ELECTRIC CIRCUITSLAB	0	0/0	3/0	1
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5. Verification of Nodal and Mesh Analysis
6. Study of CRO and measurement of sinusoidal voltage, frequency and power factor
7. Experimental determination of time constant of series R-C electric circuits
8. Experimental determination of frequency response of RLC circuits.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits
11. Simulation of three phase balanced and unbalanced star, delta networks circuits
12. Experimental determination of power in three phase circuits by two-watt meter method
13. Calibration of single phase energy meter
14. Determination of self, mutual inductance and coefficient of coupling.
15. Simulation of transient response of RLC circuit.

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEC18IL4	Subject Name: ANALOG AND DIGITAL IC'S LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: ANALOG AND DIGITAL IC'S	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- To understand various Digital and Linear Integrated Circuits used in Simple System Configuration.
- To be able to understand the various types of combinational circuits.
- To Understand the Operational amplifier characteristics and applications
- To learn about Designing and verifying waveform generator circuits and filter circuits

COURSE OUTCOMES (COs) : (3- 5)

CO1	Graduates can understand various Digital and Linear Integrated Circuits used in Simple System Configuration.
CO2	The students will be able to understand the various types of combinational circuits.
CO3	Understands the Operational amplifier characteristics and applications
CO4	Will be capable of Designing and verifying waveform generator circuits and filter circuits

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	H	H	M	L	L	M	H	H
CO2	L	H	M	L	M	H	M	L	H	M	H	M
CO3	H	H	M	L	L	H	M	L	M	H	M	L
CO4	M	L	H	L	H	M	L	H	M	L	M	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		M		L		M			
CO2	H		M		L		M		H			
CO3	M		H		M		L		M			
CO4	L		H		M		L		L			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEC18IL4	ANALOG AND DIGITAL IC'S LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Construct an Integrator and Differentiator
2. Conduct an Experiment with Multivibrators using IC 555 Timer
3. Conduct an Experiment with Schmitt Trigger
4. Construct an Instrumentation Amplifier
5. Conduct an experiment on RC Phase Shift Oscillator
6. Conduct an experiment on Wein Bridge Oscillator
7. Construct the Half Adder and Full Adder
8. Construct the Half subtractor/ Full subtractor
9. Construct the Encoder and Decoder
10. Construct Multiplexer and De-Multiplexer
11. Conduct an experiment with Shift Register
12. Construct the Counter

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BMA18011	Subject Name: NUMERICAL METHODS FOR ELECTRICAL ENGINEERS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Maths- I, Maths - II	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To develop the ability in Numerical Skills

COURSE OUTCOMES (COs) : (3- 5)

CO1	To understand the Basic concepts in Numerical Analysis
CO2	To understand the Basic concepts in System of Linear Equations
CO3	To understand the Basic concepts in Non Linear Equations
CO4	To understand the Basic concepts in Interpolation
CO5	To understand the Basic concepts in Numerical Differentiation and Integration

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	H	L	L	L	L	L	L	M	L	L	M
CO2	L	H	L	L	L	L	L	L	M	L	L	M
CO3	L	H	L	L	L	L	L	L	M	L	L	M
CO4	L	H	L	L	L	L	L	L	M	L	L	M
CO5	L	H	L	L	L	L	L	L	M	L	L	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	M	L	L	L							
CO2	M	M	L	L	L							
CO3	M	M	L	L	L							
CO4	M	M	L	L	L							
CO5	M	M	L	L	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
	✓												



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMA18011 NUMERICAL METHODS FOR ELECTRICAL 3 1/0 0/0 4
ENGINEERS

UNIT I BASICS OF NUMERICAL METHODS 12

Curve fitting-Method of group averages-Principle of least square-Method of moments-Finite differences-Operators (Forward, Backward and Shifting) -Relationship between the operators.

UNIT II SYSTEM OF LINEAR EQUATIONS 12

Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method- Eigen value problem-Power method

UNIT III NON LINEAR EQUATIONS 12

Solution of Algebraic and Transcendental equations – Method of false position -Fixed point iteration method (single and multi variables) - Newton-Raphson method (single and multi variables)

UNIT IV INTERPOLATION 12

Newton forward and backward differences – Central differences – Sterling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT V NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Numerical differentiation with interpolation polynomials – Numerical integration by Trapezoidal and Simpson's (both $1/3^{\text{rd}}$ and $3/8^{\text{th}}$) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

Total No of Periods: 60

TEXT BOOKS:

1. Veerarajan T., Numerical Methods, Tata McGraw Hill Publishing Co., (2007)
2. Sastry S.S., Introductory Methods of Numerical Analysis, Prentice Hall of India, (2012)

REFERENCE BOOKS:

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012)
2. Kandasamy P., Thilagavathy, Gunavathy K., Numerical Methods (Vol.IV), S.Chand& Co., (2008)



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18005	Subject Name: TRANSDUCER ENGINEERING	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Understanding how physical quantities are measured and converted to electrical or other forms.
- To have an adequate knowledge of different transducers, resistance.
- Developing the knowledge in inductance and capacitance transducers.
- Studying the operation, characteristics, applications of various types of transducers.
- Studying the advantages and disadvantages of various types of transducers.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The student understands the dynamics of the transducer.
CO2	The student will be able to select a suitable transducer for a given application.
CO3	The student can design a transducer as per the requirement
CO4	Understands the operation, characteristics, applications of various types of transducers
CO5	Understands the advantages and disadvantages of various types of transducers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	M	H	M	H	H	M	L	H
CO2	M	H	H	M	M	H	L	L	H	H	M	H
CO3	H	H	H	M	L	H	M	L	H	H	M	H
CO4	M	H	H	M	L	H	M	L	H	M	H	L
CO5	H	H	H	M	L	H	M	H	M	L	H	M
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		H		M		L			
CO2	H		M		H		M		L			
CO3	L		H		M		M		H			
CO4	M		H		H		L		M			
CO5	H		L		M		H		M			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEI18005 TRANSDUCER ENGINEERING 3 1/0 0/0 4

UNIT I SCIENCE OF MEASUREMENT 12

Units and standards - calibration methods - static calibration - classification of errors - error analysis - statistical methods - odds and uncertainty

UNIT II CHARACTERISTICS OF TRANSDUCERS 12

Static characteristics - accuracy –precision-sensitivity - linearity - mathematical model of transducers - zero order -first order - second order transducers - response to standard inputs

UNIT III VARIABLE RESISTANCE TRANSDUCERS 12

Resistance potentiometers -strain gauges- resistance thermometers-thermistors- hot-wire anemometer- piezoresistive sensors and humidity sensors

UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 12

Induction potentiometer - variable reluctance transducers - EI pick up - LVDT - capacitive transducers - variable air gap type - variable area type - variable permittivity type - capacitor microphone

UNIT V OTHER TRANSDUCERS 12

Piezoelectric transducer - magnetostrictive transducer - IC sensor - digital transducers - smart sensor - fiber optic transducers

Total No of Periods: 60

TEXT BOOKS:

1. Neubert, H.K.P., “Instrument Transducers”, Clarendon Press, Oxford, 1988
2. Patranabis, D, “Sensors and Transducers”, Wheeler Publishing Co., Ltd. New Delhi, 1997

REFERENCE BOOKS:

1. Doebelin, E.O., “Measurement Systems”, McGraw-Hill Book Co., 1998
2. Murthy, D.V.s., “Transducers and Instrumentation”, Prentice Hall of India Pvt. Ltd., New Delhi, 1995
3. Renganathan, S., “Transducer Engineering”, Allied Publishers, Chennai, 1999



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18003	Subject Name: PATHOLOGY AND MICROBIOLOGY	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To learn about Normal cell structure
- To gain knowledge on Fluid and hemodynamic derangement
- To study about Genetic disorders
- To acquire knowledge on General structural organization
- To be able to do Identification of disease producing organism

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands Normal cell structure
CO2	Gets knowledge on Fluid and hemodynamic derangement
CO3	Familiar about Genetic disorders
CO4	Acquires knowledge on General structural organization
CO5	Performs Identification of disease producing organism

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	L	M	H	L	M	H	L	M	H
CO2	M	L	H	M	L	L	M	H	L	M	H	L
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	H	M	M	L	M	H	L	M	H	L	M	H
CO5	L	L	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	H	M	H	M	L							
CO2	M	L	M	H	M							
CO3	L	M	H	M	L							
CO4	H	M	L	M	H							
CO5	M	L	H	M	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
				✓								



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18003 PATHOLOGY AND MICROBIOLOGY 3 0/0 0/0 3

UNIT I NORMAL CELL STRUCTURE 9

Cell Degeneration and regeneration - Inflammations -apoptosis - Classification- Difference between benign and malignant tumors - Etiology of tumors- Case Studies

UNIT II FLUID AND HEAMODYNAMIC DERANGEMENT 9

Edema -Shock -Hemorrhage - Thrombus - Embolism- Disseminated intra vascular Coagulation - Hematological disorders- Bleeding Disorders - Leukemia - lymphoma

UNIT III GENETIC DISORDERS 9

Genetic disorders - immunity -Autosomal and sex-linked disorders - Storage disorders - types of hypersensitivity reactions - helminthic disease- Case study

UNIT IV GENERAL STRUCTURAL ORGANIZATION 9

General structural organization of Bacterial -Viral Cell -Identification and growth of Bacteria and virus- Observation PF culture – Microscopy - Light Microscopy - Dark field Microscopy - electron microscopy

UNIT V IDENTIFICATION OF DISEASE PRODUCING ORGANISM 9

Identification of disease producing organism - types of Stain -Fluorescent techniques -Antigen - Antibody Techniques and its applications

Total No of Periods: 45

TEXT BOOKS:

1. Robbins S.L. and Ramzi S. C. "Pathologic Basis of Diseases", W.B. Saunders Co., 1999

REFERENCE BOOKS:

1. Anatha Narayanan R. and Jayaram C.R., "Text Book of Microbiology", Orient Longman, 1998



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBT18102	Subject Name: BIO-CHEMISTRY	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To study structural and functional properties of carbohydrates
- To study structural and functional properties of proteins
- To study structural and functional properties of lipids
- To study structural and functional properties of nucleic acids
- To emphasize the role of these bio molecules by providing basic information on specific metabolic diseases and disorders of these bio molecules

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands structural and functional properties of carbohydrate
CO2	Capable to analyze structural and functional properties of proteins
CO3	Understands structural and functional properties of lipids
CO4	Capable to structural and functional properties of nucleic acids
CO5	Understands the emphasize the role of these bio molecules by providing basic information on specific metabolic diseases and disorders of these bio molecules

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	L	L	H	M	L	M	H	M
CO2	H	H	M	L	H	M	H	L	M	H	M	L
CO3	M	H	M	L	M	H	L	M	H	L	M	H
CO4	M	H	M	H	L	M	M	H	M	L	H	M
CO5	H	M	L	L	M	H	L	M	H	L	M	H
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	M	L	M							
CO2	H	M	M	H	L							
CO3	H	M	L	M	H							
CO4	M	L	H	M	H							
CO5	L	M	H	M	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓										

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBT18I02	BIO-CHEMISTRY	3	0/0	0/0	3
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UNIT I BIOCHEMISTRY OF LIVING CELL 9

Biochemistry of living cell -sub cellular fractionation using the differential centrifugation method -
Function of each organelle Redox Potential -Oxidative Phosphorylation -Transport of substances across
biological membrane - NUCLEAR ACID: Composition and Function, Genes -Outline of DNA structure -
Recombinant DNA

UNIT II ENZYMES 9

Chemical Nature -General Properties -Spectrophotometric measurement of enzymes -Isolation techniques
-Diagnostic enzymes - Enzyme biotechnology - Hormones: Chemical Nature -Properties of hormones -
Hormonal Assay and their significance

UNIT III CARBOHYDRATE AND LIPIDS 9

Carbohydrate – Classification, Metabolism of carbohydrate and its dysfunction -uses of Carbohydrates -
Lipids: Classification -Metabolism of lipids -Cholesterol -bile acids -Transport of lipids -Lipids
metabolism dysfunction. Protein: Classification- Amino acids- Chromatography- electrophoresis and
architecture of protein molecules and its applications

UNIT IV	BIO CHEMISTRY OF BLOOD AND BODY FLUIDS	9
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Liver Function tests -Renal Function Tests -Blood gas Analysis -Measurement of Electrolytes -their abnormal and Normal values and conditions - Biochemistry of Urine and Stools testing

UNIT V	DIAGNOSTIC TOOL	9
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Principles and Application of Photometry -Spectrophotometry -Fluorometry -Photometry-Densitometry - calorimetry -Automation in clinical Laboratory - Use of Isotopes in Biochemistry

Total No of Periods: 45

TEXT BOOKS:

1. Dr. Amniga Shanmugam, “Fundamentals of Biochemistry for Medical Students”, Karthic Printers, Madras, 1997

REFERENCE BOOKS:

1. Jain J, Jain L, Nitin Sunjay Jain, “Fundamentals of Biochemistry,” Chand. S Group, ISBN: 8121924537.
2. Satyanarayana U, and Chakrapani U, “Biochemistry”, Books and Allied (p) Ltd., ISBN: 8187134801



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BHS18NC1	Subject Name THE INDIAN CONSTITUTION	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: NIL	Ty	2	0/0	0/0	NC

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To provide an overview of the history of the making of Indian Constitution
- To understand the preamble and the basic structures of the Constitution.
- To Know the fundamental rights, duties and the directive principles of state policy
- To understand the functionality of the legislature, the executive and the judiciary

COURSE OUTCOMES (COs) : After studying this course the student would be able to

CO1	To provide an overview of the history of the making of Indian Constitution
CO2	To understand the preamble and the basic structures of the Constitution.
CO3	To Know the fundamental rights, duties and the directive principles of state policy

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						H	L	L	L	L		
CO2						H	L	L	L	L		
CO2						H	L	L	M	L		
COs / PSOs	PSO1	PSO2			PSO3							
CO1	L	L			M							
CO2	L	L			M							
CO3	L	L			M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills			
			✓									



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BHS18NC1	THE INDIAN CONSTITUTION	Ty	2	0/0	0/0	NC
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UNIT I

3Hrs

The History of the Making of Indian Constitution, Preamble and the Basic Structures

UNIT II

3Hrs

Fundamental Rights and Duties, Directive Principles of State Policy

UNIT III

3Hrs

Legislature, Executive and Judiciary

UNIT IV

3Hrs

Emergency Powers

UNIT V

3Hrs

Special Provisions for Jammu and Kashmir, Nagaland and Other Regions, Amendments

Total Hours: 15

TEXT BOOKS:

1. D D Basu, Introduction to the Constitution of India, 20th Edn., Lexisnexis Butterworths, 2012.

REFERENCE BOOKS:

1. Rajeev Bhargava (ed), *Ethics and Politics of the Indian Constitution*, Oxford University Press, New Delhi, 2008.
2. Granville Austin, *The Indian Constitution: Cornerstone of a Nation*, Oxford University Press, Oxford, 1966.
3. Zoya Hassan, E. Sridharan and R. Sudarshan (eds), *India's Living Constitution: Ideas, Practices, Controversies*, Permanent Black, New Delhi, 2002.
4. Subhash C. Kashyap, *Our Constitution*, National Book Trust, New Delhi, 2011.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BHS18NC2	Subject Name : THE INDIAN TRADITIONAL KNOWLEDGE					Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C		
	Prerequisite: NIL					Ty	2	0/0	0/0	NC		
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab												
OBJECTIVES: - To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System - To understand the Traditional Medicine, Traditional Production and Construction Technology - To Know the History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology - To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India												
COURSE OUTCOMES (COs) : After studying this course the student would be able to												
CO1	To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System											
CO2	To understand the Traditional Medicine, Traditional Production and Construction Technology											
CO3	To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India											
Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		H	H	L		M				M		L
CO2		H	H	L		M				M		L
CO2		H	H	L		M				M		L
COs / PSOs	PSO1			PSO2	PSO3							
CO1	L			L	M							
CO2	L			L	M							
CO3	L			L	M							
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low												
Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
			✓									



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BHS18NC2	THE INDIAN TRADITIONAL KNOWLEDGE	Ty	2	0/0	0/0	NC
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UNIT I

3Hrs

Historical Background: TKS During the Pre- colonial and Colonial Period, Indian Traditional Knowledge System

UNIT II

3Hrs

Traditional Medicine, Traditional Production and Construction Technology

UNIT III

3Hrs

History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology

UNIT IV

3Hrs

Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

UNIT V

3Hrs

TKS and the Contemporary World, TKS and the Indian Union, TKS and IT Revolution

Total Hours: 15

TEXT BOOKS:

1. Amit Jha (2009) , Traditional knowledge system in india, 1st Edition, Delhi University (North Campus)
2. Dr.A.K.Ghosh (2011), Traditional Knowledge of Household Products



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18ET1	Subject Name: ADVANCEMENT IN ELECTRONICS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: ANALOG AND DIGITAL IC'S	ETL	1	0/1	3/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Familiarity on the basics of Electronic devices.
- To gain knowledge about the fundamental devices of different circuits, its characteristics and configurations
- Familiarity on the basics of Feedback Circuits
- To impart knowledge on the fundamental concepts of Nanotechnology
- To develop students to gain knowledge on Nanomaterials

COURSE OUTCOMES (COs) : (3- 5)

CO1	Gain Knowledge on Electronics devices and design different circuits
CO2	Develop knowledge to incorporate the devices and circuits for different applications
CO3	Capable to design Oscillators and Amplifiers depending upon the applications.
CO4	Students capable to gain knowledge on the latest technology
CO5	Students capable to gain knowledge in fabricating Electronic devices and other materials

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	H	M	H	M	L	H	M	H
CO2	M	M	M	M	H	H	H	H	L	M	L	M
CO3	H	M	H	M	M	M	L	L	L	L	M	H
CO4	H	M	M	H	H	H	M	H	M	M	H	M
CO5	H	H	H	M	M	M	M	L	L	L	M	H
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	H	M	L	M	L							
CO2	H	M	M	L	H							
CO3	L	H	M	M	L							
CO4	M	M	L	H	M							
CO5	M	H	M	L	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18ET1 ADVANCEMENT IN ELECTRONICS 1 0/1 3/0 3

UNIT I SEMICONDUCTOR DIODE 9

Theory of p-n junction - p-n junction as diode - p-n diode currents - Volt-ampere characteristics - Diode resistance - Temperature effect of p-n junction - Zener Diode- VI Characteristic- Zener diode Voltage Regulator- Characteristics of SCR -TRIAC -DIAC - LDR

UNIT II TRANSISTORS 9

Transistor construction - Input and output characteristics of CE -CB and CC configurations - Junction field effect transistor - Pinch off voltage - JFET volt-ampere characteristics - JFET small signal model - MOSFETS and their characteristics - Uni-junction transistor

UNIT III FEEDBACK CIRCUITS 9

Introduction-Principle of Feedback Amplifiers-Negative Feedback Circuits - Types of Negative feedback Circuits-Positive Feedback Circuits- Condition for Oscillations -Barkhausen criterion-Types of Oscillators: RC phase shift -Wein Bridge -Crystal, Collpitts -Hartley

UNIT IV FUNDAMENTALS and OVERVIEW OF NANO SCIENCE 9

Fundamental concepts- Basic Structure of Nanoparticles- Nanomaterials- scaling - Approaches-Tools and Techniques

UNIT V NANO MATERIALS 9

Nanomaterials-properties-Nanostructures:Kinetics in Nanostructured Materials- Zero dimensional -size and shape of nanoparticles; one-dimensional and two-dimensional nanostructures- clusters of metals and semiconductors - bionano-particles-Carbon Nanotubes -Fullerenes -Nanowires -Quantum Dots- Applications of nanostructures

Total No of Periods: 45

TEXT BOOKS:

1. Jacob Millman, Christos, C. Halkias, "Electronic Devices and Circuits", 3rd Edition, Tata McGraw Hill Publishing Ltd., 2010
2. David, A. Bell,"Electronic Devices and Circuit", Prentice Hall of India Private Ltd., 2003
3. Chattopadhyay, P.K, ,Banerjee, A.N., "Introduction to Nanoscience and Nanotechnology", Prentice Hall India Learning Private Ltd., 2009

REFERENCE BOOKS:

1. Theodore, F. Boghert, "Electronic Devices and Circuits", 6th Edition. Pearson Education, 2003
2. Ben G. Streetman, Sanjay Banerjee, "Solid State Electronic Devices", Pearson EducationPHI, 2002
3. Allen Mottershead,"Electronic Devices and Circuits - An Introduction", New Delhi: Prentice Hall of India Private Ltd., 2003
4. Manasi Karkare, "Nanotechnology: Fundamentals and Applications", 2008
5. Fuleka, M H., "Nanotechnology: Importance and Applications", I K International Publishing House Pvt. Ltd., 2010



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L02	Subject Name: PATHOLOGY AND MICROBIOLOGY LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- The study of microorganisms, which are unicellular or cell-cluster microscopic organisms.
- Fungi and, protists and prokaryotes. Viruses, though not strictly classed as living organisms, are also studied

COURSE OUTCOMES (COs) : (3- 5)

CO1	Capable to understand the study of microorganisms, which are unicellular or cell-cluster microscopic organisms.
CO2	The graduate can analyze Fungi and, protists and prokaryotes. Viruses, though not strictly classed as living organisms, are also studied

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	L	M	H	L	M	H	L	M	H
CO2	H	M	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		L		M		H			
CO2	M		H		L		M		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18L02 PATHOLOGY AND MICROBIOLOGY LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

1. Measure the Gram positive and Gram negative, based on the differences of the chemical and physical properties of the cell wall.
2. Measure Rapid qualitative isolation method for obtaining discrete colonies from a mixed population.
3. Introduce and demonstrate the principle and experimental set up for determining the motility of microbes
4. Introduce and demonstrate the principle and experimental set up for determining the microbe's ability to detoxify hydrogen peroxide and /or to cause blood coagulation.
5. Introduce the preparation and use of different selective and differential media
6. Introduce and demonstrate the principle and experimental set up for determining the ability of microorganism to produce "Lecithinase" enzyme.
7. Study the different phases of growth of a bacterium by plotting a curve with time of growth on the X-axis and optical density on the Y-axis.
8. Study the different carbohydrate utilization of bacteria using phenol red carbohydrate fermentation broth.
9. Study the staining of bacteria with special stains that help to reveal their morphology thereby enhancing the contrast using a bright field microscope.
10. Determine the susceptibility of a microbial species against different antibiotic agents.
11. Check the quality of the given milk sample

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18L03	Subject Name: TRANSDUCER LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To learn practically about transducers and about the types of Transducers
- To study various transducers used for the measurement of various physical Quantities
- To identify suitable instruments to meet the requirements of industrial applications
- To measure Resistive, Capacitive and Inductive transducers
- To calibrate various transducers

COURSE OUTCOMES (COs) : (3- 5)

CO1	Enables the students to practically know about transducers and about the types of Transducers
CO2	Various transducers used for the measurement of various physical Quantities
CO3	The student can identify suitable instruments to meet the requirements of industrial applications
CO4	The graduate can measure Resistive, Capacitive and Inductive transducers
CO5	Graduate can calibrate various transducers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	M	H	H	M	M	L	H	M	H	M
CO2	H	H	H	H	M	M	L	L	M	H	M	L
CO3	H	M	M	M	M	L	M	M	H	H	M	L
CO4	M	H	H	M	H	M	H	H	H	M	L	M
CO5	H	H	H	M	L	M	L	M	H	H	M	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	H	H	L
CO2	H	H	H	M	M
CO3	M	H	H	M	L
CO4	H	H	M	H	L
CO5	M	M	H	L	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BEI18L03	TRANSDUCER LAB	0	0/0	3/0	1
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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. Characteristic of LDR, Thermistor and thermocouple.
8. Ramp response characteristic of filled in system thermometer.
9. Step response characteristic of RTD and thermocouple.
10. Flapper nozzle system.
11. P/I and I/P converters.
12. Study of smart transducers

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBT18IL2	Subject Name: BIO-CHEMISTRY LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- General biochemical reactions for the identification of bio molecules
- To quantitatively estimate the primary and secondary metabolites present in plants

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands General biochemical reactions for the identification of bio molecules
CO2	Capable to quantitatively estimate the primary and secondary metabolites present in plants

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	H	M	L	L	H	M	L	M
CO2	M	H	M	L	H	M	L	H	M	L	M	H
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	M	L	H							
CO2	H	M	M	L	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BBT18IL2	BIO-CHEMISTRY LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Laboratory Safety and Hygiene: Standard Operating Procedures, Units and Measurements, basic statistical concepts for biochemical analysis.
2. Use of Instruments, pH and Buffers.
3. Qualitative analysis of Carbohydrates.
4. Qualitative analysis of Proteins and Amino acids.
5. Qualitative analysis of carbohydrates, lipids and steroids.
6. Determination of pK and pI value of amino acid.
7. Estimation of amino acids by ninhydrin method.
8. Measurement of enzyme activity: alpha-amylase, catalase.
9. Biological Preparations: Isolation of caesin, lecithin and starch.

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18TS1	Subject Name: TECHNICAL SKILL 1	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The objective is to develop the technical skill of the students.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Develop the technical skills required in the field of study
CO2	Bridge the gap between the skill requirements of the employer or industry and the competency of the students.
CO3	Enhance the employability of the students.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	P O 2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	M	M	H	M	H	M
CO2	H	H	M	H	H	H	M	M	H	H	H	H
CO3	H	H	H	H	H	H	M	M	H	H	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		H		H		H		H			
CO2	H		H		H		H		H			
CO3	H		H		H		H		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								✓				

Subject Code: BEN18SK1	Subject Name : SOFT SKILLS I (CAREER AND CONFIDENCE BUILDING)	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	ETL	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab



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OBJECTIVE:

- To create awareness in students, various top companies helping them improve their skill set matrix, leading to develop a positive frame of mind.
- To help students be aware of various techniques of candidate recruitment and help them prepare CV's and resume.
- To help student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

COURSE OUTCOMES (COs) : (3- 5)

Students will be able to

CO1	Be aware of various top companies leading to improvement in skills amongst them.
CO2	Be aware of various candidate recruitment techniques like group discussion, interviews and be able to prepare CV's and resumes.
CO3	Prepare for different types of interviews and be prepared for HR and technical interviews.
CO4	Improve their verbal, written and other skills by performing mock sessions.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	M	M	H	M	H	M	H
CO2	L	L	L	L	L	M	M	H	M	H	M	H
CO3	L	L	L	L	L	M	M	H	M	H	M	H
CO4	L	L	L	L	L	M	M	H	M	H	M	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	L		L		H		L		L			
CO2	L		L		H		L		L			
CO3	L		L		H		L		L			
CO4	L		L		H		L		L			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓						✓			



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BEN18SK1	SOFT SKILLS I (CAREER AND CONFIDENCE BUILDING)	0	0/0	3/0	1
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UNIT I	6
Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness	

UNIT II	6
Group discussions / Do's and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume	

UNIT III	6
Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different procedures such as HR interviews and Technical Interviews / self-introductions	

UNIT IV	6
Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews	

UNIT V	6
Practical session on Group Discussion and written tests on vocabulary and reading comprehension	

Total No of Periods: 30



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18004	Subject Name :DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS - I	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

- To learn about cardiac system
- To study about neurological system
- To gain knowledge on skeletal muscular system
- To learn about heart-lung machine
- To study about respiratory measurement and ventilator

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires knowledge about cardiac system
CO2	Graduates gains knowledge on neurological system
CO3	Understands skeletal muscular system
CO4	Acquires knowledge about heart-lung machine
CO5	Graduate gains knowledge on respiratory measurement and ventilator

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	M	L	H	L	M	H	L	M	H
CO2	M	L	H	M	L	M	H	L	M	H	L	M
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	L	M	H	L	M	H	L	M	H	L	M	H
CO5	H	M	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	H	M	H	L	M							
CO3	L	M	L	H	M							
CO4	M	H	L	M	M							
CO5	M	H	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18004	DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS - I	3	1/0	0/0	4
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UNIT I	CARDIAC SYSTEM	12
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ECG -sources of ECG -normal and abnormal waveform -diagnosis interpretation -cardiac pacemaker-external pacemaker -implantable pacemaker -different types of pacemakers -fibrillator -defibrillator - AC defibrillator - DC defibrillator –electrodes -synchronized and unsynchronized types

UNIT II	NEUROLOGICAL SYSTEM	12
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EEG -genesis -lead system -wave characteristics -frequency bands -spontaneous and evoked response -diagnostic interpretation -epileptic discharges -Clinical significance of EEG -Multi-channel EEG recording system - MEG (Magneto Encephalo Graph)

UNIT III	SKELETAL MUSCULAR SYSTEM	12
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Structure of muscles -sliding theory of contraction -stimulation of muscles –muscle potential generation - recording and analysis of EMG waveforms -muscle and nerve stimulation - fatigue characteristics -Nerve conduction velocity measurement - EMG Bio Feedback Instrumentation

UNIT IV HEART-LUNG MACHINE 12

Need for the unit -functioning of bubble -disc type and membrane type oxygenators -finger pump -roller pump -electronic monitoring of functional parameter- Heart rate monitor - Holter Monitor – Phonocardiography - Plethysmography

UNIT V RESPIRATORY MEASUREMENT AND VENTILATOR 12

Spirometer -Respiratory volume measurement -Lung Volume and vital capacity - measurements of residual volume - pneumotachometer -artificial respirator - IPR type - functioning- Types of Ventilators - Pressure - Volume - Time controlled - Flow - Patient Cycle Ventilators - Humidifiers - Nebulizers - Inhalators

Total No of Periods: 60

TEXT BOOKS:

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998

REFERENCE BOOKS:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997
2. Joseph J.carr and John M. Brown, "Introduction to Biomedical equipment technology", John wiley and sons, New York, 1997



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18005	Subject Name: BIOMEDICAL INSTRUMENTATION	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:

- The student will study about communication mechanics in a biomedical system with few examples
- The students try to understand the basic principles in imaging techniques
- The student will acquire basic knowledge in life assisting and therapeutic devices

COURSE OUTCOMES (COs): (3- 5)

CO1	The graduate will be able to study about communication mechanics in a biomedical system with few examples
CO2	Understands the basic principles in imaging techniques
CO3	Acquires basic knowledge in life assisting and therapeutic devices

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	M	H	M	L	M	H	M	L	M
CO2	M	H	M	L	M	M	H	L	M	H	M	L
CO3	L	M	H	L	M	H	L	M	H	M	L	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	L	M	H	M							
CO2	H	M	H	M	H							
CO3	L	M	H	M	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
		✓										



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BBI18005 BIOMEDICAL INSTRUMENTATION 3 0/0 0/0 3

UNIT I BIO-POTENTIAL ELECTRODES 9

Electrode electrolyte interface- half-cell potential- polarization and non- polarizable electrode- calomel electrode- needle and wire electrode –microelectrode-metal micropipette

UNIT II RECORDING SYSTEM 9

Low Noise preamplifier- main amplifier and driver amplifier- inkjet recorder- thermal array recorder- photographic recorder- magnetic tape recorder- X-Y recorder-medical oscilloscope

UNIT III BIO-CHEMICAL MEASUREMENT 9

pH- pO₂- pCO₂- pHCO₃ –Electrophoresis –colorimeter –spectrophotometer- flame photometer- auto analyzer- application in biomedicine

UNIT IV NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Respiration-heart rate – temperature-pulse blood pressure-cardiac output- O₂- CO₂ measurements-applications

UNIT V BLOOD FLOW AND BLOOD CELL COUNTING 9

Electromagnetic and ultrasonic blood flowmeter-indicator dilution method- thermo dilution method- manual and automatic counting of RBC- WBC and platelets

Total No of Periods: 45

TEXT BOOKS:

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998.
2. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 1997

REFERENCE BOOKS:

1. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 1997
2. Joseph J.carr and John M. Brown, “introduction to Biomedical equipment technology”, John wiley and sons, New York, 1997



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Subject Code: BEI18ET1	Subject Name : MEASUREMENTS AND INSTRUMENTATION	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: TRANSDUCER ENGINEERING	ETL	1	0/1	3/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn Developing adequate knowledge of the instruments, relevant circuits and their working
- To study about Introduction to electrical instruments and measurements techniques.
- To learn the analog and digital techniques used to measure voltage, current, power etc

COURSE OUTCOMES (COs) : (3- 5)

CO1	Developing adequate knowledge of the instruments, relevant circuits and their working
CO2	Introduction to electrical instruments and measurements techniques.
CO3	To Emphasis Knowledge on analog and digital techniques used to measure voltage, current, power etc.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	H	L	H	M	L	M	H	M
CO2	M	H	L	M	H	L	M	H	M	L	M	H
CO3	L	M	H	M	L	M	H	L	M	H	L	M
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		L		M		M			
CO2	H		M		H		M		H			
CO3	M		L		H		M		L			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEI18ET1 MEASUREMENTS AND INSTRUMENTATION 1 0/1 3/0 3

UNIT I INTRODUCTION 9

Units -Dimensions and standards-measurement errors - PMMC -moving iron instruments - Galvanometer - construction -Principle of operation- Types of Ammeter and voltmeter- Rectifier type voltmeter and ammeter

UNIT II RESISTANCE, INDUCTANCE AND CAPACITANCE MEASUREMENTS 9

Resistance measurement - wheat stone bridge - Kelvin double bridge - measurement of inductance: Maxwell bridge- Hay's bridge measurement of capacitance: Schering bridge -student type potentiometer-precision potentiometer - AC potentiometer -polar and co-ordinate type - application

UNIT III WATT METER AND ENERGY METER CALIBRATION 9

Electro dynamic Instruments -wattmeter - theory and its error - methods of correction - LPF wattmeter - induction type wattmeter - theory and adjustment - calibration of wattmeter and energy meter -Instrument transformer - construction and theory of current Transformer and potential Transformer

UNIT IV ANALOG AND DIGITAL INSTRUMENTS 9

CRO - operation - measurement of voltage - frequency and phase-Analog storage oscilloscope- sampling oscilloscope -DSO - operation -signal and function generation - Digital voltmeter and multimeter - Q-meter

UNIT V DIGITAL DISPLAY AND RECORDING DEVICES 9

Bar graph display - seven segment and dot matrix display - signal recorders - XY recorders - magnetic tape recorders - digital recording and data loggers

Total No of Periods: 45

TEXT BOOKS:

1. Cooper, "Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 1988
2. A. K. Shawney, "Electronics and Electrical Instrumentation", Tata McGraw Hill, 1975
3. David A. Bell, Electronic Instrumentation and Measurements, Prentice Hall of India New Delhi 2005

REFERENCE BOOKS:

1. Bouwels A.J., "Digital Instrumentation", McGraw Hill, 1986
2. Barney .C, "Intelligent Instrumentation", Prentice Hall of India, 1985
3. Oliver and Cage, "Electronic Measurements and Instruments and Instrumentation", McGraw Hill, 1975
4. Deobelin, "Measurements Systems", McGraw Hill, 1990



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Subject Code: BBI18L03	Subject Name: BIOMEDICAL INSTRUMENTATION LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Study of Biological Preamplifiers.
- To learn Recording of ECG signal and Analysis.
- To learn Recording of Audiogram.
- To study Recording of EMG

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands Biological Preamplifiers.
CO2	Capable of Recording of ECG signal and Analysis.
CO3	Capable of Recording of Audiogram.
CO4	Capable of Recording of EMG

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	H	M	L	M	M	L	H	M	L
CO2	H	M	L	M	H	L	M	H	L	M	H	L
CO3	M	M	M	L	H	M	L	H	M	L	M	H
CO4	L	M	H	M	L	M	H	L	M	H	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	M	H	L	M	H							
CO3	M	H	L	M	H							
CO4	M	L	M	H	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BBI18L03	BIOMEDICAL INSTRUMENTATION LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Study of Biological Preamplifiers.
2. Recording of ECG signal and Analysis.
3. Recording of Audiogram.
4. Recording of EMG.
5. Recording of EEG.
6. Recording of various physiological parameters using patient monitoring system and telemetry units.
7. Measurement of pH, pO₂ and conductivity.
8. Study and analysis of functioning and safety aspects of surgical diathermy.

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L04	Subject Name :DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS - I LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Diagnostic and Therapeutic Equipments - I	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn about cardiac system
- To study about neurological system
- To gain knowledge on skeletal muscular system
- To learn about heart-lung machine
- To study about respiratory measurement and ventilator

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires knowledge about cardiac system
CO2	Graduates gains knowledge on neurological system
CO3	Understands skeletal muscular system
CO4	Acquires knowledge about heart-lung machine
CO5	Graduate gains knowledge on respiratory measurement and ventilator

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	M	L	H	L	M	H	L	M	H
CO2	M	L	H	M	L	M	H	L	M	H	L	M
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	L	M	H	L	M	H	L	M	H	L	M	H
CO5	H	M	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		L		M		H			
CO2	H		M		H		L		M			
CO3	L		M		L		H		M			
CO4	M		H		L		M		M			
CO5	M		H		L		M		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BBI18L04	DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS - I LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Study of ECG, normal and abnormal waveform, diagnosis interpretation
2. Study of EEG, normal and abnormal waveform, diagnosis interpretation
3. Study of EMG, normal and abnormal waveform, diagnosis interpretation
4. Recording of external pacemaker, normal and abnormal waveform, diagnosis interpretation
5. Surgical diathermy normal and abnormal waveform, diagnosis interpretation
6. Spirometer normal and abnormal waveform, diagnosis interpretation
7. Oxygenators diagnosis interpretation
8. Finger pump diagnosis interpretation

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18L05	Subject Name: MICROPROCESSOR, MICROCONTROLLER AND ITS APPLICATIONS LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The students understand to do basic programming in microprocessors and Interfacing.
- Basic concept to understand code conversion.
- Logical calculations to carry out basic arithmetic.
- Graduates to understand the programming concepts of microprocessor.
- To understand the programming concepts of microcontroller.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Capable of programming in microprocessors and Interfacing.
CO2	Familiar with code conversion.
CO3	Capable of performing Logical calculations to carry out basic arithmetic
CO4	Capable of understand the programming concepts of microprocessor.
CO5	Understand the programming concepts of microcontroller.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	L	H	M	H	M
CO2	H	H	H	M	M	L	L	L	M	L	M	L
CO3	H	H	H	H	H	H	M	M	H	M	H	M
CO4	H	H	H	H	H	M	M	M	H	M	H	M
CO5	H	H	H	H	H	M	M	M	H	M	H	M
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	L		M		M		L		M			
CO2	M		M		M		M		H			
CO3	M		M		M		M		H			
CO4	M		M		M		L		H			
CO5	L		M		M		M		M			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BE118L05	MICROPROCESSOR, MICROCONTROLLER AND ITS APPLICATIONS LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Familiarization of 8085 Microprocessor kit
2. Familiarization of 8051 Microcontroller kit
3. Exercise on 8085 and 8051 assembly language Program
4. Interfacing of switches and display devices
5. Interfacing of D/A and A/D Converters
6. Interface of key board and display using programmable controllers
7. Interface of programmable Timer
8. Stepper motor control using microprocessor
9. Simple 8086 assembly language programming exercises
10. Study of MASM and DEBUG utilities

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18TS2	Subject Name :TECHNICAL SKILL 2	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Technical Skill 1	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :The objective is to develop the technical skill of the students.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Develop the technical skills required in the field of study
CO2	Bridge the gap between the skill requirements of the employer or industry and the competency of the students.
CO3	Enhance the employability of the students.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	M	M	H	M	H	M
CO2	H	H	M	H	H	H	M	M	H	H	H	H
CO3	H	H	H	H	H	H	M	M	H	H	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		H		H		H		H			
CO2	H		H		H		H		H			
CO3	H		H		H		H		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
								✓				



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18006	Subject Name : DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS II	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Diagnostic and Therapeutic Equipments I	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn about Ultrasonic Techniques for Diagnosis
- To gain knowledge on Patient Monitoring and Biotelemetry
- To study about Diathermy
- To learn about Special Diagnostic Techniques
- To gain knowledge on Patient Safety

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires knowledge on Ultrasonic Techniques for Diagnosis
CO2	Graduate understands Patient Monitoring and Biotelemetry
CO3	Understands Diathermy
CO4	Graduate gains knowledge on Special Diagnostic Techniques
CO5	Understands Patient Safety

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	M	H	L	M	L	H	M	L	H
CO2	H	M	L	H	M	L	H	L	M	H	L	M
CO3	H	M	L	M	H	L	M	H	L	M	H	L
CO4	M	L	M	H	L	M	H	L	M	H	L	M
CO5	L	M	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		M		L		H		M			
CO2	H		M		L		M		H			
CO3	M		H		L		H		M			
CO4	M		H		L		M		H			
CO5	L		M		H		L		M			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



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BBI18006	DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS II	3	1/0	0/0	4
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UNIT I ULTRASONIC TECHNIQUES FOR DIAGNOSIS 12

Tissue Reaction - Basic principles of Echo technique -display techniques A, B, M modes -Application of ultrasound as diagnostic tool -Echo cardiograms -Echo encephalogram -Ultrasonic applied as diagnostic tool in ophthalmology -obstetrics and gynecology

UNIT II PATIENT MONITORING AND BIOTELEMETRY 12

Patient monitoring system – ICU -post operative, ICCU -single channel telemetry -Multichannel telemetry -frequency allotment -radio pill - Transmission of Bio-signals over telephone lines- Central consoling controls- Applications in ECG and EEG Transmission.

UNIT III DIATHERMY 12

Clinical applications of electrotherapy -short wave diathermy -ultrasonic diathermy -microwave diathermy -surgical diathermy unit -IR lamps - UV lamps- Electro surgery machine - Current waveforms - Tissue Responses- Hazards and safety procedures

UNIT IV SPECIAL DIAGNOSTIC TECHNIQUES 12

Principles of Cryogenic technique and application –Endoscopy – Laparoscopy - Thermography

UNIT V PATIENT SAFETY 12

Physiological effects of electricity - important susceptibility parameters - Sources of leakage current - Micro and Macro shock-monitoring circuits-earthing schemes- Electrical safety analyzer - Testing the Electric system

Total No of Periods: 60

TEXT BOOKS:

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

REFERENCE BOOKS:

1. John G.Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998
2. Joseph J.Carr and John M.Brown, “Introduction to Biomedical Equipment technology”, John Wiley and sons, New York, 1997



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18007	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIOMEDICAL INSTRUMENTATION	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To provide adequate technical information on operating principles of medical instruments
- To attain mastery in fault detection and corrective measures.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the information on operating principles of medical instruments
CO2	Capable in finding fault detection and corrective measures.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	H	L	M	H	M	L	M	H
CO2	M	H	M	L	M	H	M	L	M	M	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	L	H	M	H							
CO2	H	M	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



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BBI18007	TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS	3	1/0	0/0	4
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UNIT I BASIC OF TROUBLESHOOTING PROCEDURES 12

Troubleshooting Process and Fault-finding Aids- Troubleshooting Techniques- Grounding Systems in Electronic Equipment- Temperature Sensitive Intermittent Problems-Correction Action - repair the Equipment

UNIT II TESTING OF DEVICES 12

Testing procedure of electronic components- causes of failure for electronic components- testing procedure of special diodes- bipolar transistors- field effect transistor (FET)- thyristor

UNIT III FAULT DIAGNOSIS IN CIRCUITS 12

Fault Diagnosis Circuits- Digital Troubleshooting Methods- Circuit board Troubleshooting

UNIT IV BIOMEDICAL EQUIPMENT I TROUBLESHOOTING 12

Trouble shooting of ECG Machine- EEG Machine- EMG Machine - Defibrillator Electrosurgical unit- Anesthesia machine- Autoclaves and sterilizers- Endoscope

UNIT V BIOMEDICAL EQUIPMENT II TROUBLESHOOTING 12

Troubleshooting of Incubators –Nebulizer- Oxygen Concentrators- Oxygen cylinders and flow meters- Pulse Oximeter –Sphygmomanometers- Suction Machine- X-Ray Machine Troubleshooting- Patient Monitoring Machine troubleshooting

Total No of Periods: 60

TEXT BOOKS:

1. Khandpur R S, “Troubleshooting Electronic Equipment- Includes Repair and Maintenance”, Tata McGraw-Hill, Second Edition 2009
2. Dan Tomaland Neal Widmer, “Electronic Troubleshooting”, McGraw Hill, 3rd Edition 2004.

REFERENCE BOOKS:

1. Nicholas Cram and Selby Holder, “Basic Electronic Troubleshooting for Biomedical Technicians”, TSTC Publishing, 2nd Edition, 2010
2. World Health Organisation, “Maintenance and Repair of Laboratory, Diagnostic imaging and Hospital Equipment”, Geneva, 1994
3. Ian R, McClelland, “X-ray Equipment maintenance and repairs workbook for Radiographers and Radiological Technologists”, World Health Organisation, Geneva, 2004
4. Ministry of Health and Family Welfare, “Medical Equipment Maintenance Manual- A first line maintenance guide for end users”, New Delhi, October 2010
5. Joseph.J, Panichello, “X-Ray Repair: A Comprehensive Guide to the Installation and Servicing of Radiographic Equipment”, Charles C Thomas Publisher Ltd, 2nd Edition, 2005



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BB118ET2	Subject Name : BIO-MECHANICS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	ETL	1	0/1	3/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study about Biofluid mechanics
- To learn about Cardiac mechanics
- The student will analyze Respiratory mechanics
- To learn about Soft tissue mechanics
- Student will learn about Orthopedic mechanics

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the Biofluid mechanics
CO2	Capable to analyze Cardiac mechanics
CO3	Capable to analyze Respiratory mechanics
CO4	Understands the Soft tissue mechanics
CO5	Student can analyze Orthopedic mechanics

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	M	H	M	L	L	M	H	M	L
CO2	M	H	M	L	M	L	H	M	L	H	M	L
CO3	H	M	L	H	M	L	M	H	L	M	H	M
CO4	L	L	M	H	L	M	H	L	M	H	L	H
CO5	H	M	L	H	M	H	M	L	H	M	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	M	L	H
CO2	M	M	M	L	M
CO3	H	M	L	H	M
CO4	M	H	L	M	H
CO5	H	M	L	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18ET2	BIO-MECHANICS	1	0/1	3/0	3
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UNIT I	BIOFLUID MECHANICS	9
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Newton's laws- stress, - strain elasticity- Hooke's-law – viscosity- Newtonian fluid- Non-Newtonian fluid- Viscoelastic fluids- vascular tree - Relationship between diameter -velocity and pressure of blood flow - resistance against flow

UNIT II CARDIAC MECHANICS 9

Cardio vascular system- Mechanical properties of blood vessels - arteries -arterioles -capillaries - veins - blood flow: laminar and turbulent -physics of cardio vascular diseases -prosthetic heart valves and replacement

UNIT III RESPIRATORY MECHANICS 9

Alveoli mechanics- interaction of blood and lung- P-V curve of lung- breathing mechanism- airway resistance- physics of lung diseases

UNIT IV **SOFT TISSUE MECHANICS** 9

Pseudo elasticity- nonlinear stress-strain relationship -viscoelasticity -structure- function and mechanical properties of skin- ligaments and tendons

UNIT V ORTHOPAEDIC MECHANICS 9

Mechanical properties of cartilage- diffusion properties of articular cartilage- mechanical properties of bone- kinetics and kinematics of joints- lubrication of joints analysis of force in orthopedic implants

Total No of Periods: 45

TEXT BOOKS:

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

REFERENCE BOOKS:

1. D.Dawsonand Right, "Introduction to bio-mechanics of joints and jointreplacement", Mechanical Engineering Publication Ltd, 1989



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L05	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To provide adequate technical information on operating principles of medical instruments
- To attain mastery in fault detection and corrective measures.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the information on operating principles of medical instruments
CO2	Capable in finding fault detection and corrective measures.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	H	L	M	H	M	L	M	H
CO2	M	H	M	L	M	H	M	L	M	M	H	M
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		L		H		M		H			
CO2	H		M		L		M		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BBI18L05	TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Study of Troubleshooting Process and Fault-finding Aids.
2. Troubleshooting of Temperature Sensitive Intermittent Problems.
3. testing procedure of resistors, capacitors and inductors
4. Fault Diagnosis in Op-Amp Circuits
5. Digital Troubleshooting Methods
6. Trouble shooting of ECG Machine
7. Troubleshooting of EEG Machine,
8. Troubleshooting of Defibrillator Electrosurgical unit.
9. Troubleshooting of Anesthesia machine.
10. Troubleshooting of Nebulizer.

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L06	Subject Name : DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS II LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Diagnostic and Therapeutic Equipments I LAB	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn about Ultrasonic Techniques for Diagnosis
- To gain knowledge on Patient Monitoring and Biotelemetry
- To study about Diathermy
- To learn about Special Diagnostic Techniques
- To gain knowledge on Patient Safety

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires knowledge on Ultrasonic Techniques for Diagnosis
CO2	Graduate understands Patient Monitoring and Biotelemetry
CO3	Understands Diathermy
CO4	Graduate gains knowledge on Special Diagnostic Techniques
CO5	Understands Patient Safety

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	M	H	L	M	L	H	M	L	H
CO2	H	M	L	H	M	L	H	L	M	H	L	M
CO3	H	M	L	M	H	L	M	H	L	M	H	L
CO4	M	L	M	H	L	M	H	L	M	H	L	M
CO5	L	M	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	M	L	H	M							
CO2	H	M	L	M	H							
CO3	M	H	L	H	M							
CO4	M	H	L	M	H							
CO5	L	M	H	L	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BBI18L06	DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS II LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Study and analysis of Echo cardiograms
2. Study and analysis of Echo encephalogram
3. Study and analysis of Ultrasonic applied as diagnostic tool in ophthalmology,
4. Study and analysis of single channel telemetry
5. Study and analysis of Multichannel telemetry
6. Study and analysis of short-wave diathermy
7. Study and analysis of microwave diathermy,
8. Study and analysis of Laparoscopy
9. Study and analysis of Cryogenic technique
10. Study and analysis of Surgical diathermy unit

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEN18SK2	Subject Name : SOFT SKILLS II (QUALITATIVE AND QUANTITATIVE SKILLS)	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Soft Skills - I	ETL	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The main objective is to strengthen the logical and arithmetic reasoning skills of the students.

- To help students to improve their Logical reasoning.
- To help students to improve their arithmetic reasoning.
- To help students improve their data interpretation skills

COURSE OUTCOMES (COs) : (3- 5)

CO1	Prepare students for Logical reasoning
CO2	Prepare students for arithmetic reasoning
CO3	Prepare students for data interpretation skills

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	M	M	H	M	H	M	H
CO2	L	L	L	L	L	M	M	H	M	H	M	H
CO3	L	L	L	L	L	M	M	H	M	H	M	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	L		L		H		L		L			
CO2	L		L		H		L		L			
CO3	L		L		H		L		L			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
									✓			



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BEN18SK2	SOFT SKILLS II (QUALITATIVE AND QUANTITATIVE SKILLS)	0	0/0	3/0	1
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UNIT I	LOGICAL REASONING I	6
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Logical Statements – Arguments – Assumptions – Courses of Action

UNIT II	LOGICAL REASONING II	6
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Logical conclusions – Deriving conclusions from passages – Theme detection

UNIT III	ARITHMETICAL REASONING I	6
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Number system – H.C.F and L.C.M – Problem on ages – Percentage – Profit and Loss – Ratio and Proportion – Partnership

UNIT IV	ARITHMETICAL REASONING II	6
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Time and Work – Time and Distance – Clocks – Permutations and Combinations – Heights and Distances – Odd man out and Series

UNIT V	DATA INTERPRETATION	6
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Tabulation – Bar graphs – Pie graphs – Line graphs

Total No of Periods: 30

REFERENCE BOOKS:

1. R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand and Co., (2017).
2. R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand and Co., (2017).
3. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand and Co., (2017).
4. A.K.Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).
5. B.S.Sijwali, Indusijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L07	Subject Name : MINI PROJECT/ INPLANT	TY /	L	T /	P/ R	C
	TRAINING/ INDUSTRIAL TRAINING	LB/		S.Lr		
	Prerequisite: None	ETL	L	0	0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE : The main objective of the Inplant training is to provide a short-term work experience in an Industry/ Company/ Organization

COURSE OUTCOMES (COs) : (3- 5)

CO1	To get an insight of an industry / organization/company pertaining to the domain of study
CO2	To acquire skills and knowledge for a smooth transition into the career.
CO3	To gain field experience and get linked with the professional network

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	L	L	L	H	H	H	H	H	H	H
CO2	H	M	H	M	M	M	M	M	H	H	H	M
CO3	H	H	H	H	M	H	M	H	H	H	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10	PSO11	PSO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18TS3	Subject Name : TECHNICAL SKILL 3								TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: TECHNICAL SKILL 2								L	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits													
T/L/ETL : Theory/Lab/Embedded Theory and Lab													
OBJECTIVE :The objective is to develop the technical skill of the students.													
COURSE OUTCOMES (COs) : (3- 5)													
CO1		Develop the technical skills required in the field of study											
CO2		Bridge the gap between the skill requirements of the employer or industry and the competency of the students.											
CO3		Enhance the employability of the students.											
Mapping of Course Outcomes with Program Outcomes (POs)													
COs/POs		P O 1	P O 2	PO3	P O4	P O5	P O6	P O7	PO 8	PO9	PO 10	PO1 1	PO12
CO1		H	H	H	H	H	H	M	M	H	M	H	M
CO2		H	H	M	H	H	H	M	M	H	H	H	H
CO3		H	H	H	H	H	H	M	M	H	H	H	H
COs / PSOs		PSO1		PSO2		PSO3		PSO4		PSO5			
CO1		H		H		H		H		H			
CO2		H		H		H		H		H			
CO3		H		H		H		H		H			
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low													
Category		Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
									✓				



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18008	Subject Name : MEDICAL IMAGE PROCESSING	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn the different methods and modalities used for medical imaging
- To learn the preferred medical imaging methods for routine clinical applications
- To understand the engineering models used to describe and analyze medical images

COURSE OUTCOMES (COs) : (3- 5)

CO1	The graduate understands the different methods and modalities used for medical imaging
CO2	The graduate is capable of understanding the preferred medical imaging methods for routine clinical applications
CO3	Graduate is capable to explain the engineering models and analyze medical images

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	L	M	H	M	L	M	H	M	H
CO2	H	M	L	M	H	L	M	H	L	M	H	M
CO3	L	M	H	L	M	H	L	M	H	L	M	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		M		H		M			
CO2	L		M		H		M		L			
CO3	H		M		L		M		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18008 MEDICAL IMAGE PROCESSING 3 1/0 0/0 4

UNIT I IMAGE FUNDAMENTALS 12

Image perception- MTF of the visual system- image fidelity criteria- image model- image sampling and quantization - sampling theory- image quantization- optimum mean square quantizer- image transforms - 2D-DFT and other transforms- Relationships between pixels

UNIT II IMAGE PREPROCESSING 12

Image enhancement - point operation- spatial operations- Smoothing and Sharpening -Spatial Filtering- transforms operations- Image restoration- Smoothing and Sharpening frequency domain filters - image degradation model- inverse and Wiener filtering

UNIT III IMAGE ANALYSIS AND CLASSIFICATION 12

Image analysis - spatial feature extraction- edge detection- image segmentation classification techniques - statistical methods- neural network approaches- Region based segmentation-Morphological processing- erosion and dilation

UNIT IV RECONSTRUCTION OF CT AND MRI IMAGES 12

Image reconstruction from projections - Radon transforms- filter back projection algorithm- algebraic methods- 3D tomography- imaging methods in CT images- imaging methods in magnetic resonance imagers

UNIT V TRANSMISSION OF MEDICAL 12

Medical image data compression and transmission - transform coding pixel coding- predictive coding- interframe coding - Application of image processing techniques in thermography -SPECT -PET- AI techniques in medical imaging -Bio magnetic diagnosis in connection with medical imaging of CT or MRI - image processing algorithms on medical images

Total No of Periods: 60

TEXT BOOKS:

1. Albert Macouskl, "Medical Imaging Systems", Prentice Hall New Jersey, 1983
2. Gonzalez. R and Wintz P., "Digital Image Processing", Addison Wesley Publishing Co. USA, 1987

REFERENCE BOOKS:

1. Eric Krestel, "Imaging Systems for Medical diagnosis", Siemens Aktiengesellschaft, FRG, 1995
2. Alfred Horowitz, "MRI Physics for Radiologists – A Visual Approach", Springer Verlag, New York, II Edition, 1991
3. Anil K. Jain, "Fundamental of Digital Image Processing", Prentice Hall of India Pvt Ltd., New Delhi, 1995



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BMG18009	Subject Name : TOTAL QUALITY MANAGEMENT FOR BIOMEDICAL ENGINEERS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the various quality standards
- To understand regulations used for healthcare
- To get an overview of various methodologies
- To understand about management in healthcare
- To understand about the Recent trends

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires knowledge on the various quality standards
CO2	Capable to regulations used for healthcare
CO3	Capable of analyzing overview of various methodologies
CO4	Acquires knowledge of management in healthcare
CO5	Graduate knows the Recent trends

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	M	H	L	M	H	L	M	H
CO2	H	H	H	M	L	M	H	L	M	H	L	M
CO3	L	M	H	L	M	H	L	M	H	L	M	H
CO4	M	H	M	L	M	H	L	M	H	L	M	H
CO5	L	M	H	L	M	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	L	M	L	M	H							
CO3	H	M	L	M	H							
CO4	M	L	M	H	L							
CO5	M	H	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓									



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMG18009 TOTAL QUALITY MANAGEMENT FOR 3 0/0 0/0 3
BIOMEDICAL ENGINEERS

UNIT I FUNDAMENTALS OF QUALITY MANAGEMENT 9

Definition of Quality- Dimensions of Quality-Quality Planning - Quality costs - Analysis Techniques of quality Cost - Basic concepts of Total Quality Management- Historical Review - Principles of TQM, Leadership – Concepts- Role of Senior Management - Quality Council, Quality Statements - Strategic Planning - Deming Philosophy - Barriers to TQM Implementation

UNIT II QUALITY MANAGEMENT PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality - Customer Complaints- Service Quality Customer Retention - Employee Involvement – Motivation- Empowerment - Teams and Team Work - Recognition and Reward- Performance Appraisal- Benefits - Continuous Process Improvement – Juran Trilogy - PDSA Cycle, 5S, Kaizen - Supplier Partnership – Partnering- sourcing- Supplier Selection- Supplier Rating- Relationship Development - Performance Measures – Basic Concepts- Strategy- Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL 9

Seven Tools of Quality: I, II, and III - Concept of Six Sigma: I and II - New Seven Management tools: I and II - Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample - Normal Curve, Control Charts for variables and attributes, Process capability

UNIT IV TQM TOOLS 9

Benchmarking – Reasons to Benchmark - Benchmarking Process - Quality Function Deployment (QFD) – House of Quality - QFD Process - Benefits - Taguchi Quality Loss Function - Total Productive Maintenance (TPM) – Concept, Improvement Needs - FMEA – Stages of FMEA

UNIT V REGULATORY ORGANIZATIONS IN MEDICINE 9

Need for ISO 9000 and Other Quality Systems - ISO 9000:2000 Quality System – Elements, Implementation of Quality System - Quality Auditing - Need for Accreditation of hospitals - FDA Regulations- Joint Commission - Regulatory Bodies of India-Medical Council of India - Pharmacy Council Of India, Indian Nursing Council - Dental Council of India, Homeopathy Central Council

Total No of Periods: 45

TEXTBOOKS:

1. Rose J.E, “Total Quality Management”, Kogan Page Ltd., 1993.
2. Cesar A. Cacere& Albert Zana, ”ThePractise of clinical Engineering”. Academic Press, Newyork, 1997.

REFERENCES BOOKS:

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



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18ET3	Subject Name :VIRTUAL INSTRUMENTATION FOR MEDICAL APPLICATION	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIOMEDICAL INSTRUMENTATION	ETL	1	0/1	3/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To educate about the Basic concepts of VI
- To make them understand the programming concepts of VI.
- To provide an insight to various Common Instrument Interface.
- To enable them to implement VI in medical systems
- To impart knowledge on various analysis tools

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the Basic concepts of VI
CO2	Understands the programming concepts of VI.
CO3	Capable to analyze various Common Instrument Interface
CO4	Capable to implement VI in medical systems
CO5	Understands various analysis tools

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	M	L	M	H	L	M	H	M
CO2	M	M	M	L	M	H	L	M	H	L	M	H
CO3	M	H	L	M	L	M	L	M	L	H	M	L
CO4	H	M	L	M	H	M	L	M	H	L	M	H
CO5	L	M	H	M	L	M	H	L	M	H	M	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	M	L	H	M	L							
CO3	H	H	M	L	H							
CO4	M	H	L	M	H							
CO5	M	H	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18ET3	VIRTUAL INSTRUMENTATION FOR MEDICAL APPLICATION	1	0/1	3/0	3
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UNIT I INTRODUCTION 9

Virtual instrumentation (VI): Evolution –Definition –Architecture- Conventional and Distributed – VI - Comparison of VI with traditional Instruments- Need of VI –advantages- block diagram- data flow techniques- graphical programming- Comparison between graphical programming and conventional programming- VI in engineering process

UNIT II PROGRAMMING MODES 9

Front panel- Block diagram- LABVIEW Environment: Startup-Shortcut and Pull-down menu-Pallets- Control structures: FOR loop- WHILE loop- Shift Registers- feedback nodes- Selection Structures: Case and sequence structures- Formulae nodes- Arrays- Clusters- Waveform Chart and graph- XY Graph- Strings- Tables- File I/O functions

UNIT III HARDWARE ASPECTS 9

Pull-up and pull-down resistors -TTL to solid state Relays -Voltage dividers -data acquisition in LABVIEW -hardware installation and configuration -Data acquisition (DAQ): Components - Accessories –Hardware and Software

UNIT IV COMMON INSTRUMENT INTERFACE 9

4-20mA -60mA -RS232 -RS422 -RS485 -General purpose interface bus (GIPB) -Virtual Instrument Software Architecture (VISA) -Universal serial port bus(USB) -Peripheral computer interface (PCI) -VME extensions for instrumentation (VXI) -PCI extensions for Instrumentation (PXI) -Personal Computer Memory Card International Association (PCMCIA) -Signal conditioning extension for instrumentation (SCXI)

UNIT V ANALYSIS TOOLS AND APPLICATIONS OF VI 9

Fourier transform -Power spectrum –Correlation –Windowing –filtering –Oscilloscope -Waveform generator –Multi-channel data acquisition using LABVIEW -ECG acquisition for long term monitoring of heart rate using VI

Total No of Periods: 45

TEXT BOOKS:

1. Gary Jonson, “Labview Graphical Programming”, Second Edition, McGrawHill, New York, Fourth edition 2006
2. Lisa K wells and Jeffrey Travis, “Labview for everyone”, Prentice Hall Inc, New Jersey, First edition, 1997

REFERENCE BOOKS:

1. Gupta S J, Gupta P, “PC interfacing for Data Acquisition and Process Control”, Instrument Society of America, Second Edition, 1994
2. Technical Manuals for DAS Modules of Advantech and National Instruments



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L08	Subject Name : BIO-SIGNAL ACQUISITION LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To represent the basic discrete time signals and analyze it
- To design the IIR and FIR filter
- To acquire various types of bio signals and study its characteristics

COURSE OUTCOMES (COs) : (3- 5)

CO1	The graduate is capable of representing the basic discrete time signals and analyze it
CO2	Capable to design the IIR and FIR filter
CO3	Capable to acquire various types of bio signals and study its characteristics

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	H	M	L	M	H	L	M	H	M
CO2	H	M	L	M	H	L	M	H	L	M	H	L
CO3	M	L	H	M	L	M	L	H	M	L	M	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		M		L		M		H			
CO2	L		M		L		M		H			
CO3	M		L		H		H		M			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
							✓					



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18L08	BIO-SIGNAL ACQUISITION LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Representation of basic discrete time signals
2. Computation of convolution –linear convolution
3. Response of a difference equation to initial conditions; stability
4. DFT and FFT computation
5. FIR filter design using windowing techniques
6. IIR filters design-digital Butterworth filter and Chebyshev filter
7. Simulation of signals.
8. Simulation of ECG signals.
9. Simulation of EEG signals
10. Simulation of EMG signals

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L09	Subject Name : BIOMEDICAL IMAGE PROCESSING LAB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: MEDICAL IMAGE PROCESSING	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To analyze various types of bio signals and study its characteristics

COURSE OUTCOMES (COs) : (3- 5)

CO1 Capable to analyze various types of bio signals and study its characteristics

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	H	M	L	H	M	M	L	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		L		M		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



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BBI18L09	BIOMEDICAL IMAGE PROCESSING LAB	0	0/0	3/0	1
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LIST OF EXPERIMENTS

1. Analysis of Bio-signals.
2. Analysis of ECG signals.
3. Analysis of EEG signals
2. Analysis of EMG signals
3. To obtain the response of I order low pass filter
4. To obtain the response of II order band pass filter
5. To analysis the ECG waveform using MATLAB
6. To analyze IIR digital filter for ECG using MATLAB
7. To perform Frequency domain analysis of the ECG using MATLAB
8. To perform EEG signal averaging using MATLAB

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L10	Subject Name :PROJECT PHASE - I	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/3	2

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue,address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions
CO3	To refine research skills and demonstrate their proficiency in communication skills.
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	M	H	H	L	M	M	H	H
CO2	H	H	H	H	H	H	H	M	M	M	H	H
CO3	H	H	H	H	H	H	H	M	M	H	H	M
CO4	H	M	H	H	H	H	M	H	H	H	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		H		H		H		H			
CO2	H		H		H		H		H			
CO3	H		H		H		H		H			
CO4	H		H		H		H		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BHS18FLX	Subject Name :FOREIGN LANGUAGE	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	3/0	1

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	L	H	L	H	M	H	H	L
CO2	M	L	L	L	L	H	L	H	H	H	H	L
CO3	L	L	M	M	L	H	M	H	M	H	H	L
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	L		L		L		L		L			
CO2	L		L		L		L		L			
CO3	L		L		L		L		L			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			✓									



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18010	Subject Name :MEDICAL WASTE MANAGEMENT	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	1/0	0/0	4

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The study would ensure safe practices
- The study of proper management of medical waste
- The study order to safeguard the patient
- The study of health care
- The study of community and the environment.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands safe practices
CO2	Capable to understand proper management of medical waste,
CO3	Capable to analyze safeguard of the patient
CO4	Understands health care
CO5	Familiarized with community and the environment.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	M	L	L	M	H	L	H	M
CO2	M	H	L	M	H	L	M	H	L	M	H	M
CO3	H	M	L	H	M	L	H	M	L	H	M	L
CO4	M	H	M	L	M	H	L	M	H	L	M	H
CO5	M	H	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	L	M	H
CO2	H	M	L	H	M
CO3	M	H	M	H	L
CO4	H	M	L	M	M
CO5	H	M	L	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



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BBI18010 MEDICAL WASTE MANAGEMENT 3 1/0 0/0 4

UNIT I INTRODUCTION AND WASTE SEGREGATION 12

General Introduction- Definition of Biomedical Waste- General and Hazardous health care waste - Colour Coding and types of containers for disposal of medical waste – Segregation - Collection and Disposal

UNIT II TYPES OF BIOMEDICAL WASTE 12

Infectious waste - Genotoxic waste - Waste Sharps – Categories - Categorization and composition of Biomedical waste - Liquid Biomedical Waste - Radioactive wastes – Metals - Chemicals & drugs

UNIT III HOSPITAL GENERATED WASTE 12

Human Blood and Blood Products-Contaminated sharps- Contaminated animal carcasses- body parts and bedding -Basic information about infection- Infectious agents on organizations spread of infection- Basic information about Hospital acquired infection

UNIT IV TYPES OF WASTE DISPOSAL 12

Disinfections unit container for Autoclaving- Sharp waste containers for storage and transportation - autoclaving - Incineration- Plasma Pyrolysis /Gasification systems- Composting

UNIT V BIOETHICS AND RECENT TRENDS 12

Modern Technology for handling Biomedical Wastes - Monitoring and Controlling of Cross Infections- Protective Devices - Bioethics and Handling of Waste Management.

Total No of Periods: 60

TEXT BOOKS:

1. V. J. Landrum, "Waste Management and disposal", Elsevier, ISBN: 978-0-8155-1264-6, 1991
2. S A Tabish, "Principles of Hospital Management", OUP, Jaypee Publishers.6th Edition, 2000
3. S L Goel, Dr. R. Kumar, "Encyclopedia of Hospital Management - Text and Case Studies Hospitals in Community Health Care", ISBN (Hardbound): 8184502273, 9788184502275, 2010

REFERENCE BOOKS:

1. J. Glyn Hendry & Gary W Heinke, "Environmental Science and Engineering", Prentice Hall India, 2004
2. Shyam Divan, "Environmental law and policy in India", Oxford India Press, 2004
3. Charles A Wentz, "Hazardous Waste Management", McGraw Hill Inc, New York, 1995



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18011	Subject Name: BIOPROCESS TECHNOLOGY	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

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 immobilization

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn introduction` and technology of bioprocess,screening, preservation
CO2	To clear view of Bioreactor design. Batch, fed batch and continuous cultivation
CO3	To learn about Growth rate parameters: Specific growth rate, doubling time
CO4	To learn Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme immobilization,
CO5	To clear view methods of on-line and off-line biomass estimation; Flow injection analysis for measurement of substrates

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	M	L	L	M	H	L	H	M
CO2	M	H	L	M	H	L	M	H	L	M	H	M
CO3	H	M	L	H	M	L	H	M	L	H	M	L
CO4	M	H	M	L	M	H	L	M	H	L	M	H
CO5	M	H	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	H	M	L	H	M							
CO3	M	H	M	H	L							
CO4	H	M	L	M	M							
CO5	H	M	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								



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BBI18011 BIOPROCESS TECHNOLOGY 3 0/0 0/0 3

UNIT I 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

UNIT II 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

UNIT III 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 K_s- Definition of lag period

UNIT IV ENZYME TECHNOLOGY 9

Kinetics and thermodynamics of enzyme-catalyzed reactions - techniques of enzyme immobilization - basic design and configuration of immobilized enzyme reactors - applications of immobilized enzyme technology

UNIT V 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

Total No of Periods: 45

TEXTBOOKS :

1. Whitekar& Stanbury, “Principles of Fermentation Technology”

REFERENCE BOOKS :

1. Casida, “Industrial Microbiology”
2. Shule and Kargi, "Bioprocess Engineering ", Prentice Hall, 1992



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18L11	Subject Name : PROJECT PHASE - II	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	L	0	0/0	12/12	8

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE:The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue,address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions
CO3	To refine research skills and demonstrate their proficiency in communication skills.
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	H	H	H	H	H
CO2	H	H	H	H	H	H	H	H	H	H	H	H
CO3	H	H	H	H	H	H	H	H	H	H	H	H
CO4	H	H	H	H	H	H	H	H	H	H	H	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		H		H		H		H			
CO2	H		H		H		H		H			
CO3	H		H		H		H		H			
CO4	H		H		H		H		H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E01	Subject Name : BIO CONTROL SYSTEM	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To provide strong foundation in basic science and mathematics necessary to formulate, solve and analyze control and instrumentation problems
- To solve control and instrumentation problems
- To analyze control and instrumentation problems
- To understand and apply differential equation, integrals, matrix theory, probability theory etc
- To provide good knowledge of instrumentation systems and their applications

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands strong foundation in basic science and mathematics necessary to formulate, solve and analyze control and instrumentation problems
CO2	Capable to solve control and instrumentation problems
CO3	Capable to analyze control and instrumentation problems
CO4	Understands and applies differential equation, integrals, matrix theory, probability theory etc
CO5	Familiarized with good knowledge of instrumentation systems and their applications

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	M	L	L	M	H	L	H	M
CO2	M	H	L	M	H	L	M	H	L	M	H	M
CO3	H	M	L	H	M	L	H	M	L	H	M	L
CO4	M	H	M	L	M	H	L	M	H	L	M	H
CO5	M	H	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	H	M	L	H	M							
CO3	M	H	M	H	L							
CO4	H	M	L	M	M							
CO5	H	M	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E01	BIO CONTROL SYSTEM	3	0/0	0/0	3
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UNIT I CONTROL SYSTEM MODELING 9

System concept- Differential Equations- Transfer functions- modeling of electrical systems- Translational and rotational mechanical systems-physiological systems- block diagram modeling- signal flow graphs

UNIT II TIME RESPONSE ANALYSIS 9

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

UNIT III FREQUENCY RESPONSE & STABILITY 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 –stability –Routh-Hurwitz criteria

UNIT IV PHYSIOLOGICAL CONTROL SYSTEMS 9

Introduction to physiological control systems- modeling of human movements- parameter estimation- linearizing

UNIT V STUDY OF BIOLOGICAL SYSTEMS 9

Human Thermal system- Neuro muscular system- Respiratory system- oculomotor system

Total No of Periods: 45

TEXT BOOKS:

1. M.Gopal, "Control Systems", Principles and Design, Tata McGraw-Hill, 1997
2. Benjamin. C.Kuo, "Automatic Control Systems", Prentice Hall of India, 1995

REFERENCE BOOKS:

1. Manfred Clyner and John H. Milsum, "Bio Medical engineering system", McGraw-Hill and Co., New York, 1970



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E02	Subject Name : REHABILITATION ENGINEERING	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To study basics of Rehabilitation Engineering
- To learn the design of Wheel Chairs
- To gain knowledge of the recent developments in the field of rehabilitation engineering.
- To understand various assistive technology for vision and hearing
- To study various orthotic and prosthetic devices

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the basics of Rehabilitation Engineering
CO2	Capable to design Wheel Chairs
CO3	Understands the recent developments in the field of rehabilitation engineering
CO4	Acquires various assistive technology for vision and hearing
CO5	Analysis various orthotic and prosthetic devices

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	M	H	L	M	H	L	M	H	H	H
CO2	H	M	H	M	L	M	H	L	M	H	L	M
CO3	H	M	H	M	L	M	H	H	M	H	L	M
CO4	L	H	M	L	H	M	H	L	L	H	M	H
CO5	M	H	L	H	M	L	H	L	M	H	L	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	M	L	H	M	H							
CO3	H	L	M	H	L							
CO4	L	M	M	L	M							
CO5	H	M	L	H	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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BBI18E02 REHABILITATION ENGINEERING 3 0/0 0/0 3

UNIT I REHABILITATION TECHNOLOGY 9

Selection -design and manufacturing of augmentive- assistive devices appropriate for individual with disability

UNIT II REHABILITATION SCIENCE 9

Knowledge about the basic and clinical research - the variation in the physiological functioning - anatomical structure

UNIT III REHABILITATION ADVOCACY 9

Legal aspect helps the handicapped people in choosing the devices -the provisions available to them in this regard

UNIT IV REHABILITATION MEDICINE 9

Physiological aspects of functional recovery -neurological and physiological aspects -rehabilitation therapies training to restore vision auditory and speech

UNIT V REHABILITATION ENGINEERING 9

Introduction to Rehabilitation Engineering - PHAATE model - Clinical practice of rehabilitation Engineering - Low technology tools - Service delivery - Universal design - Design based on human ability - Standards for assistive technology - Test for best design

Total No of Periods: 45

TEXT BOOKS:

1. Reswick.J., "What is Rehabilitation Engineering?, Annual Review of rehabilitation",volume 2
springer – verlag, New York, 1982

REFERENCE BOOKS:

1. Robinsion.C.J, "Rehabilitation Engineering Handbook of electrical engineering", CRC Press,
Bocaraton, 1993



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E03	Subject Name : BIOMATERIALS AND IMPLANTABLE DEVICES	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIOMEDICAL INSTRUMENTATION	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Learn characteristics and classification of Biomaterials
- Understand different metals and ceramics used as biomaterials
- Learn polymeric materials and combinations that could be used as a tissue replacement implants
- Know the various artificial organs developed using these materials to perform medical application.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Analyze different types of Biomaterials and its classification.
CO2	Perform combinations of materials that could be used as a tissue replacement implant.
CO3	Know about the various polymeric materials used for medical applications
CO4	About bio-ceramics and its applications in medicine
CO5	The graduate will be capable to perform medical application.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	M	L	H	M	H	L	L	M
CO2	M	M	H	M	L	H	M	L	H	M	L	H
CO3	H	H	H	M	H	M	H	L	H	M	H	M
CO4	H	H	M	L	H	M	L	H	M	L	H	M
CO5	M	H	M	L	H	M	L	H	M	L	H	M
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	M		H		M		L		H			
CO2	H		M		H		M		L			
CO3	M		M		L		H		M			
CO4	H		L		M		H		L			
CO5	L		M		M		H		M			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E03 BIOMATERIALS AND IMPLANTABLE DEVICES 3 0/0 0/0 3

UNIT I BIOCOMPATIBILITY AND HEMOCOMPATIBILITY 9

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 orthopedic implants- Stainless steel - Cobalt chromium alloy - Titanium and its alloys -Electro kinetic factors - Types of orthopedic fixation devices – pins - screws and plates - IM nails and spinal

UNIT II BIOELECTRIC EFFECT 9

Wolff'slaw - 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 III POLYMERS IN BIOMEDICAL USE 9

Hydrogels- silicone rubber- biodegradable polymers- microorganisms in polymeric implants and polymer sterilization-Biopolymers- Synthetic polymers- Composites- Types and Applications- Contraceptive devices

UNIT IV ORTHOPAEDIC IMPLANTS 9

Ophthalmology - introduction - contact lenses - eye shields and artificial tears- Biological Tests-Material surface characterization – Corrosion- Standards on biomaterials

UNIT V BIOCERAMICS, TYPES 9

Bioactive- resorbable - non-resorbable -Stoichiometry and Ca/P ratio of various forms calcium phosphates -bio ceramic 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

Total No of Periods: 45

TEXT BOOKS:

1. Sujata V Bhat., "Biomaterials", 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

REFERENCE BOOKS:

1. L.L. Hench and E.C. Ethridge "Biomaterials: An Interfacial Approach", Academic press, New York, 1982.
2. F.H. Silver, "Biomaterials, Medical Devices and Tissue Engineering: An Intergrated Approach", 1st Editionn, Chapman & Hall, London, 1994
3. Buddy Ratner etal., "Biomaterials Science – An Introduction to Materials in Medicine", Academic Press, San Diego, 2004



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18E05	Subject Name : EMBEDDED SYSTEM	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: ADVANCEMENT IN ELECTRONICS	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- The brief view of real time and embedded system.
- The graduates can understand the embedded system components and interface.
- Detailed overview about embedded system design and development.
- Analysis of real time system performance, language and their features.
- The case studies of safety, aerospace, automobile, medical and industrial application.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Capable to get brief view of real time and embedded system.
CO2	Understands embedded system components and interface.
CO3	The graduates understand embedded system design and development.
CO4	The graduates Analysis of real time system performance, language and their features
CO5	The graduate will be capable to perform case study on safety, aerospace, automobile, medical and industrial application.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	H	M	L	H	M	H	L	L	M
CO2	M	M	H	M	L	H	M	L	H	M	L	H
CO3	H	H	H	M	H	M	H	L	H	M	H	M
CO4	H	H	M	L	H	M	L	H	M	L	H	M
CO5	M	H	M	L	H	M	L	H	M	L	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	M	L	H							
CO2	H	M	H	M	L							
CO3	M	M	L	H	M							
CO4	H	L	M	H	L							
CO5	L	M	M	H	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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BEI18E05	EMBEDDED SYSTEM	3	0/0	0/0	3
UNIT I	INTRODUCTION TO EMBEDDED SYSTEMS	9			
Brief overview of real time systems and embedded systems - Classification of embedded systems - Embedded system definitions - Functional and non-functional requirements - Architectures and standards - Typical applications					
UNIT II	EMBEDDED SYSTEM COMPONENTS AND INTERFACE	9			
Device choices - Selection criteria and characteristics of Processors and memory systems for embedded applications - Interface and Peripherals - Power sources and management					
UNIT III	EMBEDDED SYSTEM DESIGN AND DEVELOPMENT	9			
Design methods and techniques - Classification of need - Need analysis -Requirement and specification - Conceptual design - Models and languages - State machine model - State machine tables - Verification - Validation - Simulation and emulation					
UNIT IV	REAL TIME SYSTEMS AND MODELS	9			
Characteristics and classification of real time systems - Real time specifications and Design techniques - Event based - Process based and graph-based models - Real time kernel - Hierarchy services and design strategy - Real time system performance and analysis - Typical real time systems - Their languages and features					
UNIT V	CASE STUDIES	9			
Case studies of safety-critical - time-critical embedded systems with reference to Aerospace- automobile - Medical and Industrial applications.					

Total No of Periods: 45

TEXT BOOKS:

1. Noergaard, T., "Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers", Elsevier Publications, 2005
2. Berger, A.S., "Embedded System Design: An Introduction to Process, Tools and Techniques", CMP Books, 2002

REFERENCE BOOKS:

1. David, S., "An Embedded Software Primer", Addison-Wesley, 1999
2. Liv, J.W.S., "Real-Time Systems", Pearson Education, 2001
3. Vahid and Givargis, T., "Embedded System Design: A Unified Hardware/ Software Introduction", John Wiley and Sons, 2002
4. Peatman, J.B., "Design with Microcontrollers", McGraw-Hill International Ltd., Singapore, 1989
5. Kang, C.M.K., and Shin, G., "Real Time Systems", McGraw Hill, 1997



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E04	Subject Name : LASER AND ULTRASONIC APPLICATION IN MEDICINE	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Gain Knowledge of Laser
- To Study About Ultrasonic
- To Learn About Ultrasonic Scanners
- To Study About High Energy Ultrasonic
- To Gain Knowledge of Holographic Application InMedicine

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires Knowledge of Laser
CO2	Graduate acquires knowledge on Ultrasonic
CO3	Capable to analyze Ultrasonic Scanners
CO4	Understands High Energy Ultrasonic
CO5	Acquires knowledge on Holographic Application InMedicine

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	M	H	M	L	H	M	L	M
CO2	H	M	L	M	H	L	M	L	H	M	L	M
CO3	L	M	H	L	M	H	L	M	H	L	M	H
CO4	H	M	L	M	H	L	M	H	L	M	H	H
CO5	M	L	H	H	M	L	H	M	L	M	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	M	L	H	M	L							
CO3	H	M	L	M	H							
CO4	M	H	L	M	H							
CO5	L	M	H	M	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E04 LASER AND ULTRASONIC APPLICATION IN 3 0/0 0/0 3
MEDICINE

UNIT I LASER 9

Principles of Laser action -different types and of lasers and its operation -Applications of Laser in Biology -Dentistry, Ophthalmology –Dermatology –Medicine –Surgery -Interferometer Applications - Fluorescence studies in cancer Diagnosis -Laser in Genetic Engineering -Low power applications in Medicine

UNIT II ULTRASONICS 9

Different Modes of Display - A, B, C -scanning Techniques -Absorption in biological Tissues - Measurement of Ultrasonic Energy -Construction of Ultrasonic probe -Ultrasonic Imaging in Abdomen – Breast –Heart –Chest –Eye –Kidney –Skull -Pulsatile Motion -Pregnant and non-Pregnant uterus

UNIT III ULTRASONIC SCANNERS 9

Real Time Echo -2-D Scanners -Colour Doppler

UNIT IV HIGH ENERGY ULTRASONICS 9

Effects due to High energy ultrasonics applications in Surgery -Cell destruction -Cleaners

UNIT V HOLOGRAPHIC APPLICATION IN MEDICINE 9

Wave front Recording and Reconstruction -Recording Media -Image forming application -Motion Induced Contrast -correlation filtering -Holograms using Ultrasonic signals and Hologram using Lasers

Total No of Periods: 45

TEXT BOOKS:

1. Leon Goldman, M.D., and R. Jamies Rockwell, Jr.,“Lasers in medicine Gordon and breach”,science publishers Inc., New York, 1971
2. Brown Y.H.V. and Dickson J.F. (Eds), “Advances in Bio – Medical Engineering”, Volume II and V, Academic press, London, 1972
3. Georg W. Stroke, Kock W.E., “Ultrasonic Imaging and Holography”,plenum press, New York, 1974

REFERENCE BOOKS:

1. Mertellucci S. Sand Chester A.N.,“Laser Photo biology and photo medicine”,plenum press, New York, 1989.
2. Wolbarsht M.L., “Laser Application in Medicine and Biology”, Plenum press, New York, 1989



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E05	Subject Name :COMPUTER BASED MEDICAL INSTRUMENTATION	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIOMEDICAL INSTRUMENTATION	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Gain Knowledge on Introduction of Computer Based Medical Instrumentation
- To Study About the Microcontrollers
- To Learn About the System Design
- To Gain Knowledge on Computers in Patient Monitoring
- To Study About Medical Equipments System

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires Knowledge On Introduction of Computer Based Medical Instrumentation
CO2	Capable to analyze the concept of Microcontrollers
CO3	Capable to analyze System Design
CO4	Capable to acquire Knowledge On Computers In Patient Monitoring
CO5	Acquires Knowledge on Medical Equipments System

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	M	H	L	M	H	L	M	H
CO2	H	M	L	M	H	L	M	H	L	M	H	M
CO3	H	M	L	M	H	L	M	H	L	M	H	L
CO4	L	M	L	M	L	H	M	L	M	H	L	M
CO5	L	M	H	L	M	M	L	M	L	H	L	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	H	M	L	M	H							
CO3	L	M	H	L	M							
CO4	M	H	L	M	H							
CO5	M	L	H	L	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							





DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E06	Subject Name :BIOMEDICAL MEMS AND NANOTECHNOLOGY	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIOMATERIALS & IMPLANTABLE DEVICES	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To understand the working principle of MEMS and Microsystems
- To understand the working of MOEMS Technology
- To understand the concepts of BioMEMS and its application in healthcare
- To give an insight to the DNA based BioMEMS
- To study about the biomedical Nanotechnology and its application in researchdomain

COURSE OUTCOMES (COs) : (3- 5)

CO1	understands the working principle of MEMS and Microsystems
CO2	understands the working of MOEMS Technology
CO3	understands the concepts of BioMEMS and its application in healthcare
CO4	Acquires knowledge on the DNA based BioMEMS
CO5	Acquires knowledge on the biomedical Nanotechnology and its application in researchdomain

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	L	L	M	H	L	M	H	L	M	H
CO2	H	H	H	L	L	M	H	M	H	L	M	H
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	H	M	L	M	H	L	M	H	L	M	H	L
CO5	L	M	H	L	M	H	L	M	H	L	M	H
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	L	H	L	M							
CO2	M	H	L	M	H							
CO3	H	H	H	M	L							
CO4	M	H	L	M	H							
CO5	L	M	M	L	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E06	BIOMEDICAL MEMS AND NANOTECHNOLOGY	3	0/0	0/0	3
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UNIT I MEMS 9

Introduction - Typical MEMS Products - Application of Micro-system in Healthcare Industry - Working Principles of Microsystems Microsensors - Microactuation - MEMS with actuation - Micro-accelerators and Microfluidics - Materials for MEMS and Microsystems

UNIT II MEMS and Microfluidics 9

Fundamental principle - Light Modulators -Beam splitter - Micro-lens -Micro-mirrors - Digital Micro-mirror Device -Light detectors - Important Consideration on Micro-scale fluid -Properties of fluid - Fluid Actuation Methods - Micro-pumps - Typical Micro-fluidic Channel -Micro-fluid Dispenser

UNIT III BIOMEMS 9

Introduction -Principle of Biosensor -Ampero-metric Biosensor - Micro-dialysis - BioMEMS for Clinical Monitoring - Monitoring of Glucose and Lactate with a micro-dialysis probe - Ammonia Monitoring - Electronic Nose -DNA Sensors

UNIT IV BIOMEMSAND DNA 9

Unique features of Nucleic Acids -Lab on the Chip –Electrophoresis -Polymerase Chain Reaction (PCR) - Biochemical reaction chains for integration: Biosensors and the “lab biochip” - Typical Microarray experiment -Manufacturing of Microarrays -Synthesis on the chip -Spotting Techniques - PCR on the chip -Microchamber Chips -Micro-fluidics Chips -Emerging BioMEMS Technology

UNIT V BIOMEDICAL NANOTECHNOLOGY 9

Nanoparticles- Nanomaterial characterization – XRD –SAXS –TEM –SEM –Scanning Tunneling microscopy –AFM –SPM technique -Biomolecular sensing for cancer diagnostics using carbon nanotubes -Carbon nanotube biosensors -Magnetic nanoparticles for MR Imaging -Nano-devices in biomedical applications

Total No of Periods: 45

TEXT BOOKS:

1. Steven S, Saliterman, "Fundamentals of BioMEMS and Medical Microdevices", International Society for Optical Engineering, First Edition 2006
2. NitaigourPremchandMahalik, "MEMS", Tata McGraw Hill, 2nd Reprint, 2008
3. Wanjun Wang and Steven A.Soper, "BioMEMS- Technologies andapplications", CRC Press, First edition, 2007

REFERENCE BOOKS:

1. Tai-Ran Hsu, “MEMS and Microsystems- Design, Manufacture and NanoscaleEngineering”, John Wiley and Sons, 2nd Edition, 2008
2. Gerald A Urban, “BioMEMS”, Springer, First Edition, 2006
3. Abraham P. Lee and James L. Lee, “BioMEMS and BiomedicalNanotechnology”, Volume I, Springer, First Edition, 2006
4. Paul C.H. Li, “Introduction to Microfluids and BioMEMS: A Design andProblem-Solving Textbook”, CRC Press, First Edition, 2009
5. Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press, First Edition 2002.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E07	Subject Name : COMPUTER NETWORKS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn about Transmission media, Data encoding, Interface and Modems
- To learn about Multiplexing clear view ISO – OSI layered architecture
- To learn about Frames relay operation – layers and traffic control
- To learn about ATM networks. LAN topology, Ethernet, Tokenbus
- To learn about Token ring, FDDI, Wireless LAN

COURSE OUTCOMES (COs) : (3- 5)

CO1	To learn about transmission media, data encoding, interface and modems, Multiplexing
CO2	To get a clear view of ISO – OSI layered architecture
CO3	To learn about Frames relay operation – layers and traffic control; ATM networks
CO4	To clear view LAN topology, Ethernet ,Token bus ,Token ring, FDDI ,Wireless LAN
CO5	To learn about Transport layer issues, session layer, Synchronization ,Presentation layer

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	L	H	L	M	H	L	M	H	L
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	M	H	L	M	L	M	H	L	M	H	L	M
CO5	M	H	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	M	H	L	M	H							
CO3	H	M	L	H	L							
CO4	L	M	H	L	M							
CO5	H	M	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E07 COMPUTER NETWORKS 3 0/0 0/0 3

UNIT I 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.

UNIT II 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

UNIT III FRAME RELAY AND ATM NETWORKS 9

Frames relay operation - layers and traffic control - ATM networks - Architecture switching - layers service classes

UNIT IV 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

UNIT V OSI LAYERS 9

Transport layer issues - Session layer - Synchronization - Presentation layer - Encryption- decryption - Application layer - Message handling system - file transfer - virtual terminal - Email.

Total No of Periods: 45

TEXT BOOKS:

1. William Stallings, “Data and Computer Communication”, sixth edition, Pearson education Asia, 2000

REFERENCE BOOKS:

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



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E08	Subject Name: NEUROSCIENCE FOR BIOMEDICAL APPLICATIONS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Learn About System Concept
- To Gain Knowledge on Transducer Function
- To Study About Impedance Concept
- To Learn About Periodic Signals, Feedback
- To Gain Knowledge on Simulation of Biological Systems

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands System Concept
CO2	Acquires knowledge on Transducer Function
CO3	Graduate understands Impedance Concept
CO4	Understands Periodic Signals, Feedback
CO5	Simulation of Biological Systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	L	H	L	M	H	L	M	H	L
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	M	H	L	M	L	M	H	L	M	H	L	M
CO5	M	H	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	L	M	H
CO2	M	H	L	M	H
CO3	H	M	L	H	L
CO4	L	M	H	L	M
CO5	H	M	L	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E08 NEUROSCIENCE FOR BIOMEDICAL 3 0/0 0/0 3
APPLICATIONS

UNIT I INTRODUCTION TO NEUROSCIENCE 9

An overview of neuroscience - Applications of neuroscience - Neurons and Neuroglia - Neurotransmitters

UNIT II NERVOUS SYSTEM 9

Nervous system: central nervous system - peripheral nervous system - autonomic nervous system - anatomical organization of the nervous system - functional organization of the nervous system - neurons- the nerve cell - CSF

UNIT III ELECTRICAL PROPERTIES OF NERVOUS SYSTEM 9

Electrolytes within our neurons - Ion channels - Local signaling - Signal propagation - Action potential – Synapse - Synaptic integration - Modulation of synaptic transmission - Nerve-Muscle interaction

UNIT IV NEURAL NETWORKS 9

Current flow in neurons - Introduction to electro diagnostic signals and their measurement - nerve conduction study - evoked potentials and EEG

UNIT V CHALLENGES 9

Neuroscience methods and techniques to understand the functions of nervous system - Pathology of Nervous system - Molecular and cellular mechanisms of Parkinson's - Huntington's - Stroke and Alzheimer's diseases

Total No of Periods: 45

TEXT BOOKS:

1. Richard S Snell, "Clinical Neuro Anatomy", Lippincott Williams & Wilkins, 2006
2. W.F Ganang, "Review of Medical Physiology", Mc Graw Hill Professional, 21st Edition, 2003

REFERENCE BOOKS:

1. A Krishnamurti, "Notes on Nervous System", Janagam Offset Printers, 1999
2. Eric R Sandel, "Principles of Neural Science", Elsevier, 4th Edition, 2000



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E09	Subject Name :BIOLOGICAL EFFECTS OF RADIATION	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: MEDICAL PHYSICS	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Study About Action of Radiation on Living Cells
- To Learn About Somatic Application of Radiation
- To Gain Knowledge on Genetic Effects of Radiation
- To Study About Effect of Microwave and RF With Matters
- To Gain Knowledge on UV Radiation

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands Action of Radiation on Living Cells
CO2	Capable to analyze Somatic Application of Radiation
CO3	Acquires Knowledge on Genetic Effects of Radiation
CO4	Understands Effect of Microwave and RF With Matters
CO5	Acquires Knowledge on UV Radiation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	H	M	L	M	H	L	M	H
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	H	M	L	H	M	H	M	H	L	M	H	L
CO4	L	M	H	L	M	H	L	M	H	L	M	H
CO5	H	M	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	L	M	H							
CO2	H	M	H	L	H							
CO3	L	M	H	L	M							
CO4	H	L	M	H	M							
CO5	M	L	H	L	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BB118E09 BIOLOGICAL EFFECTS OF RADIATION 3 0/0 0/0 3

UNIT I ACTION OF RADIATION ON LIVING CELLS 9

Various theories related to radiation at cellular level -DNA and chromosomal damages -experiments on computation of various parameters related to this radiation exposure

UNIT II SOMATIC APPLICATION OF RADIATION 9

Radio sensitivity protocols of different issues of human -LA\ D 50/30 effective radiation on skin -bone marrow - eye -endocrine glands - basis of radiotherapy

UNIT III GENETIC EFFECTS OF RADIATION 9

Thresholds and linear dose -gene control hereditary diseases -effect of dose and I Infleneceson genetic equilibrium

UNIT IV EFFECT OF MICROWAVE AND RF WITH MATTERS 9

Effects on various human organs and systems -wavelength in tissues -nonthermal interaction -low frequency radiation -measurement devices used to compute the thermal effects -standards of protection - national and international standards and precautions.

UNIT V UV RADIATION 9

Classification of sources-measurement -photo medicine -UV radiation safety Visibleand infrared radiation -combined effect of UV and IR -dose measuring instruments sed safety standards for this radiation

Total No of Periods: 45

TEXT BOOKS:

1. Glasser.O.,“Medical Physics”, vol I, II, III, The year book Publishers Inc., Chicago, 1980
2. Baranski.S and Cherski.P, “Biological effects of microwave”, Hutchison and Ross Inc., Stroudsburg, 1980

REFERENCE BOOKS:

1. Moselly.H., “non-ionizing Radiation”, Adam-Hilgar, Bristol, 1988



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E10	Subject Name : DRUG DELIVERY SYSTEMS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To educate the student on drug delivery system which would enable a comprehensive analysis
- Give direction of these drug delivery systems as an important tool in improving the efficacy
- safety of the release of drugs in the body
- explores the present and future strategies within the drug delivery market.
- Understands Implementation of plans and method

COURSE OUTCOMES (COs) : (3- 5)

CO1	The graduate can know about drug delivery system which would enable a comprehensive analysis
CO2	Capable of giving these drug delivery systems as an important tool in improving the efficacy
CO3	Understands safety of the release of drugs in the body
CO4	Graduates can understand about present and future strategies within the drug delivery market.
CO5	Understands Implementation of plans and method

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	H	H	H	M	L	H	M	H	L
CO2	M	H	M	L	H	M	L	H	M	L	H	M
CO3	H	H	M	L	H	L	M	H	L	M	H	L
CO4	L	M	H	L	H	M	L	M	H	L	M	H
CO5	H	M	L	H	L	M	H	L	M	H	L	H
COs / PSOs	PSO1		PSO2		PSO3		PSO4		PSO5			
CO1	H		M		L		H		H			
CO2	M		H		L		H		M			
CO3	H		H		H		M		L			
CO4	M		M		H		L		M			
CO5	H		H		M		L		M			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E10 DRUG DELIVERY SYSTEMS 3 0/0 0/0 3

UNIT I SUSTAINED AND CONTROLLED DRUG DELIVERY 9

Introduction - properties of drugs - Pharmacokinetic properties of drugs - sustained release formulations - concept - physicochemical biological properties of drug - advantages and disadvantages - controlled drug delivery systems - automatically controlled drug delivery systems and their biomedical applications

UNIT II POLYMERS & TARGETTED DRUG DELIVERY SYSTEMS 9

Polymers used in drug delivery systems - modules - classification- characterization - advantages and disadvantages of polymer - targeted drug delivery systems - concepts - nanoparticles - liposomes - microspheres - hydrogels

UNIT III TRANSDERMAL DRUG DELIVERY SYSTEMS 9

Transdermal penetration of drugs - formulation - addition - polymers in transdermal drug delivery system - iontophoresis - transdermal controlled release products and devices

UNIT IV IMPLANTABLE DRUG DELIVERY SYSTEMS 9

Implantable micro - pump systems - peristaltic micro pump - osmotic micro pump - diaphragm micro pump - Fluorocarbon propellant driven micro pump - solenoid driver reciprocates micro pump - programmable implanted drug administrative device (DAD)

UNIT V SITE SPECIFIC DRUG DELIVERY SYSTEMS 9

Development in insulin therapy using biomedical controlled drug delivery systems - drug delivery using monoclonal antibodies - role of biosensors and transducers in diagnostic

Total No of Periods: 45

TEXT BOOKS:

1. Vyas S. P. Khar R. K., "Targetted and controlled drug delivery Novel Carrier System CBSPD", 2006
2. Anya M Hillery et. al., "Drug delivery and targeting", CRC press, 2000

REFERENCE BOOKS:

1. Robinson R Robinson, "Conventional drug delivery systems", CRC press, 2004



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18E12	Subject Name : ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Representing the concept of intelligent agents, search technique, knowledge, reasoning and planning.
- Providing the ideas of intelligent agents and search method.
- Learning about knowledge representation.
- Graduates to understand about planning and learning methodologies.
- Implementation of plans and method for designing controllers

COURSE OUTCOMES (COs) : (3- 5)

CO1	The graduate can represent the concept of intelligent agents, search technique, knowledge, reasoning and planning.
CO2	Capable of giving ideas of intelligent agents and search method.
CO3	Understands knowledge representation
CO4	Graduates can understand about planning and learning methodologies.
CO5	Understands Implementation of plans and method for designing controllers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	H	H	H	M	L	H	M	H	L
CO2	M	H	M	L	H	M	L	H	M	L	H	M
CO3	H	H	M	L	H	L	M	H	L	M	H	L
CO4	L	M	H	L	H	M	L	M	H	L	M	H
CO5	H	M	L	H	L	M	H	L	M	H	L	H

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	L	H	H
CO2	M	H	L	H	M
CO3	H	H	H	M	L
CO4	M	M	H	L	M
CO5	H	H	M	L	M

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEI18E12 ARTIFICIAL INTELLIGENCE AND EXPERT 3 0/0 0/0 3
SYSTEMS

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9

Overview of AI-general concepts-problem spaces and search - search techniques - BFS - DFS-Heuristic search techniques

UNIT II KNOWLEDGE REPRESENTATION 9

Knowledge - general concepts- predicate logic-representing simple fact- instance and ISA relationships - resolution - natural deduction

UNIT III KNOWLEDGE ORGANISATION AND MANIPULATION 9

Procedural Vs declaration knowledge - forward Vs backward reasoning - matching techniques - control knowledge/strategies - symbol reasoning under uncertainty - introduction to non – monotonic reasoning - logic for monotonic reasoning

UNIT IV PERCEPTION – COMMUNICATION AND EXPERT SYSTEMS 9

Natural language processing - pattern recognition - visual image understanding - expert system architecture

UNIT V KNOWLEDGE ACQUISITION 9

Knowledge acquisition - general concepts - learning - learning by induction - explanation based learning

Total No of Periods: 45

TEXT BOOKS:

1. Elaine Rich and Kelvin Knight, “Artificial Intelligence”, Tata McGraw-Hill, New Delhi, 1991
2. Stuart Russell and Peter Norvig, “Artificial Intelligence: A modern approach”, Prentice Hall, 1995

REFERENCE BOOKS:

1. Nelson N.J., “Principles of Artificial Intelligence”, Springer Verlag, Berlin, 1980
2. Patterson, “Introduction to Artificial Intelligence and Expert systems”, Prentice Hall of India, New delhi, 1990.



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E11	Subject Name :MEDICAL INFORMATICS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Gain Knowledge on Biomedical Information Technology
- To Learn About Overview of Computer Hardware
- To Study About Hospitals Information Systems
- To Gain Knowledge on Visual Programming and Multimedia Information Systems
- To Learn About Integrated Medical Information Systems

COURSE OUTCOMES (COs) : (3- 5)

CO1	Acquires Knowledge on Biomedical Information Technology
CO2	Acquires Knowledge on Overview of Computer Hardware
CO3	Acquires Knowledge on Hospitals Information Systems
CO4	Acquires Knowledge on Visual Programming and Multimedia Information Systems
CO5	Acquires Knowledge on Integrated Medical Information Systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	L	L	H	M	L	M	H	L	M
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	L	M	H	L	M	H	L	M	H	L	M	H
CO4	M	H	L	M	H	L	M	H	L	M	H	L
CO5	L	M	L	H	L	M	H	L	M	H	L	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	L	M	H
CO2	H	M	L	M	H
CO3	L	M	H	L	M
CO4	M	L	M	H	L
CO5	H	M	L	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E11 MEDICAL INFORMATICS 3 0/0 0/0 3

UNIT I BIOMEDICAL INFORMATION TECHNOLOGY 9

Historical highlights of Healthcare Information systems - Biomedical Information systems - problems and pitfalls - History and evolution of Electric resources - Internet and Interactive Multimedia components

UNIT II OVERVIEW OF COMPUTER HARDWARE 9

Motherboard and its logic - memory and I/O interfacing -memory and I/O map I/O peripherals - add-on cards -RS 232-C - various IEEE standards

UNIT III HOSPITALS INFORMATION SYSTEMS 9

Concept of HIS and its Position on the hospital - introduction of a computerized HIS-application of HIS in project management - Automation of Medical record - hospital Inventory data protection aspects - costs and benefits of HIS - transfer of information within the hospital - Modems and computer networking in Hospitals

UNIT IV VISUAL PROGRAMMING AND MULTIMEDIA INFORMATION SYSTEMS 9

Visuals Basic principles and programming – Design - Production and testing of multimedia based medical information systems

UNIT V INTEGRATED MEDICAL INFORMATION SYSTEMS 9

Integration of Intra and Inter hospital information systems - Role of expert systems and fuzzy logic in medical information systems - Physiological system modeling and simulation - Concepts of Virtual reality -web based multimedia information systems - video conferencing

Total No of Periods: 45

TEXT BOOKS:

1. S.K. Chauhan, . “PC Organisation”, S.K. Kataria and sons, Delhi.
2. Haroidsackman, “Biomedical Inforamtion Technology”, Academic Press, New York, 1997

REFERENCE BOOKS:

1. Mary Beth Fecko, “Electronic Resources: Access and Issues, Bowker-saur, London, 1997
2. R.D. Lele, “Computers in medicine”, Tata McGraw Hill, New Delhi, 1999
3. Tay Vaughan, “Multimedia making it work”, Tata McGRaw Hill, New Yotk, 1999
4. Mark Spenik, “Visual Basic 6, Iterative Course”, Techmedia, New Delhi, 1999



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18E16	Subject Name : PRINCIPLES OF ROBOTICS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite:	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To introduce the basic concepts and parts of robots.
- Understanding the working of robots and various types of robots.
- Familiarizing with the various drive systems of robots, sensors and their applications in robots and programming of robots.
- The various applications of robots, justification and implementation of robots.
- Studying about the manipulators, activators and grippers and their design considerations

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands the basic concepts and parts of robots.
CO2	Understanding the working of robots and various types of robots.
CO3	Familiarized with the various drive systems of robots, sensors and their applications in robots and programming of robots.
CO4	Capable of knowing the various applications of robots, justification and implementation of robots.
CO5	Understands the concept of the manipulators, activators and grippers and their design considerations

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	H	M	H	M	L	H	M	L
CO2	H	M	L	H	L	M	H	L	M	H	L	M
CO3	H	H	M	L	H	M	L	M	L	H	M	L
CO4	M	H	M	M	H	M	L	L	H	M	L	M
CO5	M	H	M	L	M	H	L	M	H	L	H	M
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	H	M	L	H	M							
CO2	M	L	H	M	H							
CO3	L	H	M	H	M							
CO4	M	H	L	M	H							
CO5	M	H	L	M	M							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BE118E16 PRINCIPLES OF ROBOTICS 3 0/0 0/0 3

UNIT I BASIC CONCEPTS 9

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 POWER SOURCES AND SENSORS 9

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 MANIPULATORS, ACTUATORS AND GRIPPERS 9

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 KINEMATICS AND PATH PLANNING 9

Solution of inverse kinematics problem - multiple solution jacobian work envelop - hill climbing techniques - robot programming languages

UNIT V CASE STUDIES 9

Multiple robots - machine interface - robots in manufacturing and non-manufacturing applications - robot cell design - selection of robot

Total No of Periods: 45

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", McGraw-Hill Singapore, 1996
2. Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998

REFERENCE BOOKS:

1. Deb.S.R., "Robotics technology and flexible Automation", John Wiley, USA 1992
2. AsfahlC.R., "Robots and manufacturing Automation", John Wiley, USA 1992
3. Klafter R.D., Chimielewski T.A., Negin M., "Robotic Engineering – An integrated approach", Prentice Hall of India, New Delhi, 1994
4. McKerrow P.J., "Introduction to Robotics", Addison Wesley, USA, 1991
5. Issac Asimov, "I Robot", Ballantine Books, New York, 1986



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E12	Subject Name :BIOMEDICAL SIGNAL PROCESSING	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- Introduction to periodic and pulse signals, various systems
- To be able to time domain analysis.
- To understand the properties of Z-transform
- To be able solve the Fourier series.
- To study Overview of FFT and problems in the fast Fourier transforms.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands periodic and pulse signals, various systems
CO2	Capable of analysis of time domain specification.
CO3	Understands the properties of Z-transform
CO4	Capable to solve the Fourier series.
CO5	Understands Overview of FFT and problems in the fast Fourier transform.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	M	L	M	H	M	H	M	L	H	M
CO2	H	M	L	M	H	M	L	H	M	L	M	H
CO3	H	M	L	H	M	H	M	L	M	H	M	L
CO4	H	M	M	H	M	L	H	M	H	M	L	H
CO5	L	M	H	M	L	M	H	L	M	H	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L	M	H	M	L
CO2	H	M	L	M	H
CO3	M	M	L	H	H
CO4	H	M	L	M	H
CO5	M	H	M	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E12 BIOMEDICAL SIGNAL PROCESSING 3 0/0 0/0 3

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS 9

Classification and time domain representation of discrete-time signals - Typical sequences and their representation - Classification of sequences - Basic operations on sequences - Discrete-time systems

UNIT II TRANSFORM 9

Discrete Fourier Transform (DFT) computation of DFT, Z-transform - Mathematical derivation of the unilateral-properties of the Z-transform - Inverse Z-Transform

UNIT III NEUROLOGICAL SIGNAL PROCESSING 9

EEG analysis - Linear prediction theory-Autoregressive method adaptive segmentation - Transient detection - Overall performance -classification of sleep stages

UNIT IV CARDIOLOGICAL SIGNAL PROCESSING 9

ECG data acquisition - ECG lead system ECG parameters and their estimation - Multiscale analysis for parameters estimation of ECG waveforms - Arrhythmia analysis monitoring - Continuous ECG recording

UNIT V ECG DATA REDUCTION TECHNIQUES 9

Direct ECG data compression techniques - Transformation compression techniques - Other data compression techniques - Compression clinical application of Prony's method

Total No of Periods: 45

TEXT BOOKS:

1. DC Reddy, "Biomedical signal processing", TMH, 2005

REFERENCE BOOKS:

1. Akav M., "Biomedical signal processing", Academic press 1994
2. Kok FL, "Biomedical signal processing", PHI, 1999
3. Mitra SK, "Digital signal processing", TMH, 2001



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E13	Subject Name :BIO-MATERIALS AND ARTIFICIAL ORGANS	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To know about the different classes of materials used in medicine
- To gain knowledge about the application of biomaterials in medicine
- To understand the concept of biocompatibility and the methods of biomaterial testing
- To know about the technologies of biomaterial processing, clinical trials, ethical issues and regulatory standards.
- To gain knowledge in some of the existing designs of artificial organs.

COURSE OUTCOMES (COs) : (3- 5)

CO1	The graduate understands about the different classes of materials used in medicine
CO2	Familiar with the application of biomaterials in medicine
CO3	Graduate understands the concept of biocompatibility and the methods of biomaterial testing
CO4	The graduate will be able to use technologies of biomaterial processing, clinical trials, ethical issues and regulatory standards.
CO5	Acquires knowledge in some of the existing designs of artificial organs.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	H	L	M	H	L	M	H	M	L	M
CO2	H	M	H	M	L	M	H	L	H	M	H	M
CO3	H	L	M	M	L	H	M	L	H	M	L	M
CO4	H	M	L	H	M	L	H	M	L	M	H	L
CO5												
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	M	H	M	L	M							
CO2	H	M	L	M	H							
CO3	H	M	M	H	M							
CO4	M	L	H	M	L							
CO5	M	H	L	M	H							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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BBI18E13 BIO-MATERIALS AND ARTIFICIAL ORGANS 3 0/0 0/0 3

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY 9

Definition and classification of bio-materials -mechanical properties -visco elasticity -wound-healing process - body response to implants - blood compatibility

UNIT II IMPLANT MATERIALS 9

Metallic implant materials -stainless steels -co-based alloys -Ti-based alloys -ceramic implant materials - aluminum oxides -hydroxyapatite glass ceramics carbons -medical applications

UNIT III POLYMERIC IMPLANT MATERIALS 9

Polymerization –polyolefin – polyamides –Acrylic –polymers –rubbers -high strength thermoplastics - medical applications

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

Total No of Periods: 45

TEXT BOOKS:

1. PARK J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984

REFERENCE BOOKS:

1. Chua, Chena.J.Y, Wanga.L.P, N.Huang, “Plasma-surface modification of biomaterials”, Materials Science and Engineering: R: Reports, Volume 36, Number 5, 29 March 2002, pp. 143-206 (64)



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E14	Subject Name :RECENT ADVANCES APPLIED TO HOSPITAL ENGINEERING	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To learn about Standardization of Hospital Equipment's
- To gain knowledge on Clinical Engineering
- To study about Networking
- To gain knowledge on Fiber Optic Sensors for Measuring Physiological Parameters
- To learn about EMI and EMC Applied to Hospital Equipment's

COURSE OUTCOMES (COs) : (3-5)

CO1	Acquires knowledge on Standardization of Hospital Equipment's
CO2	Gains knowledge on Clinical Engineering
CO3	Graduate understands Networking
CO4	Gains knowledge on Fiber Optic Sensors for Measuring Physiological Parameters
CO5	Acquires knowledge EMI and EMC Applied to Hospital Equipment's

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	L	M	H	L	M	H	L	M
CO2	M	L	H	M	L	M	H	L	M	H	L	M
CO3	L	M	H	L	M	H	L	M	H	L	M	H
CO4	H	M	L	M	H	L	M	H	L	M	H	L
CO5	M	H	L	M	H	L	M	H	L	M	H	L
COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5							
CO1	H	M	L	M	H							
CO2	M	H	L	M	H							
CO3	L	M	H	L	M							
CO4	M	H	L	M	H							
CO5	H	M	M	H	L							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E14 RECENT ADVANCES APPLIED TO HOSPITAL 3 0/0 0/0 3
ENGINEERING

UNIT I STANDARDISATION OF HOSPITAL EQUIPMENTS 9

Need for standardization -classification of equipment's -international standards -Experimental methods of testing standards -maintenance of standards and recalibration

UNIT II CLINICAL ENGINEERING 9

Hospital design-electrical- airconditioning-sanitation -ventilation -safety regulation to be incorporated in the hospital center -management and legal aspects -latest drug delivery systems for sustained delivery of medicines

UNIT III NETWORKING 9

Importance of networking -LAN features -network topologies -LAN components -network operating system -basic data communication concept -application-LAN and multi-user system -planning and installing LAN in hospital set up

UNIT IV FIBRE OPTIC SENSORS FOR MEASURING PHYSIOLOGICAL PARAMETERS 9

Different optical sources -optical detectors -principle of fiber optic cables -single mode multi-mode -step index and graded index type -sensors based on polarization -interferometer principle -magnetic sensors - application of the sensors in measuring pressure -temperature -flow -rotation and chemical activities - principles of smart sensors

UNIT V EMI AND EMC APPLIED TO HOSPITAL EQUIPMENTS 9

Principles of EMI -computation of EMI -measuring techniques to quantify the level of interference - method of suppressing and isolating this unit from interference

Total No of Periods: 45

TEXT BOOKS:

1. Donald R.J. White, "A Handbook of electromagnetic Interference and Compatibility", Vol 4, 5, Published by Donwhite Constant – Maryland, 1972
2. Webster J.G. and Albert M. Cook, "Clinical Engineering Principles and Practices", Printice Hall Inc, Englewood Cliffs, New Jersey, 1979
3. Bernhard Keiser, "Principles of Electromagnetic Compatibility", Artech House- 3rd Edition, 1986

REFERENCE BOOKS:

1. Eric Udd, "Fiber Optic Sensors and introduction for engineers and scientists", Wiley Interscience Publication, New Delhi, 1991
2. Bajpai, P.K., "Ceramic – a novel device for sustained long term delivery of drugs Bio Ceramic", Vol III
3. Rose Heliman Institute of Technology, Terrahaute, Indian, 1992.
4. S.K. Basandia, "Local Area Network", Golgotia Publishing Pvt Ltd., New Delhi, 1995



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BBI18E15	Subject Name :HOSPITAL MANAGEMENT	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: None	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Learn about need and scopes of clinical engineering
- To gain knowledge on training and management of technical staff in hospital
- To study about training and management of technical staff in hospital
- To learn about standards and codes in health care
- To gain knowledge on computer in medicine

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands need and scopes of clinical engineering
CO2	Acquires training and management of technical staff in hospital
CO3	Graduate understands training and management of technical staff in hospital
CO4	Understands standards and codes in health care
CO5	Understands computer in medicine

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	L	H	L	M	H	L	M	H	L
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	M	H	L	M	L	M	H	L	M	H	L	M
CO5	M	H	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	L	M	H
CO2	M	H	L	M	H
CO3	H	M	L	H	L
CO4	L	M	H	L	M
CO5	H	M	L	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E15 HOSPITAL MANAGEMENT 3 0/0 0/0 3

UNIT I NEED AND SCOPES OF CLINICAL ENGINEERING 9

Clinical engineering program - educational responsibilities - role to be performed by them in hospital - staff structure in hospital

UNIT II NATIONAL HEALTH POLICIES 9

Need for evolving health policy - health organization in state - health financing system - health education - health insurance - health legislation

UNIT III TRAINING AND MANAGEMENT OF TECHNICAL STAFF IN HOSPITAL 9

Difference between hospital and industrial organization - levels of training - steps of training - developing training program - evaluation of training - wages and salary - employee appraisal method

UNIT IV STANDARDS AND CODES IN HEALTH CARE 9

Necessity for standardization – FDA - Joint Commission on Accreditation of hospitals - ICRP and other standard organization - methods to monitor the standards

UNIT V COMPUTER IN MEDICINE 9

Computer application in ICU - X-Ray department - laboratory administration - patient data - medical records – communication - simulation

Total No of Periods: 45

TEXT BOOKS:

1. Webster J.C. and Albert M.Cook, “Clinical Engineering Principle and Practice”, Prentice Hall Inc., Englewood Cliffs, New Jersey, 1979

REFERENCE BOOKS:

1. Goyal R.C., “Handbook of hospital personal management”, Prentice Hall of India, 1996



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BB118E16	Subject Name :SYSTEM THEORY APPLIED TO BIOMEDICAL ENGINEERING	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: BIO CONTROL SYSTEM	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
 T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Learn about System Concept
- To Gain Knowledge on Transducer Function
- To Study about Impedance Concept
- To Learn about Periodic Signals, Feedback
- To Gain Knowledge on Simulation of Biological Systems

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands System Concept
CO2	Acquires knowledge on Transducer Function
CO3	Graduate understands Impedance Concept
CO4	Understands Periodic Signals, Feedback
CO5	Simulation of Biological Systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	L	H	L	M	H	L	M	H	L
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	M	H	L	M	L	M	H	L	M	H	L	M
CO5	M	H	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	H	L	M	H
CO2	M	H	L	M	H
CO3	H	M	L	H	L
CO4	L	M	H	L	M
CO5	H	M	L	M	H

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							





DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BB118E17	Subject Name :SPECIAL TRANSDUCERS AND INSTRUMENTATION	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite:	T	3	0/0	0/0	3

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To Learn about **basic** concepts of measurement
- To gain knowledge on force, pressure and motion measurement
- To study about chemical and optical transducer
- To learn about temperature and radiation measurement
- To gain knowledge on data acquisition recording

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understands basic concepts of measurement
CO2	Acquires knowledge on force, pressure and motion measurement
CO3	Graduate understands chemical and optical transducer
CO4	Understands temperature and radiation measurement
CO5	Understands data acquisition recording

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	L	H	L	M	H	L	M	H	L
CO2	M	H	L	M	H	L	M	H	L	M	H	L
CO3	M	H	L	M	H	L	M	H	L	M	H	L
CO4	M	H	L	M	L	M	H	L	M	H	L	M
CO5	M	H	L	M	H	L	M	H	L	M	H	L

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	M	H	L	M	H			
CO2	M	H	L	M	H			
CO3	H	M	L	H	L			
CO4	L	M	H	L	M			
CO5	H	M	L	M	H			

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BBI18E17 SPECIAL TRANSDUCERS AND 3 0/0 0/0 3
INSTRUMENTATION

UNIT I BASIC CONCEPTS OF MEASUREMENT 9

Transducer Categories - Characteristics of Transducers Static and Dynamic Characteristics of Measurement

UNIT II FORCE, PRESSURE AND MOTION MEASUREMENT 9

Various Transducers Capable of Measuring Low Pressure and Force - Its measuring System - External and Catheter tip Transducers - Transducer to Measure Single Movement and Differential Movements - Velocity Transducer - Seismic Pick Up - Accelerometer

UNIT III FLOW MEASUREMENT 9

Transducer to Measure Velocity - Magnitude and Direction Flow various Methods of measuring these Parameter - Invivo and Invitro Type of Measurements

UNIT IV CHEMICAL AND OPTICAL TRANSDUCER, TEMPERATURE AND RADIATION MEASUREMENT 9

Ion Sensor - Anion and Cation Sensor - Liquid and solid Ion Exchange Membrane Electrodes - Enzyme Electrodes - Molecular Electrode - Fiber Optic Sensor - Photo Acoustic Sensors- PPG Sensors-Variou Thermal Sensors Including Integrated Circuit Thermal Sensors - Radiation Thermometry and Chemical Thermometry - Scintillation technique - Gas ionization type films

UNIT V DATA ACQUISITION RECORDING 9

Signal Conditioners - Single and Multi-Channel data acquisition System - DATA Transmission system - Various Types of recorders - Multichannel column display oscilloscope - Multi colour dot scanner - Magnetic recorder.

Total No of Periods: 45

TEXT BOOKS:

1. Michael R. Newman, David G. Flemming, "Physical Sensors for Bio Medical Applications", CRC Press Inc, Flordia, 1980
2. Rangan C.S., Sarma G.R., And Mani V.S.V., "Instrumentation Devices and System", Tata McGraw Hill Publication Company Limited, New Delhi, 1983

REFERENCE BOOKS:

1. Jacob Kline., "Handbook of Bio Medical Engineering", Avademic Press Inc., San Diego 1988
2. George C. Barney, "Intelligent Instrumentation", Prentice Hall of India, New Delhi, 1988
3. Earnest O.Doebelin., "Measurement System Application and Design", McGraw Hill, New York, 1990