

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	С
1	BEN18001	Technical English - I	Ту	1	0/0	2/0	2
2	BMA18001	Mathematics - I	Ту	3	1/0	0/0	4
3	BPH18001	Engineering Physics - I	Ту	2	0/1	0/0	3
4	BCH18001	Engineering Chemistry - I	Ту	2	0/1	0/0	3
5	BES18001	Basic Electrical and Electronics Engineering	Ту	2	0/1	0/0	3
6	BES18002	Basic Mechanical and Civil Engineering	Ту	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	С
1	BMA18003	Mathematics – II	Ту	3	1/0	0/0	4
2	BPH18002	Engineering Physics –II	Ту	2	0/1	0/0	3
3	BCH18002	Engineering Chemistry – II	Ту	2	0/1	0/0	3
4	BES18003	Environmental Science*	Ту	NO	N CREI	DIT COU	JRSE
		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



		III SEMESTER					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BBI18001	Human Anatomy and Physiology	Ту	3	1/0	0/0	4
2	BEI18002	Circuit Theory	Ту	3	1/0	0/0	4
3	BEE18003	Electromagnetic Field Theory	Ту	3	0/0	0/0	3
4	BBI18002	Medical Physics	Ту	3	0/0	0/0	3
5	BEC18I06	Analog and Digital ICs	Ту	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	С	
1	BMA18011	Numerical Methods for Electrical Engineers	Ту	3	1/0	0/0	4	
2	BEI18005	Transducer Engineering	Ту	3	1/0	0/0	4	
3	BBI18003	Pathology and Microbiology	Ту	3	0/0	0/0	3	
4	BBT18I02	Bio-Chemistry	Ту	3	0/0	0/0	3	
5	BHS18NC1 / BHS18NC2	The Indian Constitution*/ The Indian Traditional Knowledge*	Ту	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

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



		V SEIVILSTER					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BBI18004	Diagnostic and Therapeutic Equipments - I	TY	3	1/0	0/0	4
2	BBI18005	Biomedical Instrumentation	Ту	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	С
1	BBI18006	Diagnostic and Therapeutic Equipments II	Ту	3	1/0	0/0	4
2	BBI18007	Troubleshooting of Biomedical Equipments	Ту	3	1/0	0/0	4
3	BXX18EXX	Elective II	Ту	3	0/0	0/0	3
4	BXX18OEX	Open Elective 2	Ту	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



		VII SENIESTEK					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BBI18008	Medical Image Processing	Ту	3	1/0	0/0	4
2	BXX18EXX	Elective III	Ту	3	0/0	0/0	3
3	BXX18EXX	Elective IV	Ту	3	0/0	0/0	3
4	BMG18009	Total Quality Management for Biomedical Engineers	Ту	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	С
1	BBI18010	Medical Waste Management	Ту	3	1/0	0/0	4
2	BBI18011	Bioprocess Technology	Ту	3	0/0	0/0	3
3	BXX18EXX	Elective V	Ту	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



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

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

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



		ELECTIVE –IV					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BBI18E11	Medical Informatics	Ту	3	0/0	0/0	3
2	BEI18E16	Principles of Robotics	Ту	3	0/0	0/0	3
3	BBI18E12	Biomedical Signal processing	Ту	3	0/0	0/0	3
4	BBI18E13	Bio-Materials and Artificial Organs	Ту	3	0/0	0/0	3
		ELECTIVE –V					
			Ty/				
S.NO.	CODE	SUBJECT NAME	Lb/ ETL	L	T/ SLr	P/R	С
S.NO. 1	BBI18E14	SUBJECT NAME Recent Advances Applied to Hospital Engineering	Lb/ ETL Ty	L 3	17 SLr 0/0	P/R 0/0	C 3
S.NO. 1 2	BBI18E15	SUBJECT NAME Recent Advances Applied to Hospital Engineering Hospital Management	Lb/ ETL Ty Ty	L 3 3	T/ SLr 0/0 0/0	P/R 0/0 0/0	C 3 3
S.NO. 1 2 3	BBI18E14 BBI18E15 BBI18E16	SUBJECT NAMERecent Advances Applied to Hospital EngineeringHospital ManagementSystem Theory Applied to Biomedical Engineering	Lb/ ETL Ty Ty Ty	L 3 3 3	T/ SLr 0/0 0/0 0/0	P/R 0/0 0/0 0/0	C 3 3 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 CREE	DITS -	160



		OPEN ELECTIVE					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С
1	BEE18OE1	Electrical Safety for Engineers	Ту	3	0/0	0/0	3
2	BEE18OE2	Energy Conservation Techniques	Ту	3	0/0	0/0	3
3	BEE18OE3	Electric Vehicle Technology	Ту	3	0/0	0/0	3
4	BEE18OE4	Biomedical Instrumentation	Ту	3	0/0	0/0	3
5	BEE18OE5	Introduction to Power Electronics	Ту	3	0/0	0/0	3
6	BEE18OE6	Industrial Instrumentation	Ту	3	0/0	0/0	3
7	BEE18OE7	Solar Energy Conversion System	Ту	3	0/0	0/0	3
8	BEE18OE8	Wind Energy Conversion System	Ту	3	0/0	0/0	3
9	BEE18OE9	Energy Storage Technology	Ту	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



			D	EPART	MENT O	F ENG	LISH								
Subject C	ode:	Subject	Name :	FECHN	ICAL EN	GLISH	- I	Ty/Lb/	ETL	L T/S	SLr	P/F	C C		
BEN1800)1	Prerequ	uisite : N	one				Ту	,	1 0/	/0	2/0	2		
L : Lectur	e T : Tutor	ial SLr :	Supervise	ed Learni	ng P : Pro	ject R :	Resea	arch C: Cre	dits						
T/L/ETL	: Theory / I	Lab / Emb	edded Th	neory and	l Lab	-									
OBJECT	TIVES :														
• Use	appropriate	e vocabula	rv and st	ructure in	n academi	c comm	unicat	ion							
• Use	structural a	nd function	onal gram	nmar in a	cademic v	vritings.									
• Give	e instruction	ns, sugges	tions and	recomm	endations										
• Inter	pret Charts	, diagram	s, adverti	sements,	etc										
• Take	e notes, sun	nmarize ai	nd make j	power po	int preser	tations.									
COURSE	E OUTCO	MES (Cos	(3-5)	5)											
Students of	completing	the course	e would b	be able to)										
CO1	Use appro	priate voc	abulary a	and struct	ure in aca	demic c	ommu	nication							
CO2	Use structural and functional grammar in academic writings.														
CO3	3 Give instructions, suggestions and recommendations.														
CO4	04 Interpret Charts, diagrams, advertisements, etc														
CO5	Take note	s, summar	ize and n	nake pow	ver point p	oresentat	ions.								
Mapping	of Course	Outcome	es with P	rogram	Outcome	s (POs)				1	1				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO	11	PO12		
CO1										Н					
CO2										Н					
CO3										Н					
CO4										Н					
CO5										Н					
H/M/L in	dicates str	ength of	correlati	on H–	High, M	– Mediı	ım, L	– Low			I	I			
лу	es	es	niti	м Ш		in 'es		/es	al / t			ditt			
atego	asic	ngg tienc	uma &	ocial oraic	ore	rogra lectiv		pen lectiv	ractic ojec			terns	oft cills		
Ü	N N N	ХË	E H	Ъй	S	Pr El		Ē	Pr Pr			In	Š Ž		
			N												

B. Tech. –BioMedical Instrumentation - 2018 Regulations



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

UNIT I VOCABULARYBUILDING

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

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

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 Concerts Classifying data Comprehension Essay Writing Informal and

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

UNIT V ORAL COMMUNICATION AND INTERACTIVE LEARNING

(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 Heasly. 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

6

6

6



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF MATHEMATICS

Subject C	Code:	Subjec	t Name	:MATHI	EMATI	CS – I		Ty/L	L	T/SL	P/R	C			
DNIAId	001							L		r					
		Prereq	uisite: N	None				Tv	3	1/0	0/0	4			
		-						- 3		1,0	0/0	•			
L : Lecture	T : Tutor	ial SLr	: Supervi	ised Learn	ning P :	Project	R : Rese	earch C	: Credits	5	1	1			
T/L/ETL : T	Theory /]	Lab / Em	ibedded '	Theory an	nd Lab										
• Apj	oly the B	asic cond	cepts in A	Algebra											
• Use	tify and	solve pr	oblems i	n Trigone	metry										
• Und	lerstand	the Basic	concept	ts in Diffe	erentiati	on									
• Ap	ply the Basic concepts in Functions of Several variables OUTCOMES (Cos) : (3 – 5)														
COURSE	OUTCOMES (Cos) : $(3-5)$ ompleting the course were able to														
Students co	mpleting 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	transformation. Find expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts.														
CO4	Apply maxima	knowled a / minim	ge and a of the	concepts given fun	in find ction.	ing the	derivati	ve of g	iven fu	nction a	nd to fi	nd the			
CO5	Evaluat	e the par	tial / tota	al differen	tiation a	and max	ima / mi	nima of	a functi	on of se	veral var	riables.			
Mapping o	f Course	Outcon	nes with	Program	n Outco	mes (PC)s)								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12			
CO1	Н	H			Μ	Μ			Н	H		Н			
CO2	Н	Н			Н	L						Н			
CO3	Н	Н			Μ				М	Н		L			
CO4	Н	Н			L	1			М	Н		М			
CO5	Н	Н				Μ			М	М		Н			
H/M/L ind	icates sti	ength o	f correla	tion H-	– High,	M – Me	dium,	L – Low	7	1	1	1			



MATHEMATICS - I

BMA18001

UNIT I ALGEBRA Binomial, Exponential, Logarithmic Series (without proof of theorems) - Problems on Summation, Approximation and Coefficients.

UNIT II MATRICES

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

Expansions of Sin n θ . Cos n θ in powers of Sin θ and Cos θ – Expansion of Tan n θ – Expansions of Sinⁿ θ 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

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**

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).



12

12

3 1/0 0/0 4

12



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF PHYSICS

Subject Cod BPH18001	e:	Su	bject	: Na	me :EN	GINEE	RI	NG P	HYSI	CS	- I	TY/ Lb/ ETL		L	T/S Lr	P/.	R	С
		Pr	erequ	uisit	te : Non	e						Ту		2	0/1	0/	0	3
L : Lecture 7 T/L/ETL : T	Г : Tutor heory / I	ial SLr Lab / Er	: : Suj nbed	perv ded	vised Lea Theory	arning P and Lab	9 : P	roject	R : F	Rese	arch C	: Cred	its					
OBJECTIV	ES :																	
 Outline Demons Apply for To ident Produce 	the relati strate con undamen tify & sol	on betw petenc tal laws we prol ent act	ween y in u s of P blems ivities	Scie unde hys: s usi s as:	ence, En erstandin ics in En ing phys sociated	gineerin ng basic ngineerin ics conc with the	ig & cor ng & cepta e co	t Tech ncepts & Tecl s. ourse t	nolog hnolo hroug	gy. gy. h ef	fective	techni	cal	comn	unic	ation		
COURSE O	DUTCON	AES (C	Cos) :	(3-	- 5)													
Students cor	npleting	leting this course were able to Demonstrate competency in understanding basic concepts.																
CO1	Demon	emonstrate competency in understanding basic concepts. tilize scientific methods for formal investigations & demonstrate competency with experimental																
CO2	Utilize method	Utilize scientific methods for formal investigations & demonstrate competency with experimental methods and verify the concept to content knowledge. Identify and provide solutions for engineering problems.																
CO3	Identify	Identify and provide solutions for engineering problems.																
CO4	Relate t	he tech	nical	cor	ncepts to	o day to	day	life a	nd to	prac	tical sit	uation	s.					
CO5	Think a	nalytic	ally t	o in	terpret c	concepts	•											
Mapping of	f Course	Outco	mes v	with	n Progra	am Outo	com	nes (P	Os)		-						—	
COs/POs	PO1	PO2	PO	3	PO4	PO5	P	06	PO	7	PO8	PO	9	PO1	0	PO11		PO12
CO1	Н	н			М	М		М										
CO2	н	н	M	r	M	М		M				M	r	M				
			11	r	M	M		M										
	п 	п 	п			IVI								IVI				IVI
CO4	H	H	Μ	[Μ			Μ				M	[Μ				Μ
CO5	Н	Н	Μ	[Μ			Μ							L
H/M/L indi	cates str	ength o	of coi	rrela	ation H	I – Higl	h, N	/I – M	ediun	n, I	L – Lov	V			·		•	
Category	Basic Sciences	Engg	Sciences	Humaniti	es & Social	Program		Program Flectives		Open	Electives	Practical /	100/011	Internship	s / T-1-:-1	l ecnnical Skills	Soft	Skills



BPH18001

ENGINEERING PHYSICS - I 2 0/1 0/0.3

UNIT I **MECHANICS & PROPERTIES OF MATTER**

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

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

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. 9

UNIT IV ELECTROMAGNETIC THEORY

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

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.

TEXT BOOKS :

- 1. Brijlal, M. N. Avadhanulu& N. Subrahmanyam, Text Book of Optics, S. Chand Publications, 25th edition. 2012
- 2. R. Murugeshan, Electricity and Magnetism, S.Chand Publications, 10th edition, 2017
- 3. R. Murugeshan & 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. Murugeshan, Electricity and Magnetism, S. Chand & Co., New Delhi, 1995
- 6. Thygarajan K & Ajay Ghatak, Laser Theory and Applications, Macmillan, New Delhi, 1981

9

9

9

9

Total No of Periods : 45



DEPARTMENT OF CHEMISTRY

Subject Co	de:	Subj	ject Nan	ne :EN	GINEE	RING CI	HEMIS	TRY – I	Ty/	L	T/S	P/R	С		
BCH18002	1								Lb/		Lr				
		Prer	eanisite	· None						2	0/1	0/0	3		
L : Lecture	T : Tuto	orial SLr	: Super	vised Le	earning]	P : Proiec	t R : Re	esearch (C: Credit	S S	0/1	0/0	5		
T/L/ETL :	Theory /	'Lab / Er	nbedded	l Theory	and La	b									
OBJECTI	VES :														
• Pro	oviding a	n insight	t into ba	sic conc	epts of c	chemical	thermod	lynamics							
• To	create a	awarenes	s about	the wa	ter qual	ity paran	neters, v	vater ana	lysis an	d softe	ning o	of wate	er from		
inc	lustrial p	erspectiv	ve.		-				-		-				
• Im	parting	fundame	ntals of	emf, sto	rage and	i fuel cell	ls.								
• C1	reating a	wareness	about c	orrosior	n and its	control n	nethods.								
• Int	roducing	g modern	n materi	als such	as com	posites a	ılong wi	th basic	concepts	of pol	ymer c	chemis	stry and		
pla	lastics. E OUTCOMES (Cos) : (1–5)														
COURSE	OUTCOMES (Cos) : (1–5) Gain a clear understanding of the basics of chemical thermodynamics which include concepts such														
CO1	Gain a clear understanding of the basics of chemical thermodynamics which include concepts such as Enthalpy, Entropy and Free energy.														
	as Enthalpy, Entropy and Free energy. Obtain an overall idea of Water quality parameters. Boiler requirements, problems, Water softening														
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														
	princip	les of sto	rage dev	vices.											
CO4	Observ	e the in	formatic	on abou	t corros	ion and	underst	and the	mechani	sms of	corro	osion a	and the		
	method	ls of corr	osion co	ntrol.											
<u>CO5</u>	Articul	ate the so	tience of	t polyme	ers and c	composite	es.								
Mapping (of Cours	e Outcol	mes wit	h Progr	am Out	comes (I	POS)	DOP	DOO	DO14		11	DO12		
		PO2	POS	P04	P05	PUo	PO/	PUð	P09	POI) PC	Л	POI2 M		
$\frac{CO1}{CO2}$	п	<u>н</u> и	м	п		ц	ц						M		
C02	п	п М	Н	п		п							IVI		
C03	H	IVI	II I	н			L						L I		
C04	н												M		
H/M/L ind	licates si	trenoth a	of correl	ation	l H _ Hio	$\frac{1}{h M - N}$	/ Aedium	L = Lo	w				171		
								,		,	_				
ory	ces	ces	mit	ر مەر	am	am ves		ves	ect	shi	nica				
Iteg	isic	ien	ima	& Cia	ogr re	ogr ecti)en	ecti acti	roj	em /	chr ills	ft ills			
Ca	Ba Sc	En	Ht	So So	Pr(coj	Pr El	OF	El El	/ P	Int ps	Te Sk	Sk Sk			
						1									



BCH18001

ENGINEERING CHEMISTRY – I 2 0/1 0/0 3

UNIT I CHEMICAL THERMODYNAMICS

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

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

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- H₂– O₂ fuel cell, Batteries-Lead storage battery, Nickel– Cadmium and Lithium-Battery.

UNIT IV CORROSION AND PROTECTIVE COATING

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

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.

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).

9

10

8

9

9 1g

Total No of Periods: 45



DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Co BES18001	de:	Subj ELE	ect Nan CTROI	ne :BAS NICS E	SIC ELE NGINE	ECTRIC ERING	CAL A	ND	Ty/ Lb/ ETL	L	T/S Lr	P/R	C		
		Prer	equisite	: None					Ту	2	0/1	0/0	3		
L : Lecture T/L/ETL : '	T: Tuto Theory /	orial SLr Lab / En	: Superv ibedded	rised Lea Theory	arning P and Lab	: Projec	t R:	Researcl	n C: Credi	ts					
OBJECTI	VES :														
COURSE	Un Acc Gai Ide Der OUTCC	derstand t quire kno in inform ntify basi monstrate DMES (C	the conce wledge of ation on c theore <u>digital</u> os) : (3 -	epts of c on conv measure tical pri <u>electron</u> - 5)	circuit el entional ement of nciples b ic circuit	ements, &non co f electric behind th ts and as	circui onven cal par ne wor ssemb	t laws an tional en ameters. king of le simple	nd coupled hergy produ modern eld e devices.	circu action ectron	its. ic gadg	ets.			
CO1	Studen	tudents understand Fundamental laws and theorems and their practical applications redict the behavior of different electric and magnetic Circuits.													
CO2	Predict	redict the behavior of different electric and magnetic Circuits.													
CO3	 Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution. Identify & Apply schematic symbols and understand the working principles of electronic devices. 														
CO4	O4 Identify & Apply schematic symbols and understand the working principles of electronic devices														
CO5	Analyz	e basics of	of digital	electro	nics and	solving	probl	ems and	l design co	mbina	ational	circuits	3		
Mapping o	of Cours	e Outcon	nes with	Progra	am Outo	comes (l	POs)		- <u>r</u>						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	POT	PO8	8 PO9	PO1	.0 P	011	PO12		
CO1	Н	Н	Н	Н								M	L		
CO2	Н	Н	Н	Μ	M		Μ					М			
CO3	Н	М	Н	М	H		Μ		М				L		
CO4	Н	М		М			Μ					M	L		
CO5	H M H M											M	L		
H/M/L ind	licates st	rength o	f correla	ation I	H – High	n, M – N	/lediu	m, L –	Low		<u> </u>				
Category	Basic Sciences	Engg Sciences	Humaniti	es & Social	Program core	Program Electives		Open Electives	Practical / Project	Internship	Technical Skills	Soft	Skills		

B. Tech. –BioMedical Instrumentation - 2018 Regulations



BES18001 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 2 0/1 0/0 3

UNIT I ELECTRIC CIRCUITS

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

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

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

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

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

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.

9 nt

9

9

9



DEPARMENT OF MECHANICAL ENGINEERING

Subject (BES180	Code:)2	Sub	ject Na	me : BA CIVIL F	SIC ME ENGINE	ECHANI EERING	CAL A	ND T	y/ Lb/ ETL	L	T/SLr	P/R	C		
		Prer	equisite	e:None					Ту	2	0/1	0/0	3		
L : Lectu T/L/ETL	re T : T : Theor	utorial SI y / Lab / 1	Lr : Supe Embedd	ervised L ed Theor	earning y and L	P : Proje ab	ct R : R	esearch	C: Crec	lits					
OBJECT	FIVES :														
•	Learn H Demons machine To iden Learn b Know th Dams	Basics of strate Hoves tify & sol asics of B he basic I	Internal w metals ve probl suilding process o	Combus s are for lems in E materials of concre	stion En med, join Engineer s and con ete, type	igines, po ined, usir ing Mech nstruction s of ma	wer plan ng mach anics n sonry Co	nts and b ining op	oilers erations on of Re	s Lath oads	ie, Mill , Railwa	ing and ays, Brid	Drilling dges and		
COURS	E OUT	COMES	(Cos) : ((3-5)	_										
Students	complet	ompleting the course were able to Demonstrate the working principles of power plants, IC Engines and boilers													
	Demonstrate the working principles of power plants, IC Engines and boilers Utilize the concept of metals forming, joining process and apply in suitable machining process														
C02	 2 Utilize the concept of metals forming, joining process and apply in suitable machining process 3 Identify and provide solutions for problems in engineering mechanics 														
CO3	Utilize	the conc	ent of 1	Building	material	s and co	nstructio	n able to	perform	n co	ncrete n	nix and	masonry		
001	types		opt of 1	5 411 411 8					ponon				j		
CO5	Demon	strate hov	w Roads	, Railwa	ys, dam	s, Bridge	s have b	een cons	tructed						
Mapping	g of Cou	rse Outc	omes w	ith Prog	ram Ou	tcomes (POs)		1						
COs/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P	D10	PO11	PO12		
5 CO1						м			TT	_	11		TT		
$\frac{CO1}{CO2}$	п				L	M M		п М	п		п М		п М		
CO2	H	н						M	M	_	M		M		
CO4	H				L	L			M		M		M		
CO5	H				L	L		М	Μ		Μ		Μ		
H/M/L i	ndicates	strength	of corr	elation	H – Hi	gh, M – I	Medium	n, L – L	OW						
Category	Basic Sciences	Sciences Engg Sciences Humanit ies & Social Sciences Program Electives Electives Practical / Project Internshi ps / Technica I Skills Skills											SILAC		

B. Tech. –BioMedical Instrumentation - 2018 Regulations



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

UNIT I THERMAL ENGINEERING

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

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

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

UNIT IV BUILDING MATERIALS AND CONSTRUCTION

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

<u>Construction</u>: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

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

9

13

9

7



DEPARTMENT OF ENGINEERING SCIENCES

Subject C BES18L	Code: 01	bde: 1 Subject Name :BASIC ENGINEERING WORKSHOP Ty / Lb/ ETL L T/ SL P/ R C Prerequisite : None Lb 0 0/0 2/0 1 e T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits Theory / Lab / Embedded Theory and Lab Lb 0 0/0 2/0 1 IVES : Familiarize the plumbing tools, fittings, carpentry tools, etc. dentify basic electrical wiring and measurement of electrical quantities. dentify Electronic components, logic gates and soldering process Display simple fabrication techniques Execute a project independently and make a working model Image: COUTCOMES (Cos) : (3 - 5) ompleting the course were able to Demonstrate fitting tools and carpentry tools, & Perform the process of Filing, Chipping, Cutting. Perform the process of fabrication of tray, cones and funnels, Tee Halving Cross, Lap Joint Martise& Joints Demonstrate various types of wirings and other equipments. Measure fundamental parameters using the electronic instruments Of Course Outcomes with Program Outcomes (POs) PO PO1 PO11 PO12 I H H M L M L H H M L L M L												
		Prerequi	site : N	one						Lb	0	0/0	2/0	1
L : Lectu	re T : Tu	torial SL	r : Supe	rvised L	earning l	P : Projec	et R : I	Research	C: (Credits	•		•	-
T/L/ETL	: Theory	/ Lab / E	mbedde	d Theor	y and La	b								
OBJECT	TIVES :													
•	Familiari	ize the plu	mbing	tools, fit	tings, ca	rpentry to	ools, e	tc.						
•	Identify	basic elec	etrical w	viring an	d measu	rement of	f electr	ical quar	tities	8.				
•	Identify	Electroni	c compo	onents ,1	ogic gate	es and sol	ldering	process						
•	Display	simple fa	brication	n techni	ques		1	.1						
•	Execute	a project i	ndepen	dently a	nd make	a workin	ig mod	21						
COURS Students	E OUTC completi	COMES (Ong the cou	Cos) : (3 urse wer	3-5) re able to	C									
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&													
001	Joints													
CO3	03 Demonstrate various types of wirings and other equipments.													
CO4	CO4 Measure fundamental parameters using the electronic instruments													
Mapping	g of Cou	rse Outco	mes wi	th Prog	ram Out	tcomes (l	POs)							
COs/PO	s PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P	PO9 PO	D10	PO1	P	012
	1													
CO1	ц	ц	п	м	м			T		м				<u>т</u>
		11		T						T				L
	H		H		M								_	
	H		M											
C04	H	Н	Μ	L				L		L				M
CO5														
H/M/L i	ndicates	strength	of corre	elation	H – Hig	gh, M − N	Aediur	n, L – L	/OW	·				
Category	Basic Sciences	Engg Sciences	Humaniti	es & Social Sciences	Program core	Program Electives	Onen	Electives	Practical /	Internship s / Technical	Skills	Soft	Skills	

B. Tech. –BioMedical Instrumentation - 2018 Regulations



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



ABDUL KALAM COE FOR INNOVATION & ENTREPRENEURSHIP

Subject Coo BES18ET1	le :	Subject ENTRF	Name EPREN	: ORIE EURSH	NTATIO IP AND	ON TO PROJE	CT LAI	3	Ty / Lb/ ETL	L	T/SL r	P/R	С		
		Prerequ	iisite : l	None					ETL	0	0/0	2/0	1		
L : Lecture ' T/L/ETL : T	Г : Tutori heory / I	ial SLr : Lab / Emt	Supervi bedded 7	sed Lear Theory a	rning P : and Lab	Project 1	R : Rese	arch C	C: Credi	ts	•				
OBJECTIV • Und • Ider • Und • Ider • Use COURSE C	TES : lerstand h htify individentiation lerstand c htify com brainston DUTCON	now entre vidual po lifference ponents a rming in MES (Co	epreneur tential & e betwee & create a group s) : (3 –	ship Edu &S have en ideas action p to gener	ucation to career do & opport olan. rate ideas	ransforms reams tunities S.	s individ	uals in	to succ	essful	leaders.				
CO1	Develop	evelop a Business plan & improve ability to recognize business opportunity													
CO2	Do a se	Do a self analysis to build a entrepreneurial career.													
CO3	Articulate an effective elevator pitch.														
CO4	Analyze	e the loca	ıl marke	t enviro	nment &	demonst	rate the	ability	to find	an att	ractive n	narket			
C05	Identify	the requ	ired ski	lls for er	ntreprene	urship &	develop)							
Mapping of	Course	Outcom	es with	Program	m Outco	mes (PO	s)								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	9	PO10	PO11	PO12		
CO1		Μ	Μ	Н	Μ	Μ	Μ		Ν	1	Μ	Μ	L		
CO2	Н	Μ		Н	Μ	Н	Μ	Н	I	I	Н	Μ	Μ		
CO3		Μ	Μ	Μ		Η		Н	I	I	H				
CO4		Η	Μ	Μ	Μ	Μ		Н	N	1	Μ	Η			
CO5		Μ	Μ	H	Μ	Μ	Н	Н	N	1	Μ	H	L		
H/M/L indi	cates str	ength of	correla	tion H	– High,	M - Me	dium, I	2 – Lov	W			1			
Category	Basic Sciences	Engg Sciences	Humaniti	es & Social Sciences	Program core	Program Electives	Open	Electives	Practical / Project	-	Internsnip s / Technical	Soft Skills			



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

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

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

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

3

3

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

Subjec	t Code :	Subject	Name :	MAT	HEMA	TICS –	Ty /]	Lb/	L	ſ/SLr	P/R	C		
BMA	18003	11 Prereat	uisite : N	lone					3	1/0	0/0	4		
				10110			- 5	, 	•	2,0	0,0	-		
L : Lectu	re T : Tuto	rial SLr :	Supervi	sed Le	earning 1	P : Projec	t R : R	esearch	C: Cre	dits		-		
T/L/ETL	: Theory /	Lab / Em	bedded 7	Theory	and La	.b								
OBJEC	FIVES :													
• [Jnderstand	the Basic	concept	s in In	tegratio	n								
• 1	dentify the	Basic cor	icepts in	Multi	ple integ	grals								
• (Use the Bas	1c concep	ts in Orc	iinary . Vnalyti	Differen	itiai equa	tions							
• 4	Analyze the	Basic cone	ncepts of F	f Vecto	or Calcu	ilus								
COURS	E OUTCO	MES (Co	(3 - 3) : (3 - 3)	· 5)										
CO1	Integrate	given fun	ction by	using	method	s of integ	gration a	and to f	ind the	area un	der curv	e and the		
	volume of	a solid b	y revalua	ation.		c								
CO2	Evaluate the multiple integrals / area /volume and to change the order of integration. Solve the ordinary differential equation and to solve Eulers differential equation.													
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	O5 Find the gradient, maximum directional derivative and work done by a force and to verify Green/													
	Stokes/ G	auss divei	gence th	leorem										
Mapping	g of Course	e Outcom	es with	Progr	am Out	tcomes (l	POs)			2010				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	H	Н			Μ	Μ			Μ	Μ		H		
CO2	H	Н			Μ	Η			H	Н		М		
CO3	H	H			Μ	Η			Н	Н		М		
CO4	H	H			L	Μ			Μ	Н		М		
CO5	Н	H			Μ	Μ			Μ	Н		Μ		
H/M/L i	ndicates st	rength of	correla	tion]	H – Hig	gh, M – N	Iedium	, L – I	/OW					
y	ŝ	ŝ	iti			n SS	Sč		ul /		in			
10g0	ic ence	g ince	nan c	ial	gran	grar tive	n Stive		stica		rnsł	ls		
Cate	Bas	Eng Scie	Hur es &	Soc	Pro	Pro _{ Elec	Ope Elec		Pra(Proj		Inte s /	Sofi		
					-							_		



BMA18003

MATHEMATICS – II 3 1/0 0/0 4

UNIT I **INTEGRATION**

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**

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**

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).

THREE DIMENSIONAL ANALYTICAL GEOMETRY UNIT IV

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**

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:

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

REFERENCE BOOKS:

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



12

12

12



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF PHYSICS

Subject	Subje	ct Name	: ENGI	NEERI	ING PI	HYSIC	S –II	T	y / _]		Γ/	P/R	C			
Code : RPH18002									b/ FI	S	sL r					
DI 1110002	Prere	quisite :	None					<u> </u>	'v	2 0	/1	0/0	3			
I · Lecture	T · Tuto	rial SIr	Supervi	sed I e	arning	P · Proi	ect R ·	Researc		edite	-					
T/L/ETL : T	Theory /	Lab / Em	bedded 7	Theory	and La	ı . 110j ıb	ctr.	Research	u c. c.	cuits						
	2			2												
OBJECTI	VES :	_	_													
• Des	sign, con	duct expe	eriment a	nd anal	lyze da	ta.	1									
• Dev	derstand	the conce	autitude a	u micro Iodern 1) and n Physics	ano sca	le of m	aterials								
• Ap	olv the so	cience of	material	s to Eng	gineerii	, ng & Te	echnolo	gv								
				2	5			01								
COURSE	OUTCO	MES (Co	os) : (3 –	5)												
Students co	ompletin	g the cou	irse wer	e able 1	to											
GO1		emonstrate skills necessary for conducting research related to content knowledge and														
CO1	Demo	monstrate skills necessary for conducting research related to content knowledge and poratory skills.														
CO2	Apply	oratory skills. ply knowledge and concepts in advanced materials and devices.														
CO3	Acqui	apply knowledge and concepts in advanced materials and devices.														
CO4	Acquired Analytical, Mathematical skills for solving engineering problems.Ability to design and conduct experiments as well as function in a multi disciplinary teams.															
CO5	Gener	ate analy	tical thou	ight to	interpr	et resul	ts & pla	ice them	within	a broa	der	context				
Mapping o	f Course	Outcon	es with	Progra	m Out	tcomes	(POs)									
COs/POs	PO1	PO2	PO3	PO	PO	PO	PO7	PO8	PO	PO1	L	PO1	PO1			
				4	5	6			9	0		1	2			
CO1	Η	Н	Μ	Μ	Μ	L				Μ			L			
CO2	Н	Н		Μ	Μ								L			
CO3	Н	Н	Н	Н	М					Μ						
CO4	Н	Н	Н	Н	М				Н	M			L			
CO5	Н	Μ	М	Μ	Μ	L			Μ	Μ			L			
H/M/L ind	icates st	rength of	correla	tion H	I – Hig	gh, M –	Mediu	m, L –	Low							
<u> </u>			· H					s	_			ip				
gory	c	ces	anit	al nces ram		ram		ive	ical sct			inshi	s			
ate	asic	inge cier	lum s &	oci. cier	ore	rog	104	llect	ract roje			nter /	oft kill			
0	N B	ЦN	ц эс		ιŪ	ЧЧ		ЭЦ	44			I1 s	SS			
	N															



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERINGBPH18002ENGINEERING PHYSICS - II20/10/03

UNIT I QUANTUM PHYSICS

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

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

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

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

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, Semicoductor Devices, S. Chand Publications, 2014
- 3. Charles Kittal, 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

9

9

9

9



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF CHEMISTRY

Subje	ct	Sub	ject Name	e: ENGI	NEERI	ING CH	Ty / Lb	/ L	T/SL	P/R	C				
Code	:	II							ETL		r				
RCHI	8002	Prer	equisite :	None					Ту	2	0/1	0/0	3		
L:Le	cture	T : Tuto	rial SLr :	Supervis	ed Lea	rning P	: Projec	t R : Re	search C:	Credits					
'T/L/E'	$\Gamma L: 1$	heory /	Lab / Emt	bedded T	heory a	ind Lab									
OBJE	CTIV	/ES :													
•	Imp	arting th	ne basic co	oncepts of	f phase	rule an	d apply	the same	e to one an	nd two co	omponer	nt systen	ns.		
•	Intr	oducing	the chem	istry of	enginee	ering m	aterials	such as	cement, l	ubricant	s,abrasiv	ves, refr	actories,		
•	• To impart a sound knowledge on the principles of chemistry involving different application-oriented														
•	 To impart a sound knowledge on the principles of chemistry involving different application-oriented topics 														
•	 Introducing salient features of fuels and combustion. 														
•	То	give an o	overview o	on moder	n analy	vtical teo	chnique	S							
COUI	RSE (OUTCO	MES (Co	s): $(1 - 3)$	5)										
CO1		Understand the science of phase equilibria and apply the phase rule to different systems													
CO2		G	Gain an overview of Engineering Materials such as Lime Cement Lubricants Abrasives												
		R	Refractories, Alloys and Nanomaterials.												
CO3		R	ecognize	the ess	ential	inform	ation a	bout co	onsumer	products	such	as Soa	aps and		
		Detergents, also gaining the basic knowledge about Explosives and Propellants.													
CO4		D	iscover the	e fuel Ch	emistry	and Co	ombusti	on proce	SS.						
CO5		In	ferring fev	v importa	ant Ana	alytical	Technic	jues and	their appli	cations.					
Марр	ing o	f Cours	e Outcom	es with F	Program	n Outc	omes (l	POs)	11						
COs/I	POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO12		
											0	1			
CO1		Η											L		
CO2		H		H			L	H					L		
CO3		H					H						L		
CO4		H	Μ	H	H			Н					Μ		
CO5		H				Μ							H		
H/M/I	L ind i	icates st	rength of	correlat	ion H	– High	n, M – N	Aedium,	L – Low						
Ŋ		s	S	iti	s s	=	n se		Se	al /	dir 1	, an			
oge	ic	snce	g	nan č	1al <u>mcé</u>		gran xiv	ų	ctiv	ctica	rnsl	lls	ls		
Cate	Bas	SCIE	Eng Scié	Hur es &	Scie	COLE	Pro; Elec	odC	Elec	Pra(Proj	Inte s / r ₂₂ 1	Skil	Sofi Skil		
<u> </u>		1							-	~ -		•1			



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

BCH18002

UNIT I PHASE EQUILIBRIA

UNIT II MATERIAL CHEMISTRY

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

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

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

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 – H_2O , CO_2 . –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).
- B. R. Puri ,L.R. Sharma &M.S.Pathania, "Principles of Physical Chemistry", Vishal publishing co., (2013).

9

9

8

10



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF ENGINEERING SCIENCES

Subject	Subje	ect Name	: ENVI	RONN	AENTA	L SCI	ENC	ЕЛ	'y /	L	T/S	P/R	С	
Code :	(Non-	- Credite	d)						.b/		Lr			
BES18003	Duono		Nama					E						
T T ()	Prere	$\frac{1}{1}$	None	1.7	· ,	· ת נ	(D		<u>'y</u>	-	1.	-	-	
T/L/ETL : T	T : Tutor Theory /	rial SLr : Lab / Em	Supervi bedded	sed Le	arning I	P : Proj b	ect R	: Kese	arch	C: Cr	edits			
OBJECTIV	/ES :													
• To a	acquire k	knowledg	e of the	Enviro	nment a	nd Eco	syster	m & B	odiv	ersity				
• To a	acquire k	cnowledg	e of the	differe	nt types	of Env	vironn	nental j	ollu	tion				
• To I	 To gain understanding of social issues and the Environment 													
• 10 g	 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 $(0,0) = (0,0) = (0,0)$														
	<i>e</i>	,												
CO1	To kn	To known about Environment and Ecosystem & Biodiversity												
CO2	To cle	To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and												
	Solid	Solid Waste management and identify the importance of natural resources like forest,												
	water	water, and food resources												
CO3	To dis	To discover water conservation and watershed management												
CO4	To id	To identify its problems and concerns climate change global warming acid rain ozone												
	layer	depletion	etc.,					0,	U		U,	,		
CO5	To ex	plain fam	ily welf	are pro	gramme	es and	role o	of infor	matio	on tech	nology	in human	1	
	health	and envi	ironment	t	-									
Mapping of	f Course	Outcom	es with	Progra	am Out	comes	(POs)						
COs/POs	PO1	PO2	PO3	PO	PO	PO	PO7	/ PC	8	PO	PO1	PO1	PO1	
				4	5	6				9	0	1	2	
CO1						Μ	H	N	1				Μ	
CO2						Μ	H				Μ		Μ	
CO3						M	H		1				Μ	
CO4						M	H	N	1		M		Μ	
CO5						M	H				Μ		Μ	
H/M/L indi	cates st	rength of	correla	tion 1	H – Hig	<u>h, M –</u>	Med	ium, l	∠ – L	OW				
			s									s /		
ry	SS	SS	uitie al	es	E	u a	3	es		al /		hip cal	aills	
0g9	ic	ig Suce	nan oci	ence	grai	grai tiv		žtiv		ctic		rns hni ls	t Sk	
Cate	Bas	Eng Scie	Hur & S	Scie	Pro	Prog		Dpe Elec	Skil Pra			Sofi		
							-		\rightarrow				•1	
	ν													



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. If this arudeen, 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			ubject N	ame	e :CC	OMMU	NICATI	ON LAB	6	Ty / L ETI	b/	L	T/S	P/F	2	С
BEN18	вет	1 🗆									-		LI			
		P	rerequis	ite :	Non	e				ETL		1	0/0	2/0)	1
L:Lec	ture	T: Tuto	orial SL	:: S	uperv	vised Le	arning P	: Project	R : Re	esearch	C: (Credits				
1/L/E1	L:	I neory /	Lab / E	mbe	aaea	Theory	and Lab									
OBJE	CTI	VES :														
The stu	den	t should	be able t	0												
•	Us	e approp	oriate voo	cabu	lary a	and stru	cture for	effective	interpe	ersonal a	and	academ	ic comm	unic	ation.	
•	• Interpret charts, diagrams, advertisements, etc															
•	Participate in group discussions and present projects effectively.															
•	Present projects and ideas effectively Attend interviews															
COUR	SE		MES (⁷ 05)	• (3	- 5)										
Students completing the course were able to																
CO1	U	Use appropriate vocabulary and structure for effective interpersonal and academic communication														
CO2	I	Interpret charts, diagrams, advertisements, etc.														
CO3	P	Participate in group discussions and present projects effectively														
CO4	P	Present projects and ideas effectively														
CO5	Α	Attend in	terviews													
Mappi	ng c	of Cours	se Outco	mes	s with	n Progr	am Outc	comes (P	Os)							
COs/P	Os	PO1	PO2	P	03	PO4	PO5	PO6	PO7	PO8 PO9		PO9 PO10		P	011	PO12
CO1													Н			
CO2													Н			
CO3													Н			
CO4													Н			
CO5													н			
H/M/L	ind	licates s	trength	of co	orrel	ation]	H – High	n, M – M	edium,	L - Lo	ow					
Category	Basic Sciences Engg Sciences Ceinces es & Social Social Social		Program core	Program Electives		Open Electives Practical /		Project	Internship s / Technical Skills		Soft Skills					



BET18ET1	COMMUNICATION LAB	1	0/0	2/0	1
UNIT I Listening and Speaking- Informa	l and Formal Contexts				6
UNIT II Interpretation of charts / Diagram	s – Group Discussion				6
UNIT III Compeering -Anchoring -Group	Discussion				6
UNIT IV Formal Presentation -Power poin	t presentation of charts/ Diagrams				8
UNIT V Interview					4

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 Heasly. 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 MECHANICAL ENGINEERING

Subject Code: BES18ET2		Subjec	et Name	: BASI GRAI	C ENGI PHICS	NEERIN	IG	Ty / Lb/		L	T/SL r	P/R		С	
								ETL							
Prerequisite : None								ETL		1	0/0	2/0		1	
L : Lectur	re T : Tuto	orial SLr	: Superv	vised Lea	arning P	: Project	R : R	lesearc	h (C: Credi	ts				
T/L/ETL	: Theory	/ Lab / Er	nbedded	Theory	and Lab	1									
OBJECT	TVES :														
• 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															
p ● K	projection • Know the basics of elevation and plan of building														
• I	 Know the basics of elevation and plan of building. Learn the basics of Drafting using AutoCAD Software 														
COURS	COURSE OUTCOMES (Cos) : (3 – 5)														
Students	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	Demonst	rate the p	rojectio	ns of Poi	nts, Line	es, Planes	and S	Solids.							
CO5	Draw the	sectional	l view of	f simple	building	s and util	ize A	uto CA	7D 8	Softwar	e.				
Mapping	of Cours	se Outcor	mes with	n Progra	am Outo	comes (P	Os)								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P P)8	PO9	PO10	PO1	1	PO12	
CO1	Н	Н	Н	М	М	М				Н	Н			Н	
CO2	Н	Н	Н	Μ	Μ	Μ				Н	Н			Н	
CO3	Н	Н	Н	L		Μ				Μ	Μ			М	
CO4	Н	Н	М	Μ		Н		I	M	Н	Н			Н	
CO5	Н	Н	Н	М	Н	L		I	M	Н	Н			Н	
H/M/L in	dicates s	trength o	of correl	ation I	I – High	n, M – M	ediun	1, L –	Lo	W					
Category	Basic Sciences Engg Sciences Sciences Sciences Sciences Sciences Sciences Sciences Sciences		es & Social Sciences	Program core	Program Electives		Open Electives		Proceed /	Internship s /	Technical Skills	Soft	Skills		

B. Tech. –BioMedical Instrumentation - 2018 Regulations



BES18ET2 BASIC ENGINEERING GRAPHICS 1 0/0 2/0 2

CONCEPTS AND CONVENTIONS (Not for examination)

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 cyloids.

UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES

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

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 DEVELOPMMENT OF SURFACES AND ISOMETRIC PROJECTION

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 ORTHOGRAPHICS PROJECTIONS

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

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.



6

6

6

6



Subject Code: BES18L02		Subject	Name :	Ty / L ETL	b/	L	Г/SL r	P/.	R	С			
		Prerequ	isite : N	lone			Lb		0	0/0	2/	0	1
L : Lectu	re T : Tutori	al SLr : S	Supervise	ed Lear	ming P	: Project R	: Resea	urch C	: Credi	ts			
T/L/ETL	: Theory / L	.ab / Embe	edded Th	neory a	nd Lab								
OBJECT	TIVES :												
• [• Demonstrate the ability to make physical measurements & understand the limits of precision in measurements												
n - E	 Display the ability to measure properties of variety of electrical mechanical optical systems 												
	 Display the ability to measure properties of variety of electrical, mechanical, optical systems. To help learners measure conductivity and EME using electrical equipment 												
• 7	 To help learners measure conductivity and ENTF using electrical equipment. To understand the analytical skills through chromatography &viscometry 												
• 1	 To understand the analytical skins 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	3 Familiarizing the titration methods using conductometry & potentiometry												
CO4	Developing	g the Resea	arch spir	rit throu	igh the	knowledge	of Che	minfor	matics	& Ana	alytic	cal skills	•
Mapping	g of Course	Outcome	s with P	rograi	n Outc	omes (POs	s)						
COs/PO	s PO1	PO2	PO3	PO4	PO	5 PO6	PO7	PO8	PO9	PO	10	PO11	PO12
CO1	Н	Н	L	Н	H								
CO2	Н	Н	Μ	Н	Н					M	I		
CO3	Н	Н	Μ	Н	Н				Н				
CO4	Н	Н	Н	Н	Н				Н			Н	М
H/M/L i	ndicates str	ength of c	orrelati	on H	– High	, M – Med	ium, L	– Low	V	1			1
_													
gory	anit	ives	nica (
ateg	asic cien	ngg cien	um , &	ocit cier	ore	rogi lect	pen lect		ract roje		ttern / echu bitt off		kilk
C	S, S	ых	H Sol	v v ç	с х	Ъ	ОШ	¢	Pr Pr		ul [°] I I S		S
							\checkmark						


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 usingChem Draw.
- 12. Studies on potential energy surface of the given molecules.
- 13. Estimate NMR spectra from a Chem Draw structure.



DEPARTMENT OF COMPUTER SCIENCE

Subject BES18E	Code : T3	Subjec	t Name	:C PR	OGRA	MMING	AND L	AB	Ty / Lb/	L	T/S Lr	P/F	2	С	
		Prereq	uisite :	None					ETL E TL	1	0/0	2/0)	2	
L : Lectu T/L/ETL	re T : Tu : Theory	torial SI / Lab / 1	Lr : Supe Embedd	ervised I ed Theo	Learning ry and L	P : Proje ab	ct R : R	esearch	C: Cre	edits					
OBJEC	FIVES :														
• (Dutline th	e basics	of C La	nguage.											
• •	Apply fun Produce a	nd prese	us in C j nt activi	program	ming. ociated w	vith the co	urse								
	Tource a	na prese		105 0550			Juise.								
COURS Students	E OUTC completi	OMES	(Cos) : (ourse we	(3-5) ere able t	to										
CO1	Acquire	knowled	dge how	to write	e and exe	ecute c pr	ograms								
CO2	Underst	and the f	fundame	ntal exp	ression a	and staten	nents of	C Lang	uage.						
CO3	Work w	ith array	s, functi	ons, poi	nters, str	ructures, S	Strings a	nd Files	in C.						
CO4	O4 Identify and provide solutions for engineering problems in C programming Image of Course Outcomes with Program Outcomes (POs)														
Mapping	Mapping of Course Outcomes with Program Outcomes (POs)														
COs/PO	s PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9]	PO10	PO11	P	012	
CO1	Н	Н			М	М		Н	Μ					Н	
CO2	Н	Μ			Н	Μ		Μ	H					Μ	
CO3	Н			Н		Μ		Μ	H					Μ	
CO4	Η			Μ		Μ		Н	Μ					Μ	
H/M/L i	ndicates	strength	of corr	elation	H – Hi	gh, M − 1	Medium	$L - \overline{I}$	/OW						
Category	Basic Sciences	Electives	Practical / Project	Intounchin	s / Technical	Skills Soft	Skills								



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

UNIT I **INTRODUCTION**

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**

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**

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

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

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.



6

6

2

6



	D	<u>EPARTM</u>	IENT OF	ELEC'	ΓRICAI	LAND	ELECT	<u>'RONIC</u>	<u>CS ENGIN</u>	NEERIN	G				
Subject Code:	S	ubject Na	ame: HUN	MAN A	NATON	IY ANI)		TY /	L	Τ/	P/ R	С		
BBI18001	P	HYSIOL	OGY						LB/		S.Lr				
									ETL						
	P	Prerequisi	te: None						Т	3	1/0	0/0	4		
L : Lecture T :	Tutor	ial SLr :	Supervise	ed Learr	ning P:	Project	R : Res	earch C:	: Credits						
T/L/ETL : The	ory/L	ab/Embed	ded Theor	y and L	ab										
OBJECTIVE	:To le	earn basics	s of humar	n body, o	cell and	blood									
• To stu	dy abo	out the pos	itioning a	nd funct	tioning o	of the car	rdiovasc	ular							
• To stue	dy abo	out the pos	itioning a	nd funct	tioning o	of the res	spiratory	y system	S						
To stue	dy abo	out the pos	itioning a	nd funct	ioning o	of the ne	rvous sy	stem							
To stue	dy abo	out the pos	itioning a	nd funct	tioning o	of the mu	ısculosk	eletal sy	ystem						
COURSE OU	TCOI	MES (CO	s) : (3- 5)												
CO1		Understar	$\frac{1}{1}$ ds the bas	sics of h	uman bo	dv. cell	and blo	bod							
CO2		Capable t	o analvze	the posi	tioning a	and fund	tioning	of the ca	ardiovascu	ılar					
CO3		Acquires	knowledg	e on the	position	ning and	functio	ning of t	the respira	atory sys	tems				
CO4		Understar	nds the po	sitioning	r and fur	nctionin	g of the	nervous	system						
CO5		Acquires	the position	oning an	d functio	oning of	$\frac{1}{2}$ the must	sculoske	eletal syste	m					
Mapping of C	ourse	Outcome	s with Pr	ogram (Outcom	es (POs									
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12		
CO1	M	M	M	H	H	H	H	M	L	M	H	I	M		
CO2	Н	H	Н	M	L	H	M	L	H	Μ	L	Ī	M		
CO3	Μ	Μ	HHMLHMLHMLMMHLMHMLHMLM												
CO4	Н	Н	M H L M L H M L M H M H M H H M H M												
CO5	Н	Μ	H M H M H M H M												
_												-			
COs / PSOs	I	PSO1	PSC)2	PS	03	PS	604	PSO5			-			
CO1		Μ	Н		N	A]	H	М			-			
CO2		Н	Н		N	A		H	Μ						
CO3		L	Μ	[I]	H	Н						
CO4		Μ	Н		N	1]	H	L						
CO5		Н	Μ	[Ι		I	М	Н						
H/M/L indicate	es Stre	ength of C	orrelation	H- Hi	gh, M- N	Medium	, L-Low				·	<u> </u>			
								kill							
			Г					ll S							
		ses	ocia					lica							
		enc	Š		es		t	chn							
	es	Sci	pu	e	Stiv	es	oje	Te							
	snc	38	SS 3	Cor	Ilec	tiv	\mathbf{Pr}	s /							
	cié	erii	itie es	n (n H	llec	al /	hip	silis						
ory	ic S	ine	nan nce	grai	grai	n F	tic	rns	Sk						
teg	3asi	gu	Hun	roį	rog	Jpe	rac	nte	loft						
Ca	v	/	н S												
•	•														



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

UNIT I INTRODUCTION

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

UNIT IIDIGESTIVE SYSTEM, EXCRETORY AND UROGENITA SYSTEM12Digestive System- GI Tract, parts, stomach –Intestine -Liver and Pancreas -Respiratory System- Tracheaand Lungs- Parts, Reproductive System -Male and Female Reproductive Organs - Nervous System -

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

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

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 respirating 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

12

12

12

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



Prerequisite: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING T 3 1/0 0/0 4 L: Lecture T: Tutorial ELECTRONICS ENGINEERING T 3 1/0 0/0 4 L: Lecture T: Tutorial ELECTRONICS ENGINEERING T 3 1/0 0/0 4 L: Lecture T: Tutorial ELECTRONICS ENGINEERING T 3 1/0 0/0 4 DIJECTIVE : • 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. CO1 Understands basics of circuit analysis, network theorems, ac circuits and transient analysis. • CO2 CO3 Ability to analyse complex circuits using meth current and nodal voltage methods • CO3 CO3 Acquire the knowledge about different parameters of two networks Mapping of Course Outcomes with Program Outcomes (POs) CO4	Subject Code BEI18002	: Su	bject Na	ame :CIR	CUIT	THEOR	RY			TY / LB/	L	T / S.Lr	P/R	C	
Image: Preconstruction of the state of		Dw	magnia	to. DACI		CTDIC	A.T. A.NIT	•		ETL T	2	1/0	0/0	1	
L: Lecture T: Tutorial SL: Supervised Learning P: Project R: Research C: Credits TL/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. COUTEOMES (COs) : (3-5) CO1 Understands basics of circuit analysis, network theorems. CO2 The graduate will be about different parameters of two networks. CO3 Ability to analyse complex circuits using network theorems. CO4 Understands the concept of complex frequency & 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 M		EI	ECTR	DNICS E	U ELEU NGINE	ERING	AL ANI	,		1	5	1/0	0/0	4	
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. COI 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	L : Lecture T :	Tutoria	l SLr	: Supervis	ed Lear	ning P:	Project	R : Res	search C	: Credits					
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. Understand about different parameters of two networks. COI Understand about different parameters of two networks. COI Understands basics of circuit analysis, network theorems, ac circuits and transient analysis. COI Understands basics of circuit analysis, network theorems, ac circuits and transient analysis. COI Understands basics of circuit analysis, network theorems CO1 Understands the concept of complex circuits using methor theorems CO2 The graduate will be able to analysis complex circuits using methor theorems CO4 Understands the concept of complex frequency & free and free and forced response of RL, RC & RLC circuits. COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 COs/POs PO1 PO1 PO12 PO1 PO1 PO12 PO1	T/L/ETL : The	eory/Lab	/Embed	ded Theor	ry and L	Lab									
 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 analyze complex circuits using network theorems. CO4 Understands the concept of complex frequency & free and forced response of RL, RC & RLC circuits. 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) CO5 M CO4 H CO3 M CO4 H CO5 PO3 PO4 PO5 PO6 PO7 PO8 PO9 CO3 M	OBJECTIVE	:			2										
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 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) CO5 CO1 M L H L M M H H L H H M M H H L H H M H L L H M H CO4 H H M M H H L L M H H L L H H M H L CO5 H H M M H H L L M H H L L H H H H L H H H H	 Enabli 	ng the s	students	to acquire	e knowle	edge abo	out the b	asic of	circuit a	nalysis, no	etwork	theorems	, ac circ	uits	
 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 force of 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 COs/POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 COs/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 COs/POS PO1 M H H L M M M H H L M M M CO3 M H H H L M M M H H L M M H L CO5 H H M M M H H L M M H L L M H M CO5 H H M M M H H L M M H L L M H M CO3 H M M H H L L M M H H L CO4 H M M M H H L M M H L L M H M CO5 H H M M M H H L M M L L CO5 H H M M M L L L M H CO3 H M M H H L L M H M L CO4 H M M L L M H M L CO3 H M M H H L L M H M L CO4 H M M H L L M H M L CO5 H M M H H L L M H M L CO5 H M H M L L M H M L CO5 H M M H H L L M H M L CO4 H M M H L L M H M L CO5 H M H M L L L H H M L CO5 H M H M L L L H H M L CO5 H M H M L L L H H M L Fig. 98 gr 39 gr 30 gr 39 gr 30 g	and tra	ansient a	nalysis	-		-				-					
 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 frequency & free and forced response of RL, RC & RLC circuits. CO4 Understands the concept of complex frequency & 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) CO3 M CO4 H CO5 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 CO3 M M H	• The gr	aduate v	will lear	n the anal	ysis of c	omplex	circuits	using m	lesh curi	ent and no	odal vol	tage metł	nods.		
 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) 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 mesh current and nodal voltage methods 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) CO5/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 M L H L M H M M L H H M M L CO2 M H H H L M M H H L M H H CO3 M H H H L M M H H L M H H CO4 H H M M M H H L M H L M H M CO5 H H M M M H H L M M H L CO5 PSOs PSO1 PSO2 PSO3 PSO4 PSO5 CO1 H L L L M CO3 H M M L L L M M CO3 H M M H H L L M M H CO4 H M H M L L M M H CO4 H M H M L L M M H CO4 H H H M M M H H H L M H CO5 H M M L L L M M CO4 H H H M M M H H H L M H CO4 H M H H H L L M M H CO4 H M H H H L L M M H CO4 H H M M H H H L H H M H CO4 H H M H H H H H H H H H H CO4 H H H H M H H H H H H H H CO4 H H H H H H H H H H H H H H CO5 H H M H H H H H H H H H H CO4 H H H H H H H H H H H H H H H CO5 H H H 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 H H H H H CO5 H H M H H H H H H H H H H H H H H H H	Studen	nts to an	alyze co	mplex cir	cuits usi	ing netw	ork theo	orems.							
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 M H H L L H H M M L CO2 M H H H L M M H H L L H H M M CO3 M H H H L M M H H L L M M H H CO3 M H H H L M M H H L L L H M CO3 M H H H L M M H H L L L L L CO5 H H M M M H H L L M M H L CO5 H H M M M H H L L M M H L CO5 H H M M M H H L L L M L CO5 H H M M M H H L L L L CO4 H M M H H L L L M M H L CO3 H M H H L L L L M M H L CO3 H M H H L L L L M M H H L CO3 H M H H L L L M M H L CO4 H H H M M H L CO5 H H M M H H L CO5 H H M M H L CO5 H H M M H L CO5 H H M M H H L CO5 H H M M H L CO5 H H M M H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H H M M H H H L CO5 H M M L CO5 H H M M H H H L CO5 H M M H H H L CO5 H M M H H H H L CO5 H M M H H H H H L CO5 H M M H H H H L CO5 H H M M H H H L CO5 H H M M H L CO5 H H M M H L CO5 H H M M H H H L CO5 H H M M H L CO5 H M M H H H H H H H H H H H H H H H H	• Under	standing	g the con	ncept of c	omplex	frequen	cy & fre	e and fo	rced res	ponse of F	RL, RC	& RLC c	ircuits.		
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 PO8 PO9 PO10 PO11 PO12 COs/POS PO1 PO2 PO3 PO4 PO5 PO8 PO1 PO1 <th colsp<="" td=""><td> Enabli </td><td>ng to ur</td><td>derstand</td><td>d about di</td><td>fferent p</td><td>paramete</td><td>ers of tw</td><td>o netwo</td><td>rks.</td><td>-</td><td></td><td></td><td></td><td></td></th>	<td> Enabli </td> <td>ng to ur</td> <td>derstand</td> <td>d about di</td> <td>fferent p</td> <td>paramete</td> <td>ers of tw</td> <td>o netwo</td> <td>rks.</td> <td>-</td> <td></td> <td></td> <td></td> <td></td>	 Enabli 	ng to ur	derstand	d about di	fferent p	paramete	ers of tw	o netwo	rks.	-				
CO1Understands basics of circuit analysis, network theorems, ac circuits and transient analysis.CO2The graduate will be able to analysis complex circuits using mesh current and nodal voltage methodsCO3Ability to analyse complex circuits using mesh current and nodal voltage methodsCO4Understands the concept of complex frequency & free and free and forced response of RL, RC & RLC circuits.CO5Acquire the knowledge about different parameters of two networksMapping of Course Outcomes with Program Outcomes (POS)COs/POSPO1PO1PO1PO11PO12COs/POSPO1PO2PO3PO6PO7PO8PO9PO10PO11PO12COs/POSPO1PO11PO12COs/POSPO1PO11PO11PO11PO11PO12COs/POSPO10PO11PO11PO11PO11PO11PO11PO11PO12COs/POSPO10PO11PO11PO12COs/POSPO3PO4PO5 <t< td=""><td>COURSE OU</td><td>тсом</td><td>ES (CO</td><td>s):(3-5</td><td>)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	COURSE OU	тсом	ES (CO	s):(3-5)										
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $															
CO2The graduate will be able to analysis complex circuits using mesh current and nodal voltage methodsCO3Ability to analyse complex circuits using network theoremsCO4Understands the concept of complex frequency & free and free and forced response of RL, RC & RLC circuits.CO5Acquire the knowledge about different parameters of two networksCOs/POsPO1PO2PO3PO6PO7PO8PO9PO10PO11PO12COs/POsPO1PO1PO1PO11PO12COs/POsPO1PO1PO11PO12COs/POsPO1PO11PO12COs/POSPO1PO11PO12COs/POSPO1PO11PO12PO3PO6PO7PO8PO10PO11PO12COs/POSPO14PO14PO14PO14PO14PO14PO14PO14PO14PO14PO14PO14PO14PO14PO16	CO1	Underst	tands bas	ics of circu	it analys	sis, netwo	ork theore	ems, ac c	ircuits ar	nd transient	analysis	5.			
CO3Ability to analyse complex circuits using network theoremsCO4Understands the concept of complex frequency & free and free and forced response of RL, RC & RLC circuits.CO5Acquire the knowledge about different parameters of two networksMapping of Course Outcomes with Program Outcomes (POS)COs/POSPO1PO1PO1PO1PO1PO1PO11PO12COs/POsPO1PO1PO1PO11PO12COs/POsPO1PO1PO1PO1PO1PO1PO11PO12COs/POSPO1PO1PO11PO12COs/POSPO1PO11PO12COs/POSPO1PO11PO12COs/POSPO1PO1PO11PO12COs/POSPO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1PO1 <th colspa<="" td=""><td>CO2</td><td>The gra</td><td>duate wi</td><td>ll be able t</td><td>o analysi</td><td>s comple</td><td>ex circuits</td><td>s using m</td><td>nesh curr</td><td>ent and nod</td><td>al voltag</td><td>ge method</td><td>S</td><td></td></th>	<td>CO2</td> <td>The gra</td> <td>duate wi</td> <td>ll be able t</td> <td>o analysi</td> <td>s comple</td> <td>ex circuits</td> <td>s using m</td> <td>nesh curr</td> <td>ent and nod</td> <td>al voltag</td> <td>ge method</td> <td>S</td> <td></td>	CO2	The gra	duate wi	ll be able t	o analysi	s comple	ex circuits	s using m	nesh curr	ent and nod	al voltag	ge method	S	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	CO3	Ability	to analys	se complex	circuits	using net	twork the	eorems							
CO5 Acquire the knowledge about different parameters of two networks Mapping of Course Outcomes with Program Outcomes (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 H H M L H H M L H H M L H H M L H H M L H M M H H L H M M L L H M M L L L L L L Co3 M H H M M M M L L M M L L L Co3 E F050 F050 F050 F050 F050 F050 F050 F050 F050	CO4	Underst	tands the	concept of	complex	x frequen	ncy & fre	e and fre	e and for	ced respons	se of RL	, RC & RI	LC circu	its.	
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 H H M L H M L H M L H M L H M L H M M L H M M H H L L H M M H H L H M M L L L H M M L L L L M L L M M L L CO5 H H M M L L L L L CO5 I PO PO PO PO PO PO CO1	CO5	Acquire	e the know	wledge abo	out differ	ent parar	neters of	two netv	vorks						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Mapping of C	Course C	Outcome	es with Pı	ogram	Outcon	nes (PO	s)							
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	CO1	M	L	Н	L	Μ	Н	Μ	L	H	H	Μ]	L	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	<u>CO2</u>	M	H	H	L	M	M	H	H	L	L	H	N	<u>1</u>	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	<u>CO3</u>	M	H	H		M	M	H	H		M			<u>/1</u>	
COSHHMMHHMHLMHLMHLCOS / PSOsPSO1PSO2PSO3PSO4PSO5 </td <td>C04</td> <td>H</td> <td>H</td> <td>M</td> <td>M</td> <td>H</td> <td>H</td> <td></td> <td>H</td> <td>H</td> <td></td> <td></td> <td></td> <td>r r</td>	C04	H	H	M	M	H	H		H	H				r r	
COs / PSOsPSO1PSO2PSO3PSO4PSO5CO1HLLMCO2HMLMCO3HMLLMCO4HMLLMCO5HMMLLH/M/L indicates Strength of CorrelationH- High, M- Medium, L-LowImage: Signal of the second strength of CorrelationH- High, M- Medium, L-LowImage: Signal of the second strength of CorrelationH- High, M- Medium, L-Low	05	п	п	IVI	IVI	н	п	IVI	п	L	IVI	п			
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		DS	01	DSA	22	DS	5 <u>0</u> 3	DS	504	DSO5					
COIIILLIMCO2HMLMLICO3HMMLLICO4HMLLMICO5HMMLLIH/M/L indicates Strength of CorrelationH- High, M- Medium, L-LowIIH/M/L indicates Strength of CorrelationH- High, M- Medium, L-LowII	CO1	10			J4	10	105 I		<u>р04</u> т	1505 M					
CO2 II M L M L CO3 H M M L L CO4 H M L L M 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		1	u u		г Г	1	<u>с</u> г			IVI					
CO3 II III III III III 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	C02	1	I I	IV.	<u> </u>	ر ۱		1	<u>vi</u> T						
CO4 II III III III III CO5 H M M L L H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low	C03	1	I I	N. N.	<u> </u>	1	<u>۱</u>		L T						
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Sciences L H High, M- Medium, L-Low L H H High, M- Medium, L-Low L H H High, M- Medium, L-Low L H H H H H H H H H H H H H H H H H H H	C04	1	I I	N. N.	[L T	I					
ciences rring Sciences rring	H/M/L indicat	es Strength of Correlation H-High M-Medium I-Low													
ciences tring Science Sciences Core I Core I Core I Core I Core I Project IIIs		cs birth			11-11	Ign, wi-		I, L-L0w	v I						
ring Sciences ring Sciences Sciences Sciences I Lective ernships / ernships /			ince			S		Ļ.							
rring S rring S Science lective rnshij lills		ŝ	cie	nd		tive	s	jec	ps / Ski						
		nce	50	s ai enc	Ore	lec	tive	Pro	shi						
		cie	rin	Sci	лС	лЕ	leci	Ч / Г	ern mic	ills					
Skipter B B B B Skipter S Skipter Skipter B B B B B B B B B	əry	c S	net	anian	ran	ran	ЪЕ	tica	Inte	Sk					
off II act act be log com minimum as as	eg(asi	ngi	um oci	rog	rog	Ied	raci	H	oft					
	at	$\mathbf{\alpha}$	Ē	ΣΗ	<u>d</u>	Ľ.	0	Å.		Ň					



BEI18002

CIRCUIT THEORY

1/0 0/0

3

12

4

UNIT I BASIC OF CIRCUITS ANALYSIS

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

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

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

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

TEXT BOOKS:

- 1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Mc.Graw Hill publishers, 8th Edition, New Delhi, 2013
- 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

12

Total No of Periods : 60

12



		DEPA	RTME	NT OF	ELEC	TRI	CAL AN	D ELEC	TRONI	CS EN	IGINE	ERI	NG			
Subje	ct Code	: Subj	ect Nan	ne: ELI	ECTRO	OMA	GNETIC	FIELD	THEO	RY []	Γ/L/	L	Τ/	I	P /	С
DFF1	8003									I	ETL		S.L	Lr I	R	
DEEI	.0005	Prore	anisito	· RASI	C FI F	CTR					т	3	0/0		//	3
		ELE	CTRO	NICS E	NGIN	EERI	NG				1	3	0/0		/0	5
		LLL														
L : Le	cture T	Tutorial	SLr :	Superv	vised Le	earnin	g P:Pro	ject R :	Research	h C: Cr	edits					
T/L/E	TL:Th	eory/Lab	Embed	ded The	eory and	d Lab										
OBJE		:														
	• To	acquire l	cnowled	lge in E	lectron	nagne	tic field the	heory	1 9							
	• To	provide	a solid f	oundati	on in E		ostatics su	ich as Di	pole, Ca	pacitan	ice					
	• To	attain fa	miliarity	in Bou	indary (condi	tions and	Magneti	c field							
	• To	understa	nd the r	elation	betwee	n field	d theory a	ind circu	it theory							
COU	• 10	Identify	the elec	tromagi	netic w	ave pi	ropagatio	n in med	ium							
	NSE UU		L9 (U08	o; (3-3)												
CO1		Unde	rstand t	he fund	amenta	ls in I	Electroma	gnetic fi	eld theor	ry						
CO2		Foun	dation in	n Electr	ostatics	s such	as Dipol	e, Capac	itance	-						
CO3		Fami	liarity ir	n Bound	lary coi	nditio	ns and M	agnetic f	ield							
CO4		Unde	rstand t	he relat	ion bety	ween	field theo	rv and c	reuit the	orv						
CO5		Deter	mine th	e electr	omagne	etic w	ave propa	agation i	n mediui	n						
Manr	ing of ('ourse ()	utcome	s with	Progra	m Or	itcomes (POs)								
COs/	POs	PO1	PO2	PO3		<u>111 Ot</u>	PO5	<u>PO6</u>	PO7	PO8	PO9	PC)10	PO11	P	012
CO1	05	H	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO H H H H H H H H H M H M H M												<u>M</u>	
CO2		H	M	H		M N	M	M	M	M	н		M	Н		M
CO3		H	H	H	1	H	H	H	H	M	H	Ī	M	H		M
CO4		M	M	M		v	M	M	M	L	M		M	M		L
CO5		H	H	H		H	H	H	H	M	H	I	M	H		<u> </u>
	PSOs	PS	501		PSO2	-	PS	03	PS	04	P	SO5				
CO1			H		H			Ŧ	I	Ŧ	_	H				
CO2			H		H		I	- I	I	Ŧ		H				
CO3]	M		M		N	 /I	N	1		Μ				
CO4]	М		Н		I	I	I	I		Н				
CO5]	М		Н		Ν	Λ	I	I		Η				
H/M/I	indicat	es Streng	gth of C	orrelatio	on H-	High	, M- Mec	lium, L-l	LOW							
		es	ial					ical								
		ence	Soc		es		t.	hn								
	Se	Scie	pu	0	tiv	SS	ojec	Тес								
	nce	5	s a	Core	llec	tiv	Pro	s / '								
ory	cie	erii	itie	n C	пE	llec	al /	hip	ills							
teg	ic S	ine	nan	grai	grai	nE	tic	rns.	Sk							
Ca	3as	Ing	Hun	roį	roį	Dpe	rac	ofi								
	Ш	<u></u>														
				\mathbf{F}												



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

UNIT I ELECTROSTATIC FIELD

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

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

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

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

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



9

9

9



Subject Code	: St	ıbject Na	ame: ME	DICAL	PHYSI	CS			TY/	L	Τ/	P/ R	С
BBI18002									LB/ ETL		S.Lr		
	Pr	rerequisi	te: None						Т	3	0/0	0/0	3
L : Lecture T :	Tutoria	al SLr :	Supervis	ed Learr	ning P:	Project	R : Res	earch C:	Credits	11			
T/L/ETL : The	eory/Lal	b/Embed	ded Theor	ry and L	ab								
OBJECTIVE	S:												
• Introd	uction t	o Atomic	e Physics										
• To une	derstanc	d the con	cept of In	teraction	with Li	ving Ce	lls						
To pro	ovide th	e knowle	dge about	the Effe	ects of R	Radiatior	1						
COURSE OU	TCOM	IES (CO	s) : (3- 5)									
CO1	U	Jnderstar	nds the co	ncept of	Atomic	Physics	5						
CO2	(Capable t	o understa	and the c	concept	of Intera	ction wi	th Livin	g Cells				
CO3	ſ	The gradu	ates attain	nknowle	dge abo	ut the E	ffects of	Radiati	on				
Mapping of C	Course (Outcome	es with Pr	ogram	Outcom	es (POs	s)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	M	H	Μ	Η	L	H	Μ	L	Μ	H	Μ]	L
CO2	Η	Μ	L	Μ	H	Μ	L	М	H	L	Μ]	H
CO3	L	Μ	Н	L	M	H	L	М	H	L	Μ]	H
COs / PSOs	P	SO1	PS	02	PS	03	PS	SO4	PSO5				
CO1		L	N	I]	H	I	М	Н				
CO2		Μ	H	[Ν	N		L	Н				
CO3		Μ	H	[N	N	1	М	L				
H/M/L indicat	es Stren	igth of C	orrelation	H- Hi	gh, M- 1	Medium	, L-Low						
Category	Category Category Engineering Sciences Fugineering Sciences Social Sciences Program Core						Practical / Project	Internships /	Soft Skills				



3

0/0

0/0

BBI18002

MEDICAL PHYSICS

UNIT I ATOMIC PHYSICS

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

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

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

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

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

9

9

3

9

9



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING **Subject Code:** Subject Name: ANALOG AND DIGITAL IC'S **P**/**R** TY/ L Τ/ С **BEC18I06** LB/ S.Lr ETL Prerequisite: BASIC ELECTRICAL AND Т 3 0/0 0/0 3 **ELECTRONICS ENGINEERING** 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 PO2 PO3 PO4 PO7 PO9 PO12 PO1 PO5 PO6 PO8 PO10 PO11 CO1** Μ Η Μ Η Μ L L L Μ Η Μ Η **CO2** Μ Η Μ L Μ Η Μ L Η L Μ Μ **CO3** L Η L Μ Μ Η Μ Η Μ Μ Η L **CO4** Η Μ L Μ L L Η Μ L Μ Η Μ **CO5** Η Μ L L L Μ Η L Μ Η Μ L COs / PSOs **PSO1** PSO₂ PSO3 PSO4 PSO5 **CO1** Μ Η Η Μ L **CO2** Η Μ Μ Η Μ **CO3** Н L Μ Η Μ **CO4** Μ Μ Η Η L **CO5** Η Η Μ Μ L H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Skill Social Internships / Technical **Engineering Sciences** Program Electives ractical / Project Humanities and **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category √



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

UNIT I OPERATIONAL AMPLIFIERS AND APPLICATIONS

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 PHASELOCKEDLOOP 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

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

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

UNIT V SEQUENCIAL CIRCUITS

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. MorisMaNoM., "Digital Logic and Computer Design", Prentice Hall, 2001

9

9

9



Subject Code	: S	ubject Na	ame: HUI	MAN A	NATON	/IY ANI		TY/	L	Τ/	P/ R	С	
BBI18L01	Р	HYSIOL	OGY LA	B					LB/ ETL		S.Lr		
	Р	rerequisi	te: None						L	0	0/0	3/0	1
L : Lecture T :	Tutor	ial SLr :	Supervis	ed Learr	ning P:	Project	R : Res	earch C:	Credits	<u>I</u> I			
T/L/ETL : The	eory/La	ab/Embed	ded Theor	y and L	ab								
OBJECTIVE	S:												
To une	derstan	d the stan	dard oper	ating pro	ocedures	of varie	ous anat	omy ins	truments.				
To ana	alyze tl	ne differen	nt biomole	ecules, p	resent ir	the bio	logical	system u	ising the a	nalytical	l techniqu	es	
COURSE OU	TCON	MES (CO	s): (3-5)										
CO1		Understar	nds the sta	indard o	perating	procedu	ires of v	arious a	natomy in	strumen	ts.		
CO2		Capable t	o analyze	the diffe	erent bio	molecu	les prese	ent in the	e biologic	al syster	n using th	ne analy	tical
		technique	S										
Mapping of C	ourse	Outcome	es with Pr	ogram	Outcom	es (POs	;)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Н	M	Н	М	L	Н	М	L	М	H	L	J	L
CO2	Μ	H	М	Н	L	, M	L	L	М	M	H	1	H
COs / PSOs	P	SO1	PSO	02	PS	03	PS	604	PSO5				
CO1		Н	M	[1	L]	H	Μ				
CO2		М	M	[I	I	I	М	Н				
H/M/L indicat	es Stre	ngth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low						
		ences	Social		es		t	chnical Skill					
Category Basic Sciences Engineering Science Humanities and Soci Sciences Program Electives Program Electives Program Electives Practical / Project													
)													



BBI18L01HUMAN ANATOMY AND PHYSIOLOGY LAB00/03/01

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



Subject Code: Subject Name: ELECTRIC CIRCUITS LAB TY/ L Τ/ P/RС **BEI18L02** LB/ S.Lr ETL **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) Students Understands various network theorems **CO1 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. The graduate gets the ability to design and apply Hardware Implementation of what they have learnt **CO3** theoretically in the field of Electronics, Electric circuits and network analysis using both digital techniques. Students will be able to Design and implement the hardware of a voltage Regulator for AC inputs in **CO4** 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** Н Μ Μ Μ L Η L Η Η Μ Η Μ **CO2** Η Μ Н Μ Η Μ L Η Η L Μ Η **CO3** Μ Н Η Μ L Н Н Η Η Μ Μ L **CO4** Μ Η Η Μ L Η Μ L Η Н Μ Μ CO5 Η Η Μ Μ Μ Н Η Μ L Μ Μ L COs / PSOs **PSO1** PSO₂ PSO3 PSO4 PSO5 **CO1** Η Η Μ Η L **CO2** Η Η Н Μ Η **CO3** Μ Н Η Μ L **CO4** Н Η L Μ Μ **CO5** Η L Η Μ Η H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Internships / Fechnical Skill Humanities and Social Sciences **Open Electives Basic Sciences** Program Core Engineering Sciences Technical Soft Skills Program Electives Practical / Category Project



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

- 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



Subject Co	ode:	Sub	oject Na	me: ANA	LOG A	AND DI	GITAL	IC'S L	AB	TY/	L	Τ/	P/ R	С
BEC18IL4	1									LB/ ett		S.Lr		
		Pre	reanisi	te: ANA	LOGA	ND DIG	TAL	C'S			0	0/0	3/0	1
L : Lecture	- T : Tı	utorial	SLr:	Supervis	ed Learn	ning $P:$	Project	$\frac{10}{R}$: Res	earch C:	Credits	v	0/0	0/0	-
T/L/ETL :	Theor	y/Lab/	/Embed	ded Theor	y and L	ab	5							
OBJECTI	VES :	:												
• To	under	stand	various	Digital ar	nd Linea	r Integra	ated Cire	cuits use	ed in Sin	nple Syste	m Confi	guration.		
• To	be ab	le to u	Indersta	nd the var	ious typ	es of con	mbinatio	onal circ	uits.					
• To	Unde	rstand	the Ope	erational a	mplifie	r charact	teristics	and app	lications	;				
• To	learn	about	Designi	ing and ve	erifying	wavefor	m gener	ator circ	cuits and	filter circ	cuits			
COURSE	OUT	COM	ES (CO	s) : (3- 5))									
CO1	Grac	luates	s can u	nderstand	l variou	ıs Digit	al and	Linear	Integrat	ed Circu	its used	in Sim	ple Sys	stem
	Cont	figura	ation.											
CO2	The	stude	nts will	be able	to unde	rstand t	he vari	ous type	es of co	mbinatio	nal circ	uits.		
CO3	Und	erstar	nds the	Operation	nal amp	olifier cl	haracter	ristics a	nd appl	ications				
CO4	Will	be ca	apable o	of Design	ing and	l verifyi	ing wav	veform	generato	or circuit	s and fil	ter circu	iits	
Mapping	of Cou	ırse O	utcome	s with Pr	ogram	Outcom	es (POs	s)						
COs/POs	P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1		Μ	Н	Μ	L	H	H	L	L	Μ	Н]	H	
CO2		L	H	Μ	L	Μ	H	Μ	L	Н	Μ	H	N	М
CO3		H	Η	Μ	L	L	H	Μ	L	Μ	H	M		Ĺ
CO4		Μ	L	Н	L	H	M	L	H	M	L	M]	H
COs / PSC)s	PS	01	PSC)2	PS	03	PS	<u>604</u>	PSO5				
CO1		<u>N</u>	1	H	r	N	/1			M				
CO2			1					1		H				
CO3			1				<u>л</u>		L r	IVI T				
H/M/L ind	icates	L Strend	$\frac{1}{2}$	n	Н_ Н	gh M-I	n Medium	I -I ou	L/ ,	L				
	icales	Such	<u>sin or C</u>		11-11	igii, ivi- i								
	ategory Basic Sciences	Dasic Sciences	Engineering Science	Humanities and Soci Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
								✓						



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

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



Subject Code	e:	Subject N	Name: N	UME	RICAL	METH	IODS F	'OR	$\frac{100 \text{ Erro}}{\text{TY}}$	L		P /	С
BMA18011]	ELECTR	RICAL E	NGINI	EERS				LB/		S.Lr	R	
									ETL				
		Prerequi	site: Mat	hs- I, N	/laths -	II			Т	3	1/0	0/0	4
L : Lecture T	: Tut	orial SL	r : Super	vised L	earning	P:Pro	oject R	: Resea	arch C: Cr	edits			1
T/L/ETL : Th	eory/	Lab/Emb	edded Th	eory an	d Lab								
OBJECTIVI	E:												
To de	evelop	the abili	ty in Nur	nerical	Skills								
COURSE O	UTC	OMES (C	COs): (3)	- 5)									
CO1		To under	stand the	Basic	concept	s in Nu	merical	Analys	sis				
CO2		To under	stand the	Basic o	concept	s in Sys	tem of I	Linear	Equations				
CO3		To under	stand the	Basic o	concept	s in No	n Linea	Equat	ions				
CO4		To under	stand the	Basic o	concept	s in Inte	erpolatio	on					
CO5		To under	stand the	Basic	concept	s in Nu	merical	Differe	entiation a	nd Integ	gration		
Mapping of	Cour	se Outcor	nes with	Progra	am Out	comes	(POs)						
COs/POs	PO	1 PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	L	Н	L	L	L	L	L	L	M	L	L	I	М
CO2	L	Н	L	L	L	L	L	L	Μ	L	L	I	М
CO3	L	L H L L L L						L	Μ	L	L	I	M
CO4	L	Η	L	L	L	L	L	L	Μ	L	L	I	M
CO5	L	Н	L	L	L	L	L	L	Μ	L	L	I	М
COs /	PSC)1	PSO2		PSO3		PSO4		PSO5				
PSOs													
CO1		Μ	M	[I]	Ĺ	L				
CO2		Μ	M	[I]	L	L		_		
CO3		Μ	M	[I]	L	L				
CO4		Μ	M	[I]	Ĺ	L			_	
CO5		M	M					<u> </u>	L				
H/M/L indica	ites St	trength of	Correlat	ion H	- H1gh,	M- Mee	dium, L	-Low				1	
								kill					
			al					al SI					
		seo	oci					nice					
		cien	d S		ives	~	ect	ech					
	lces	s S	s an	ore	lecti	ives	Proj	T/					
	cier	arin (ities s	Ŭ	n El	lect	[/]I	nips	ills				
Jry	ic S	ine	nan	grar	grar	nE	tice	rnsł	Sk				
tego	Basi	gung	Hun Scie	Pro	Pro	Ope	Prac	Inte	Soft				
Ca		√										1	



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

UNIT I BASICS OF NUMERICAL METHODS

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

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

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

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

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

Total No of Periods: 60

12

12

12

12

12

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)



Subject Code BEI18005	: Sı	ubject Na	ame: TR	ANSDU	J CER E	NGINI	EERING	J.	TY / LB/ ETI	L	T/ S.Lr	P/ R	С
	P	rerequisi	te: None	;					T	3	1/0	0/0	4
L : Lecture T	: Tutori	al SLr	Supervis	ed Lear	ning P	: Projec	t R : Re	search C	C: Credits	<u> </u>			I
T/L/ETL : The	eory/La	lb/Embed	ded Theo	ry and I	Lab								
OBJECTIVE	S:												
• 0	Indersta	anding ho	w physic	al quant	ities are	measur	ed and c	onvertee	to electr	rical or o	ther forn	18.	
• T	'o have	an adequ	ate know	ledge of	differer	nt transd	lucers, re	esistance					
• D	Develop	ing the k	nowledge	in indu	ctance a	nd capa	citance t	ransduc	ers.				
• S	tudying	g the oper	ration, cha	aracteris	tics, app	olication	s of vari	ious type	es of trans	ducers.			
• S	tudying	g the adva	antages ar	nd disad	vantages	s of vari	ous type	es of tran	sducers.				
COURSE OU	JTCON	AES (CC	s):(3-5	5)									
CO1		The stude	ent under	stands t	he dyna	mics of	the trar	nsducer.					
CO2	- -	The stude	ent will b	e able to	o select	a suitał	ole trans	ducer fo	or a given	applica	tion.		
CO3	r	The stude	ent can de	esign a t	transduc	er as po	er the re	quireme	ent				
CO4	I	Understa	nds the o	peratior	n, charao	cteristic	s, applie	cations	of variou	s types o	of transd	ucers	
CO5	l	Understa	nds the a	dvantag	ges and	disadva	antages (of variou	is types o	of transd	ucers		
Mapping of C	Course	Outcom	es with P	rogram	Outcon	nes (PO	s)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Н	М	Н	L	Μ	Н	Μ	Н	Н	Μ	L	J	H
CO2	Μ	Н	Н	Μ	Μ	Н	L	L	Н	Н	Μ	J	H
CO3	Н	Н	Н	Μ	L	Н	Μ	L	Н	Н	Μ]	H
CO4	Μ	Н	Н	Μ	L	Н	Μ	L	Н	Μ	H]	Ĺ
CO5	Н	H	H	Μ	L	Н	Μ	H	M	L	H		M
COs / PSOs	P	SO1	PSC	02	PS	03	PS	SO4	PSO5				
CO1		Μ	Н	[I	H	I	М	L				
CO2		H	Μ	[I	H	I	М	L				
CO3		L	Н	[N	Λ	I	М	H				
CO4		Μ	H	[I	H]	L	Μ				
CO5		H	L	ı	Ν	A]	H	Μ				
H/M/L indicat	tes Stre	trength of Correlation H- High, M- Medium, L-Low											
		s al											
		ces	oci					inic					
		cient ject											
	ses	Sc	g Sci and ore Projec kill										
	lenc	ing	ies	CO	Ele	ctiv	/P	ips	s				
Ъ.	Sci	eer	unit	am	am	Ele	cal	nsh	<u>kil</u>				
108	sic	gin	ima ien(ngc	ngr	nəc	acti	iter.	fi S				
late .	Ba	En	Hu Sci	Prc	Pr(Op	\Pr_{r_c}	In	So				
C				✓									



TRANSDUCER ENGINEERING

BEI18005

UNIT I SCIENCE OF MEASUREMENT

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

UNIT II CHARACTERISTICS OF TRANSDUCERS

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

Resistance potentiometers -strain gauges- resistance thermometers-thermistors- hot-wire anemometerpiezoresistive 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

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", Clarenden 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



12

12

1

3

1/0

0/0



Subject Code:	S	ubject Na	me: PA	FHOLO	GY AN	D			TY /		T/	P/ R	С
BB118003	M	IICROBI	OLOGY						LB/ ETL		S.Lr		
	P	rerequisit	te: None						Т	3	0/0	0/0	3
L : Lecture T :	Tutoria	al SLr:S	Supervised	d Learni	ng P:P	roject R	: Resea	rch C: C	redits	1 1			
T/L/ETL : The	ory/Lat	o/Embedd	ed Theory	and Lal	b								
OBJECTIVES	5:												
• To	learn a	bout Nori	mal cell st	ructure									
• To	gain k	nowledge	on Fluid a	and hean	nodynan	nic derar	ngement						
• To	study a	about Gen	etic disor	ders									
• To	acquir	e knowled	lge on Gei	neral stru	uctural o	rganizat	ion						
• To	be able	e to do Ide	entification	n of dise	ase prod	ucing or	ganism						
COURSE OUT	ГСОМ	IES (COs):(3-5)										
CO1	1	Understan	ds Norma	l cell str	ucture								
CO2	(Gets know	vledge on	Fluid an	d heamo	dynamio	e derange	ement					
CO3]	Familiar a	bout Gene	etic disor	rders								
CO4	1	Acquires l	cnowledge	e on Gen	eral stru	ctural or	ganizati	on					
CO5	1	Performs 1	Identificat	ion of di	isease pr	oducing	organisi	n					
Mapping of Co	ourse (Outcomes	with Pro	gram O	utcome	s (POs)							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Н	Μ	Η	L	Μ	Η	L	Μ	H	L	Μ		H
CO2	Μ	L	Η	Μ	L	L	Μ	Н	L	Μ	Η		L
CO3	Μ	Η	L	Μ	Η	L	Μ	Н	L	Μ	H		L
CO4	Η	Μ	Μ	L	Μ	Η	L	Μ	H	L	Μ		H
CO5	L	L	L	Μ	H	L	Μ	Н	L	Μ	Н		L
COs / PSOs	P	SO1	PSC	02	PS	03	PS	SO4	PSO5				
CO1		H	M	[I	<u>I</u>	1	M	L				
CO2		M	L	-	N	1]	H	M				
CO3		L	M	[I	H	1	M	L				
CO4		H	M	L			1	M	H				
CO5	~	M				1		М	L				
H/M/L indicate	s Stren	igth of Co	rrelation	H- H1g	h, M- M	edıum, I	L-Low			1			
	ces	5.0	and	ore		ves		s / skill					
	ien	ring	ties	CC	_ ~	ecti		ship sal S	lls				
ıry	c Sc	nee	ani al S	ram	ram	ыEI	tical	erns	Ski				
ego	asi	ngi ciei	lum oci:	rog	rog lect	per	ract roj€	Int [ec]	oft				
Cat	Щ	ЩS	Ц N	Pr OH N					S				
				✓									
			l		L	1	I			1			



ion Diff		9
JUII- DIII	erence	between
vascular	Coag	9 ulation -
age disord	lers -	9 types of
oth of Bac by - electro	eteria a on mic	9 and virus- proscopy
SM ques -Ant	igen	9 Antibody
	vascular ge disord th of Bac y - electr M ques - Ant Total No	vascular Coag ge disorders - th of Bacteria a by - electron mic M ques -Antigen - Total No of Pe

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Anatha NarayananR. and Jayaram C.R., "Text Book of Microbiology", Orient Laongman, 1998



.....

Subject Code	<u> </u>		DI DI	O CHE	MICTD	V		KUIII			<u></u>	D/D	C						
BBT18102	Su	oject na	ime: BI	U-CHE	1VIIS I K	. X			IY/ IR/	L	1/ SIr	P/K	C						
DD 1 10102									LD/ FTI		3.LI								
	Pre	ereanisi	te: None						T	3	0/0	0/0	3						
L · Lecture T ·	Tutoria	l SLr	Supervise	ed Learr	ning P·	Project	R · Res	earch C	· Credits	5	0/0	0/0	J						
T/L/ETL : The	orv/Lab	/Embed	ded Theor	v and L	ab	110,000			. creates										
OBJECTIVE	S:			J															
• 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	U	nderstan	ds structu	iral and	function	al prope	rties of	carbohy	drate										
CO2	С	apable to	o analyze	structur	al and fu	inctional	l propert	ies of p	roteins										
CO3	U	nderstan	ds structu	iral and	function	al prope	rties of	lipids											
CO4	C	apable to	o structura	al and fu	inctional	propert	ies of nu	icleic ac	cids										
CO5	U	nderstan	ds the en	nphasize	e the role	e of thes	e bio mo	olecules	by provid	ing basic	informa	tion on							
	sp	pecific m	netabolic o	liseases	and disc	orders of	these b	io moleo	cules										
Mapping of C	ourse O	Outcome	s with Pr	ogram (Outcom	es (POs)			1									
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	P08	PO9	PO10	PO11	PO	12						
CO1	M	H	M	L		L	H	M		M	H	1							
<u>CO2</u>	H	H	M	L	H	M	H		M	H	M								
<u>CO3</u>	M	H	M		M	H		M	H		M		1						
<u>CO4</u>	M	H	M	H		M	M	H	M	L	H M H L M M H M L H								
05	H	M	H M L L M H L M H L M H																
	DC	01			M				H PSO5	L	M		1						
COs / PSOs	PS	01	PSO	D2	M PS	н 03	L PS	M 04	H PSO5 M		M		1						
COs / PSOs CO1 CO2	PS N	01 4 4	PS(H	D2	M PS N	н ОЗ Л	PS	M 604 L	H PSO5 M I		M								
COs / PSOs CO1 CO2 CO3	PS N I	01 M H H	PSO H M	D2	M PS N N	н 03 Л Л		M 604 L H	H PSO5 M L H		<u>M</u>								
COs / PSOs CO1 CO2 CO3 CO4	PS N H	01 <u>M</u> H H M	PSC H M M	D2 [[M PS N I	н 03 Л Л Ц	PS I I	M 604 L H M	H PSO5 M L H H		<u>M</u>		-1 						
COs / PSOs CO1 CO2 CO3 CO4 CO5	PS N I I N	O1 M H H M	PSC H M M L	D2 [[[M PS M I I I I	н 03 Л Л Ц Н	PS PS I I I I	M KO4 L H M M M	H PSO5 M L H H H		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS N I I N cs Strens	O1 M H H M L gth of Co	PS(H M M L M orrelation	D2 [[[[[H-Hi	M PS N I F Sh. M- N	H O3 A A A L H H Medium	L PS I I I I I I I I I I I I I I I I I I	M O4 L H M M M	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M I I S Streng	O1 M H H M L gth of Co	PSC H M M L Drrelation	D2 [[[[H-Hi	M PS N I I I I gh, M- N	H O3 A A L H H Medium	L PS I I I I I I I I I I I I I I I I I I	M iO4 L H M M M	H PSO5 M L H H L		M		1						
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M I I Streng	O1 M H H M L gth of Co	PSC H M M L M orrelation	D2 [[[[H-Hi	M PS M I I H gh, M- N	H O3 A A A A H H H Medium	L PS I I I I I I I I I I I I I I I I I I	M L L H M M M M N S Kiil	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS N I S S S treng	O1 M H H L gth of Co	PSC H M M L Drrelation	D2 [[[[H-Hi	M PS N I I J H gh, M- N	H O3 A A A L H H Medium,	L PS I I I I I I I , L-Low	M C4 L H M M M M M M	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M I I S Strens	O1 M H H M L gth of Co	PSC H M M L Drrelation	D2 [[[H-Hi	M PS N I I I I B H gh, M- N	H O3 A A A I H H Medium	L PS I I I I I I I I I I I I I I I I I I	M L L H M M M M M	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M H H S S S Trens	O1 M H H M L gth of Co	PSO H M M L M Orrelation	D2 [[H-Hi	M PS N N I I gh, M- N	H O3 A A A A H H Medium	L PS I I I I I I I I I I I I I I I I I I	Lechnical Skill	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS N I S S S S S S T C S S S U	O1 M H H M L gth of Co	s and Social Soc	D2 [[H-Hi	M PS N N I Gh, M- N gh, M- N	H O3 A A A I H Medium	L PS I I I I I I I V I I V J I I I I I I I I	M Dechnical Skill M M M M M	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M I I S S S treng	O1 M H H M L gth of Co	ities and Social W M M Durrelation	D2 L L H-Hi	M PS N N I I gh, M- N gh, M- N	H O3 A A A H H Medium	I / Project	Inps / Technical Skill	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M I I M I S S Streng c S C C C C C C C C C C C C C C C C C C	O1 M H H M L gth of Co gth of Co	anities and Social M M M Duces nces	D2 L L L H-Hi	M SP M M M H H H H H H H H H H H H H H H H	H O3 A A I H H Medium	tical / Project	M Definition of the second state of the second	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	asic Sciences	O1 M H H M L gth of Co gth of Co Co Sciences	Lumanities and Social M M M M M Ciences	D2 L L L H-Hi	M SP N N N H H gh, M- N gh, M- N	H O3 A A I H Medium	ractical / Project	M 1004 100	H PSO5 M L H H L		M								
COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PS M I I M S Strences Strences	Engineering Sciences	Humanities and Social W N Sciences Sciences	D2 L H-Hi	M PS PS I I B H gh, M- N gh, M- N	H O3 A A H H Medium	Practical / Project	M Luternships / Technical Skill M M	H PSO5 M L H H L										



3

0/0

0/0

BIO-CHEMISTRY

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 a cross biological membrane - NUCLEAR ACID: Composition and Function, Genes -Outline of DNA structure -Re-Combinant DNA

UNIT II ENZYMES

BBT18I02

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

Carbohydrate – Classification, Metabolism of carbohydrateand 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

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

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 ofBiochemistry 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

9

9

3

9 .



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING Subject **T**/ Subject Name Ty/ P/R С L Code: THE INDIAN CONSTITUTION Lb/ S.Lr BHS18NC1 ETL 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) PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 **COs/POs** PO2 PO3 **PO1 PO12 CO1** Η L L L L **CO2** Η L L L L **CO2** Η L L Μ L COs / **PSO1** PSO₂ PSO3 **PSOs CO1** L L Μ **CO2** L L М **CO3** L L Μ H/M/L indicates Strength of Correlation H-High, M-Medium, L-Low Internships / Technical Practical / Project Category Program core Humanities Electives Sciences Sciences Basic Sciences Electives & Social Program Soft Skills Skills Engg Open



BHS18NC1	THE INDIAN CONSTITUTION	Ту	2	0/0	0/0	NC				
UNIT I				3	BHrs					
The History of the Making of Indian Constitution, Preamble and the Basic Structures										
UNIT II	3	3Hrs								
Fundar	nental Rights and Duties, Directive Principles of State F	Policy								
UNIT III				3	BHrs					
Legisl	ature, Executive and Judiciary									
UNIT IV				3	BHrs					
Emerge	ency Powers									
UNIT V				3	BHrs					
Special	Provisions for Jammu and Kashmir, Nagaland and Othe	er Regi	ions,	Amendr	nents					
		U	,							

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.



Subject Code:	Subj	Subject Name :							Ty/	L	Τ/	P/R	С	
BHS18NC2	THE	I HE INDIAN I KADIHUNAL KNOWI FDCF									S.Lr			
	Drore			ב ד					ETL					
	Field	Terequisite. ML							Ту	2	0/0	0/0	NC	
L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: T/L/ETL : Theory/Lab/Embedded Theory and Lab														
	RIECTIVES.													
• To understand the Pre- colonial and Colonial Period Indian Traditional Knowledge System														
• To uno	 To understand the Fre- colonial and Colonial Period, Indian Traditional Knowledge System To understand the Traditional Medicine. Traditional Production and Construction Technology 													
• To un	To Know the History of Physics and Chemistry Traditional Art and Architecture and Vastu													
Shash	10 Know the History of Physics and Chemistry, Iraditional Art and Architecture and Vastu Shashtra Astronomy and Astrology													
To une	 To understand the Origin of Mathematics. Aviation Technology in Ancient India Crafts and 													
Trade	Trade in Ancient India													
COURSE OU	COURSE OUTCOMES (COs) : After studying this course the student would be able to													
CO1	To unde	rstanc	l the I	Pre- color	nial a	nd Colo	onial P	eriod,	Indian	Tradi	tional k	Knowled	lge	
	System													
CO2	To unde	o understand the Traditional Medicine, Traditional Production and Construction												
	Technol	ogy	1.1.4	<u></u>	N 7 - 1		<u>.</u>	·		1 .	<u>.</u>	. 7 1	0.6	
CO3	To unde	rstanc	1 the (Jrigin of . nt India	Mati	nematic	s, Avia	ation 1	echno	logy 11	n Ancie	nt India	, Crafts	
Manning of (anu mac		nos u	ith Prog	rom	Outcor	mas (P							
		uttoi	nes w	nun i rog	1 4111	Outto	nes (1	03)						
COs/POs	PO1	PO2	PO3	PO4		PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1		Н	Н	L			Μ				Μ		L	
CO2		Η	Η	L			Μ				Μ		L	
CO2		Η	Η	L			Μ				Μ		L	
COs / PSOs	PSO1	L		PSO2	1	PSO	3							
CO1	L			L		Μ								
CO2	L			L		Μ								
CO3	L			L		Μ								
H/M/L indica	tes Strei	ngth o	of Co	<u>rrelation</u>	H-	High,	M- Me	dium	<u>, L-Lo</u>	W		1		
								t						
								jec						
<u>v</u>				s	ore			Prc	2					
10g	SS	S	2	itie al es	n c	es n	es	al /	hip: cal					
Caté	ic	8 2007		nan oci	graı	grai	u Xiv	ctic	rns hni	ls I				
	Bas Scie	Eng		Hur & S Scie	Pro	Prog	Ope	Pra	[nte [ec]	Sofi				
								<u> </u>	<u> </u>					
				•										



BHS18NC2	THE INDIAN TRADITIONAL KNOWLEDGE	Ту	2	0/0	0/0	NC			
UNIT I						3Hrs			
Historical Back	ground: TKS During the Pre- colonial and Colonial Pe	riod, In	dian	Traditio	nal				
Knowledge Sys	tem								
UNIT II						3Hrs			
Traditional Me	dicine, Traditional Production and Construction Technology	ology							
UNIT III						3Hrs			
History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy Astrology									
UNIT IV						3Hrs			
Origin of Mathe	ematics, Aviation Technology in Ancient India, Crafts	and Tra	ide ii	n Ancien	t India				
UNIT V						3Hrs			
TKS and the Co	ontemporary World, TKS and the Indian Union, TKS a	nd IT R	levol	ution					
				Т	'otal H	lours: 15			

TEXT BOOKS:

- 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 Name: ADVANCEMENT IN ELECTRONICS TY/L Subject No

Subject Code BBI18ET1	: Su	bject Nai	me: ADV	ANCEN	MENT I	N ELE	CTRON	ICS	TY / LB/	L	T / S.Lr	P/ R	C	
									ETL					
	Pre	Prerequisite: ANALOG AND DIGITAL IC'S								1	0/1	3/0	3	
L : Lecture T :	Tutori	al SLr :	Supervise	ed Learr	ning P:	Project	R : Res	earch C:	Credits					
T/L/ETL : The	T/L/ETL : Theory/Lab/Embedded Theory and Lab													
OBJECTIVE	OBJECTIVE :													
• Far	niliarity	y on the b	asics of E	lectroni	c device	s.								
• To	gain kr	nowledge	about the	fundam	ental de	vices of	differen	t circuits	, its chara	cteristic	s and cor	figurat	ions	
• Far	Familiarity on the basics of Feedback Circuits													
• To	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	I	Develop I	cnowledge	e to inco	rporate	the devi	ces and	circuits f	or differen	nt applic	ations			
CO3		Tanable t	o design (Scillato	rs and A	mnlifie	rs denen	ding unc	n the ann	lications				
		Capable to design Oscillators and Amplifiers depending upon the applications.												
04	•	Students capable to gain knowledge on the latest technology												
CO5	CO5 Students capable to gain knowledge in fabricating Electronic devices and other materials													
Mapping of C	ourse	Outcome	s with Pr	ogram	Outcom	es (POs	5)	-						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
CO1	Н	Μ	Μ	L	Н	Μ	Н	Μ	L	Н	Μ]	H	
CO2	Μ	Μ	Μ	Μ	Н	Η	Η	Η	L	Μ	L	Γ	M	
CO3	Н	Μ	Н	Μ	Μ	Μ	L	L	L	L	Μ]	H	
CO4	Н	Μ	Μ	Η	Н	Η	Μ	Η	Μ	Μ	Н	Ι	M	
CO5	Η	Η	Н	Μ	Μ	Μ	Μ	L	L	L	Μ	l	H	
COs / PSOs	P	SO1	PSC)2	PS	03	PS	504	PSO5					
CO1		Н	Μ	[Ι	<u> </u>	1	M	L					
CO2		Н	Μ	[N	Л]	L	Н					
CO3		L	H		N	Л	I	M	L					
CO4		Μ	Μ	[Ι]	H	Μ					
CO5		Μ	Н		N	Л]	L	Μ					
H/M/L indicat	es Strer	ngth of C	orrelation	H- Hi	gh, M- N	Medium	, L-Low							
								cill						
			_					S						
		es	cia					cal						
		ance	So		SS			hni						
	S	cie	ри		iive	s	jec	lec						
	nce	00 00	s ai	Ore	lec	üv€	Prc	[/:						
	ciel	rin	s	ιC	ЪЕ	lect	1/]	ips	lls					
īŊ	Š	nee	ani Ices	ran	ran	Ē	ica	hsh	Ski					
oge	asic	ıgi	um ien	Ig0	lg0	pen	act	teri	oft (
Zat (Bį	Ē	Hı Sc	Pr	Pr	0 ¹ 0	Pr	In	Sc			_		
J				\checkmark										



BBI18ET1 ADVANCEMENT IN ELECTRONICS

UNIT I SEMICONDUCTOR DIODE

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

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

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

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

UNIT V NANO MATERIALS

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

3

9

9

9

9

9

1

0/1

3/0

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. Theodre, 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: Subject Name: PATHOLOGY AND TV / I T / P/ R C													
Subject Code	: Su	Dject Na	Ime: PATHOLOGY AND						LB/		1/	P/K	C
BBI18L02	M			LAB					ETL		S.Lr	2/0	
	Pr	erequisi		L	0	0/0	3/0	1					
L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits													
T/L/ETL : The	eory/Lab	/Embed	ded Theor	y and L	ab								
OBJECTIVE	S:												
• 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 OU	тсом	ES (CO	s) : (3- 5)									
CO1	C	apable	to under	stand th	e study	of m	icroorga	nisms,	which are	e unice	llular or	cell-cl	uster
	n	nicroscop	pic organi	sms.									
CO2	Т	he gradu	ate can a	nalyze F	⁷ ungi an	d, protis	sts and p	rokaryo	tes. Virus	es, thoug	gh not str	ictly cla	assed
	a	s living o	organisms	, are also	o studied	1							
Mapping of C	Course (Outcome	s with Pr	ogram	Outcom	es (POs	s)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	М	М	Н	L	М	Н	L	М	Н	L	М]	H
CO2	Н	Μ	L	Μ	Н	L	Μ	Н	L	М	H]	L
COs / PSOs	PS	501	PSO	02	PS	03	PS	504	PSO5				
CO1	I	М	Н	[]	_]	М	Н				
CO2	I	М	Н	[]]	М	Н				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- 1	Medium	, L-Low	,					
								kill					
			al					al SI					
		nce	Soci		S		t.	hnic					
	ses	Scie	and	e	ctive	/es	ojec	Tec					
	ienc	ring	ies a	Col	Ele	ectiv	/ P1	ips /	lls				
Ś	ic Sc	inee	nanit nces	gram	gram	n El	tical	msh	Ski				
tegoi	Basi	Eng	Hun Scie	Proξ	Pro§	Ope	Prac	Inte	Soft				
Cat							√						



BBI18L02PATHOLOGY ANDMICROBIOLOGY LAB00/03/01

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:** Subject Name: TRANSDUCER LAB **P**/ **R** TY/ Τ/ С L **BEI18L03** LB/ S.Lr ETL **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 **PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PO4 CO1** Η Μ Η L Μ Η Μ L Η Μ Η Μ **CO2** Η Η Η Η Μ Μ L L Μ Η Μ L **CO3** Η Μ L Μ Η L Μ Μ Μ Μ Η Μ **CO4** Μ Μ Η Η Μ Η Μ Η Η Η Μ L **CO5** Η Н Η Μ L Μ L Μ Н Η Μ L COs / PSOs **PSO1** PSO₂ PSO3 PSO4 PSO5 **CO1** Μ Η Η L Μ **CO2** Η Η Η Μ Μ **CO3** Μ Η Η Μ L **CO4** Η Η Μ Η L **CO5** Μ Μ Η L Η H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Social Internships / Technical **Engineering Sciences** Program Electives ractical / Project and **Open Electives Basic Sciences** Skill Program Core Humanities Soft Skills Sciences Category


BEI18L03

TRANSDUCER LAB

0/0 3/0 1

0

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



Subject Code:	: S	ubject Na	me: BIO	-CHEM	IISTRY		TY/	L	Τ/	P/ R	С			
BBT18IL2		Image: Prereouisite: Image: None									S.Lr			
	P	rerequisi	te: None						L	0	0/0	3/0	1	
L : Lecture T :	Tutori	al SLr:	Supervise	ed Learn	ning P:	Project	R : Res	earch C	: Credits	I				
T/L/ETL : The	ory/La	b/Embed	ded Theor	y and L	ab									
OBJECTIVE	S:													
• Genera	al biocl	hemical re	eactions fo	or the id	entificat	ion of b	io molec	cules						
 To qua 	antitati	vely estin	nate the pr	imary a	nd secon	dary me	etabolite	s preser	nt in plants					
COURSE OU	TCON	AES (CO	s) : (3- 5))										
CO1	1	Understar	ds Genera	al bioche	emical re	eactions	for the	identific	cation of b	io molec	ules			
CO2		Capable t	o quantita	tively es	stimate t	he prima	ary and s	seconda	ry metabol	lites pres	ent in pla	ints		
Mapping of C	ourse	Outcome	s with Pr	ogram	Outcom	es (POs	;)							
COs/POs	PO1	PO2	PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12											
CO1	Н	Μ	L	Μ	Н	M	L	L	Н	Μ	L	N	M	
CO2	Μ	H	М	L	Н	M	L	Н	M	L	Μ	I	H	
COs / PSOs	Р	SO1	PSC)2	PS	03	PS	504	PSO5					
CO1		Μ	Н		N	A]	L	Н					
CO2		Н	Μ	[N	A]	L	Н					
H/M/L indicate	es Stre	ngth of C	orrelation	H- Hi	gh, M- N	Medium	, L-Low	,						
								kill						
		ences Social ct ct ct ct												
	ences	ing Sciei ies and 1 Core Elective bs / Tecl ls												
;gory	asic Sci	ngineer	lumaniti ciences	rogram	rogram)pen Ele	ractical	nternshij	oft Skill					
Cate	g		т s					I	S					



BBT18IL2

BIO-CHEMISTRY LAB

0/0 3/0

1

0

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.



Subject C BBI18TS	ode: 1	Sub	oject Na	ame: T	ECHN	ICAL S	SKILL 1		TY / ETL	LB/	L	Γ/S.Lr	P/R	C
		Pre	requisi	ite: None					L		0 (0/0	3/0	1
L : Lectur	e T : Tu	torial	SLr	: Supervise	d Lear	ning P	: Project I	R : Research	C: Cre	edits				•
T/L/ETL :	Theory	/Lab/	/Embed	ded Theor	y and L	ab								
OBJECT	IVE :T	ne obj	jective	is to develo	op the to	echnica	l skill of tl	he students.						
COURSE	OUTC	OMI	ES (CO	(3-5)										
CO1	Develo	p the	technic	cal skills re	equired	in the f	field of stu	dy						
CO2	Bridge	the g	gap betv	veen the sk	till requ	iremen	ts of the er	nployer or i	ndustry	and the	compet	ency of the	e stuc	lents.
CO3	Enhan	ce the	emplo	yability of	the stud	dents.								
Mapping	of Cou	rse O	utcom	es with Pro	ogram	Outcor	nes (POs)	1			1			
COs/POs	PO1	Р	PO3	PO4	PO5	PO	PO7	PO8	PC)9	PO10	PO11		PO12
		0				6								
001		2												
<u>CO1</u>		H	H	H	H	H	M	M		<u>H</u>		H		<u>M</u>
<u>CO2</u>		H	M	H	H	H	M	M		H	H			H
CO3			H		M		DO	H	Н	Н		H		
CUS /	P50	01	P	502	PS	03]	PS04	PS	05				
PSUS CO1	T	r		TT	Т	т		TT		TT				
CO1		L r		<u>п</u> и		л т				<u>п</u> u				
C02		L r		<u>п</u> и	I I	л Т				<u>п</u> u				
H/M/L inc	licates 9	L Streno	th of C	orrelation	⊔_ ⊥ H_ Hi	ah M_	Medium			11				
11/1VI/L/111	incates .				11-11	ign, wi-								
tegory	Basic Sciences	Engineering Sciences Humanities and Social Sciences Program Core Program Electives Open Electives Practical / Project Internships / Technical Skill							Soft Skills					
Ca								\checkmark		1				
Subject C BEN18Sk	ode: X1	Subj CON	ject Na NFIDE	me :SOFT NCE BUII	SKIL LDING	LS I ((})	CAREER	AND	TY / LB/ ETL		T S.L	/ P/ F .r		
	ŀ	Prer	equisit	e: None					ETL	0	0/0	0 3/0	1	
L : Lectur	e T : Tu	torial	SLr:	: Supervise	d Lear	ning P	: Project I	R : Research	C: Cre	edits	I	I	1	
I/L/LL	rneory	/Lau/	LINDED	ucu meor	y anu L	au								



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 w	Be aware of various top companies leading to improvement in skills amongst them														
CO1	Be aware of various top companies leading to improvement in skills amongst them.Be aware of various candidate recruitment techniques like group discussion, interviews and be able to														
CO2	Be aw	vare of	f variou	is cand	idate re	ecruitme	ent tech	nniques	like group	o discuss	sion, ii	ntervie	ws and b	e able to	
	prepar	e CV'	s and re	esumes.											
CO3	Prepa	e for c	lifferen	t types	of inter	views a	and be p	orepare	d for HR a	nd techni	ical int	erview	s.		
CO4	Impro	ve the	ir verba	l, writte	en and	other sk	cills by	perforn	ning mock	sessions	•				
Mapping	of Cou	ırse O	utcome	es with	Progra	am Out	comes	(POs)							
COs/POs	;]	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	9	PO10	PO11	PO12	
CO1		L	L	L	L	L	Μ	Μ	Н	Μ		Н	Μ	Н	
CO2		L	L	L	L	L	Μ	Μ	Н	Μ		Η	Μ	Н	
CO3		L	L	L	L	L	Μ	Μ	Н	Μ		Н	Μ	Н	
CO4		L	L	L	L	L	Μ	Μ	Н	Μ		Η	Μ	Н	
COs /	PSO1 PSO2 PSO3 PSO4 PSO5														
PSOs		PS01 PS02 PS03 PS04 PS05													
CO1		L		I		I	I		L	L					
CO2		L		I		H	ł		L	L					
CO3		L		I		I	I		L	L					
CO4		L		I		ŀ	I		L	L					
H/M/L in	dicates	Streng	gth of C	orrelati	on H	- High,	M- Me	dium, I	L-Low	-					
	Category	Basic Sciences	Engineering Sciences	 Humanities and Social Sciences 	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	 ▲ Soft Skills 					



BEN18SK1

SOFT SKILLS I (CAREER AND CONFIDENCE BUILDING)

0/0 3/0 1

6

6

6

6

6

0

Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness

UNIT II

UNIT I

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

UNIT III

Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different proce3dures such as HR interviews and Technical Interviews / self-introductions

UNIT IV

Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews

UNIT V

Practical session on Group Discussion and written tests on vocabulary and reading comprehension



Subject Code BBI18004	: Su E(bject Name :DIAGNOSTIC AND THERAPEUT QUIPMENTS - I							TY / LB/	L	T / S.Lr	P/ R	C
	_								ETL		1.10	0.40	
	<u>Pr</u>	erequisi	te: None			<u> </u>		1.0	<u> </u>	3	1/0	0/0	4
L: Lecture T:	Tutoria	d SLr:	Supervise	ed Learn	iing P:	Project	R : Res	earch C	: Credits				
1/L/EIL:Inc	eory/Lat	b/Embed	ded Theor	y and L	ab								
OBJECTIVE	/ :	, 1°											
• To lea	rn abou	t cardiac	system										
• To stu	idy abou	t neurolo	ogical syst	em	,								
• To gat		ledge on	skeletal n	nuscular	system								
• To lea	rn abou	t heart-lu	ing machi	ne									
• To stu	idy abou	it respira	tory meas	urement	and ver	itilator							
COURSE OF	TCOM		(2, 5)	<u> </u>									
COURSE OU			$\frac{\mathbf{s} \cdot (\mathbf{s} - \mathbf{s})}{\mathbf{k} \mathbf{n} \mathbf{o} \mathbf{w} \mathbf{l} \mathbf{o} \mathbf{d} \mathbf{g}}$) a about	oording	evetom							
$\frac{cor}{cor}$	P C	Fraduates	noine kn	e about	carurae a	system cological	evetom						
C02	(Inderstar	de ekelete	al muscu	lar evet	-ological	i system						
C04			knowledg	e about	heart_lui	ng mach	ine						
C05		Fraduate	gains kno	wledge	on respi	ratory m	easurem	nent and	ventilator				
Manning of ('ourse (Outcomes with Program Outcomes (POs)							ventilator				
COs/POs	PO1	PO2	PO3		PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	M	H	105 L	M	105 L	H	10/ L	100 M	H	L			H H
CO2	M	L	H	M	L	M	H	L	M	H			M
CO3	M	H	L	M	H	L	M	H	L	M	H		<u></u>
CO4	L	M	H	L	M	H	L	M	H	L	M		<u>в</u>
C05	H	M	L	M	H	L	M	H		M	H		<u>.</u>
COs / PSOs	PS	501	PSC)2	PS	03	PS	504	PSO5				
CO1]	M	H	[L	<u> </u>	M	H				
CO2		Н	Μ	[I	H		L	М				
CO3		L	Μ	[I	Ĺ]	H	Μ				
CO4]	М	Н	[I	L	1	М	Μ				
CO5]	М	Н	[I	L	I	М	Н				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- 1	Medium	, L-Low						
								kill					
		es	cial cial										
		snc	So es So										
	S	Scie	pu	ritiv eeses eses Tech									
	nce	50	s a	Ore	llec	tive	Pro	s / .					
	cie	erin	itie s	nC	пE	lec	ul /	iips	ills				
fric	c S	ine	nan nce	rar	rar	nΕ	tici	nsł	Sk				
legi	asi	ign	lun cie	rog	rog	[] Jpei	rac	Iter	oft				
Cai	щ	Щ	щS			0		II I	S				
			l	· ·		I	I			1			

B. Tech. –BioMedical Instrumentation - 2018 Regulations



BBI18004 DIAGNOSTIC AND THERAPEUTIC 3 1/0 0/0 4 EQUIPMENTS - I

UNIT I CARDIAC SYSTEM

ECG -sources of ECG -normal and abnormal waveform -diagnosis interpretation -cardiac pacemakerexternal pacemaker -implantable pacemaker -different types of pacemakers -fibrillator -defibrillator - AC defibrillator - DC defibrillator –electrodes -synchronized and unsynchronized types

UNIT II NEUROLOGICAL SYSTEM

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

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

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

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

12

12

12

12

12



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING **Subject Code:** Subject Name: BIOMEDICAL INSTRUMENTATION TY/ P/RС L Τ/ **BBI18005** LB/ S.Lr ETL **Prerequisite:** None 3 0/0 0/0 3 Т 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** Μ Η L Μ Η Μ L Μ Η Μ L Μ **CO2** Η L Η L Μ Μ Μ Μ L Μ Η Μ **CO3** L Μ Н L Μ Н L Μ Η Μ L М PSO1 PSO3 PSO5 COs / PSOs PSO₂ PSO4 **CO1** Μ L Μ Η Μ **CO2** Η Μ Η Μ Η **CO3** L Μ Η Μ L H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Social Internships / Technical Engineering Sciences Program Electives ractical / Project **Jumanities** and **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category

B.Tech. –BioMedical Instrumentation - 2018 Regulations



BBI18005 BIOMEDICAL INSTRUMENTATION 3 0/0 0/0 3

UNIT I BIO-POTENTIAL ELECTRODES

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

UNIT II RECORDING SYSTEM

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

UNIT III BIO-CHEMICAL MEASUREMENT

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

UNIT IV NON-ELECTRICAL PARAMETER MEASUREMENTS

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

UNIT V BLOOD FLOW AND BLOOD CELL COUNTING

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

Total No of Periods: 45

9

9

9

9

9

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



Su IN	bject Na STRUM	ime : ME IENTAT	ASURE ION	EMENT	S AND		TY / LB/	L	T / S.Lr	P/ R	C	
								ETL				
Pr	erequisi	te: TRAN	SDUCI	ER ENC	GINEEF	RING		ETL	1	0/1	3/0	3
Tutoria	1 SLr:	Supervis	ed Learn	ing P:	Project	R : Res	earch C	: Credits				
ory/Lab	/Embed	ded Theor	y and L	ab								
:												
To lea	rn Deve	loping ade	equate k	nowledg	ge of the	instrum	ents, rel	levant circ	uits and	their wor	king	
To stu	dy abou	t Introduc	tion to e	lectrical	instrum	nents and	l measu	rements te	chnique	s.		
Tolear	n theana	log and d	igital teo	chniques	s used to	measur	e voltag	ge, current,	power	etc		
ГСОМ	ES (CO	s) : (3- 5))									
D	evelopir	ng adequa	te know	ledge of	the inst	ruments	, relevai	nt circuits	and thei	r working	5	
Ir	ntroducti	on to elec	trical in	strumen	ts and m	leasurem	nents tec	chniques.				
Т	o Empha	asis Know	ledge or	n analog	and dig	ital tech	niques 1	used to me	asure vo	oltage, cu	rrent, po	ower
et	tc.											
ourse C	Outcomes with Program Outcomes (POs)											
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
Н	Μ	L	Μ	Η	L	H	Μ	L	Μ	Н	Ι	M
Μ	Η	L	Μ	Η	L	Μ	H	Μ	L	Μ]	H
L	Μ	Η	Μ	L	Μ	H	L	Μ	Η	L	Ι	M
PS	601	PSC	02	PS	03	PS	SO4	PSO5				
Ι	M	Н	[]	L	Ι	М	Μ				
]	H	Μ	[I	I	I	М	Н				
Ι	M	L	1	I	I	Ι	М	L				
s Stren	gth of Co	orrelation	H- Hi	gh, M- I	Medium	, L-Low						
isic Sciences	Basic Sciences Engineering Sciences Humanities and Social Humanities and Social Sciences Program Core Program Electives Practical / Project Internships / Technical Skill Soft Skills											
	Su IN Pro Tutoria ory/Lab To lea To lea To stu Toleat To stu Toleat FCOM In T et D PO1 H M L I PS S Stren,	Subject Na INSTRUMINSTRUMPrerequisiTutorialSLr :ory/Lab/EmbeddeTo learn DevelTo study aboutTolearn theanaTCOMES (CODevelopinIntroductiTo Emphaetc.Ourse OutcomePO1PO2HMLMTPSO1Strength of CoStrength of CoSignalSigna	Subject Name : ME INSTRUMENTAT Prerequisite: TRAM Tutorial SLr : Supervise ory/Lab/Embedded Theories ory/Lab/Embedded Theories To learn Developing add To study about Introduce Tolearn theanalog and de TCOMES (COS) : (3-5) Developing adequa Introduction to elect To Emphasis Know etc. Ourse Outcomes with Pr PO1 PO1 PO2 PO3 H M L M H L PSO1 PO2 PO3 H M L M H M M H L Strength of Correlation Source of S	Subject Name : MEASURE INSTRUMENTATION Prerequisite: TRANSDUCI Tutorial SLr : Supervised Learn ory/Lab/Embedded Theory and Laistication To learn Developing adequate kas to study about Introduction to e Tolearn theanalog and digital teat to study about Introduction to electrical inst To Emphasis Knowledge on etc. Developing adequate knowledge on etc. To Emphasis Knowledge on etc. Dot Emphasis Knowledge on etc. PO1 PO2 PO3 PO4 M L M M M M PO1 PO2 PO3 PO4 H M L M M H M M PSO1 PSO2 M H M H M L Strength of Correlation H- Hi H Signal Signa	Subject Name : MEASUREMENT INSTRUMENTATION Prerequisite: TRANSDUCER ENO Tutorial SLr : Supervised Learning P : ory/Lab/Embedded Theory and Lab To learn Developing adequate knowledge To study about Introduction to electrical Tolearn theanalog and digital techniques TOVES (COs) : (3- 5) Developing adequate knowledge of Introduction to electrical instrument To Emphasis Knowledge on analog etc. OUTSE OUTCOMES with Program Outcom PO1 PO2 PO3 PO4 PO5 M M M PSO1 PSO2 PSS N PI (PO2) PSO1 PSO1 PSO2 PSS M H N Strength of Correlation H- High, M- N Sign of a sign of	Subject Name : MEASUREMENTS AND INSTRUMENTATION Prerequisite: TRANSDUCER ENGINEEI Tutorial SLr : Supervised Learning P : Project ory/Lab/Embedded Theory and Lab To learn Developing adequate knowledge of the To study about Introduction to electrical instrument Tolearn theanalog and digital techniques used to TCOMES (COS) : (3-5) Developing adequate knowledge of the inst Introduction to electrical instruments and m To Emphasis Knowledge on analog and dig etc. Outcomes with Program Outcomes (POs PO1 PO2 PO3 PO4 PO5 PO6 H M L M L M H L M L PSO1 PSO2 PSO3 M H L H M L H H Strength of Correlation H-High, M-Medium Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit Sign visit	Subject Name : MEASUREMENTS AND INSTRUMENTATION Prerequisite: TRANSDUCER ENGINEERING Tutorial SLr : Supervised Learning P : Project R : Res ory/Lab/Embedded Theory and Lab To learn Developing adequate knowledge of the instruments and Tolearn theanalog and digital techniques used to measure Tolearn theanalog and digital techniques used to measure To learn theanalog and digital techniques used to measure To Emphasis Knowledge on analog and digital tech etc. Developing adequate knowledge of the instruments Introduction to electrical instruments and measuren To Emphasis Knowledge on analog and digital tech etc. PO1 PO2 PO3 PO4 PO5 PO6 PO7 H M L M H L M M H L M PSO1 PSO2 PSO3 PSO M H M L M PSO1 PSO2 PSO1 PSO2 PSO3 PSO M H M L M H M H M H M H M H M H M H M H M H M H M M M M M M	Subject Name : MEASUREMENTS AND INSTRUMENTATION Prerequisite: TRANSDUCER ENGINEERING Tutorial SLr : Supervised Learning P : Project R : Research C ory/Lab/Embedded Theory and Lab To learn Developing adequate knowledge of the instruments, rei To study about Introduction to electrical instruments and measure To study about Introduction to electrical instruments and measure To study about Introduction to electrical instruments, relevant the the analog and digital techniques used to measure voltage TO Eveloping adequate knowledge of the instruments, relevant Introduction to electrical instruments and measurements tect to Express the theory and Lab Developing adequate knowledge of the instruments, relevant Introduction to electrical instruments and measurements tect to Express the theory and Lab Developing adequate knowledge on analog and digital techniques to etc. Durse Outcomes with Program Outcomes (POS) PO1 PO2 PO3 PSO1 PSO1 PSO2 PSO3 PSO4 N Source and Source	Subject Name : MEASUREMENTS AND INSTRUMENTATIONTY / LB/ ETLPrerequisite: TRANSDUCER ENGINEERINGTTLPrerequisite: TRANSDUCER ENGINEERINGETLTutorial SLr : Supervised Learning P : Project R : Research C: Credits oryLab/Embedded Theory and LabTo learn Developing adequate knowledge of the instruments, relevant circ To study about Introduction to electrical instruments and measurements te Tolearn theanalog and digital techniques used to measure voltage, current, TCOMES (COS) : (3-5)Developing adequate knowledge of the instruments, relevant circuits Introduction to electrical instruments and measurements techniques. To Emphasis Knowledge on analog and digital techniques used to me etc.OUT PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H L M H M L M H L M H L M H M L M H L M H M S Strength of Correlation H- High, M- Medium, L-LowImage: Strength of Correlation Image: Strength of CorrelationImage: Strength of Correlation Image: Strength of Correlation Image: Strength of Correlation Image: Strength of Correlation Image: Stren	$\begin{tabular}{ c c c c c c c } \hline Subject Name : MEASUREMENTS AND INSTRUMENTATION $$ TY / LB/ ETL INSTRUMENTATION $$ LB/ ETL 1$ INSTRUMENTATION $$ LB/ ETL 1$ Instruments and measure creates the structure of the instruments of the instruments and measurements technique to study about Introduction to electrical instruments and measurements techniques. To learn Developing adequate knowledge of the instruments, relevant circuits and the instruments and measurements techniques. To be the instruments and measurements techniques. To learn the analog and digital techniques used to measure voltage, current, power of the instruments, relevant circuits and their introduction to electrical instruments and measurements techniques. To Emphasis Knowledge on analog and digital techniques used to measure voltage. To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and digital techniques used to measure voletc. $$ To Emphasis Knowledge on analog and H H H H H H H H H H H H H H H H H H H$	Subject Name : MEASUREMENTS AND INSTRUMENTATIONTY / L LB/ ETLL TT/ S.LrPrerequisite: TRANSDUCER ENGINEERINGETL10/1Tutorial SLr : Supervised Learning P : Project R : Research C: Credits rry/Lab/Embedded Theory and LabTo learn Developing adequate knowledge of the instruments, relevant circuits and their wor To study about Introduction to electrical instruments and measurements techniques. Tolearn theanalog and digital techniques used to measure voltage, current, power etcTCOMES (COS) : (3-5)Developing adequate knowledge of the instruments, relevant circuits and their working Introduction to electrical instruments and measurements techniques. To Emphasis Knowledge on analog and digital techniques used to measure voltage, cu etc.TO Emphasis Knowledge on analog and digital techniques used to measure voltage, cu etc.OUT PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11HMLMHLMHLMHLMHLMHMLMHMHLMHLMHMHLMHLMHMHHMHHMHHMHHMHHMHHHMHHMHHMHHH <td>$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$</td>	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$



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

UNIT I INTRODUCTION

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 potentiometerprecision potentiometer - AC potentiometer -polar and co-ordinate type - application

UNIT III WATT METER AND ENERGY METER CALIBRATION

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

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

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

9

9

9

9

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



Subject Code:Subject Name: BIOMEDICAL INSTRUMENTATIONTY /LT /BBI18L03LABLB/S.Lr	P/R C
ETL	
Prerequisite: None L 0 0/0	3/0 1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits	<u> </u>
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 PO	1 PO12
COI H M H M L M L H N CO2 H M L M H N L H N	
CO2 H M L M H L M H L M H	
CO3 M M L H M L N CO4 L M M L M L M L N	
CO4 L M H M L M H L M H F	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	
CO4MLMHL	
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low	
egory asic Sciences ngineering Sciences umanities and Social ciences rogram Core rogram Electives pen Electives pen Electives ractical / Project ractical / Project fernships / Technical Skill oft Skills	



BBI18L03 BIOMEDICAL INSTRUMENTATION LAB 0 0/0 3/0 1

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. Re cording 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.



P/**R**

3/0

PO12 H M L H L

С

1

Subject Code: Subject Name : DIAGNOSTIC AND THERAPEUTIC TY/ L Τ/ **BBI18L04 EQUIPMENTS - I LAB** LB/ S.Lr ETL **Prerequisite: Diagnostic and Therapeutic Equipments** L 0 0/0 - I 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)

		<pre></pre>		/											
CO1		Acquires knowledge about cardiac system Graduates gains knowledge on neurological system													
CO2		Graduates	s gains kn	owledge	on neur	rological	l system								
CO3	١	Understaı	nds skeleta	al muscu	ılar syste	em									
CO4		Acquires	knowledg	e about	heart-lu	ng mach	ine								
CO5		Graduate	gains kno	wledge	on respi	ratory m	leasuren	nent and	ventilator						
Mapping of C	Course	Outcome	es with Pr	ogram	Outcom	es (POs	3)								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11				
CO1	Μ	Н	L	Μ	L	H	L	Μ	H	L	Μ				
CO2	Μ	L	Н	Μ	L	Μ	Н	L	Μ	Н	L				
CO3	Μ	Н	L	Μ	Н	L	Μ	Η	L	Μ	Н				
CO4	L	Μ	H	L	Μ	H	L	Μ	H	L	Μ				
CO5	Η	Μ	L	Μ	H	L	Μ	Н	L	Μ	Н				
COs / PSOs	Р	SO1	O1 PSO2 PSO3 PSO4 PSO5												
CO1		M H L M H													
CO2		Η	Μ	I	I	H		L	Μ						
CO3		L	Μ	I]	Ĺ]	H	Μ						
CO4		Μ	H	[]	Ĺ	I	М	Μ						
CO5		Μ	H	[]	L	I	М	Η						
H/M/L indicate	es Strei	ngth of C	orrelation	H- Hi	gh, 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						
J							✓								

B.Tech. –BioMedical Instrumentation - 2018 Regulations



BBI18L04

DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS - I LAB

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

0

0/0

3/0

1



Subject Code: BEI18L05 Subject Name: MICROPROCESSOR, MICROCONTROLLER AND ITS APPLICATIONS LAB TY/L L T/L P/R C AB Freequisite: 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 0 0/0 3/0 1 OBJECTIVE :
BEHILOS MICROCONTROLLER AND ITS APPLICATIONS LB/ ETL S.Lr LAB 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 Image: Credits <
Dref 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 microprocessors. • To understand the programming concepts of microprocessors and Interfacing. COURSE OUTCOMES (COs) : (3-5) CO1 Capable of programming in microprocessors and Interfacing. CO2 Familiar with code conversion. CO3 Capable of performingLogical calculations to carry out basic arithmetic CO4 Capable of understand the programming concepts of microprocessor. CO5 Understand the programming concepts of microprocessor.
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 andInterfacing. • 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 microprocessor. • To understand the programming in microprocessors and Interfacing. COURSE OUTCOMES (COs) : (3-5) CO1 Capable of programming in microprocessors and Interfacing. CO2 Familiar with code conversion. CO3 Capable of performingLogical calculations to carry out basic arithmetic CO4 Capable of understand the programming concepts of microprocessor. CO5 Understand the programming concepts of microprocessor. CO6 PO1
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 microprocessor. • To understand the programming concepts of microprocessors and Interfacing. COURSE OUTCOMES (COs) : (3- 5) CO1 Capable of programming in microprocessors and Interfacing. CO2 Familiar with code conversion. CO3 Capable of performingLogical calculations to carry out basic arithmetic CO4 Capable of understand the programming concepts of microprocessor. CO5 Understand the programming concepts of microprocessor. CO6 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12
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 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 performingLogical calculations to carry out basic arithmetic CO4 Capable of understand the programming concepts of microprocessor. CO5 Understand the programming concepts of microprocessor. CO6 PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO1 PO11 PO12
 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 microprocessor. To understand the programming concepts of microprocessor. To understand the programming in microprocessors and Interfacing. COURSE OUTCOMES (COs) : (3-5) CO1 Capable of programming in microprocessors and Interfacing. CO2 Familiar with code conversion. CO3 Capable of performingLogical 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) CO5 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12
 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 performingLogical 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) CO5/POr PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12
 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 performingLogical 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) CO5/POr
 Graduates to understand the programming concepts of microprocessor. To understand the programming concepts of microprocessor. COURSE OUTCOMES (COs) : (3-5) CO1 Capable of programming in microprocessors and Interfacing. CO2 Familiar with code conversion. CO3 Capable of performingLogical 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) CO5 PO1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12
 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 performingLogical 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) CO5 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12
CO1 Capable of programming in microprocessors and Interfacing. CO2 Familiar with code conversion. CO3 Capable of performingLogical 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) CO5/PO5 PO1 PO3 PO4 PO5 PO6 PO6 PO7 PO8 PO10
CO2 Familiar with code conversion. CO3 Capable of performingLogical 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) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12
CO3 Capable of performingLogical 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) CO5/POc PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12
CO4 Capable of understand the programming concepts of microprocessor. CO5 Understand the programming concepts of microcontroller. Mapping of Course Outcomes with Program Outcomes (POs) CO5/POs PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12
CO5 Understand the programming concepts of microcontroller. Mapping of Course Outcomes with Program Outcomes (POs) COs/POs PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12
Mapping of Course Outcomes with Program Outcomes (POs) COc/ROc PO1 PO3 PO4 PO5 PO6 PO7 PO8 PO10 PO11 PO12
$ C \cap_{c} / D \cap_{c} D \cap 1 D \cap 2 D \cap 3 D \cap 4 D \cap 5 D \cap 6 D \cap 7 D \cap 8 D \cap 0 D \cap 10 D \cap 11 D \cap 12 D \cap 12$
CO1 H H H H H H H L H M H M
CO2 H H H M M 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 H M M H M H M
$\begin{array}{c c c c c c c c c c c c c c c c c c c $
COS II II II II II III COS / PSOs PSO1 PSO2 PSO3 PSO4 PSO5
CO1 L M L M I
CO2 M M M H
CO3 M M M H I
CO4 M M L H
CO5 L M M M
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low
Image: Second state Image: Second st



BEI18L05

MICROPROCESSOR, MICROCONTROLLER AND ITS APPLICATIONS LAB

3/0

0

0/0

1

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



Subject Code BBI18TS2	: Su	bject Na	ame :TEC	CHNIC	AL SKI		TY / LB/ ETL	L	T / S.Lr	P/ R	C		
	Pr	erequisi	te: Techn	ical Ski	ill 1				L	0	0/0	3/0	1
L : Lecture T :	: Tutoria	l SLr:	Supervis	ed Leari	ning P:	Project	R : Res	earch C	: Credits	11			1
T/L/ETL : The	eory/Lab	/Embed	ded Theor	y and L	ab								
OBJECTIVE	The of	ojective i	s to devel	op the to	echnical	skill of	the stud	ents.					
COURSE OU	JTCOM	ES (CO	s) : (3- 5)									
CO1	Develo	op the tea	chnical sk	ills requ	ired in t	he field	of study						
CO2	Bridge	the gap	between t	he skill	requiren	nents of	the emp	loyer or	industry a	and the c	competen	cy of th	ie
	student	ts.											
CO3	Enhand	ce the en	nployabili	ty of the	e student	s.							
Mapping of C	Course C	Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Н	Н	Н	Н	Н	Н	М	Μ	Н	M	Н	I	М
CO2	H	Н	Μ	H	H	Н	Μ	M	Н	Н	H]	H
CO3	H	H	H	H	H	H	M	M	H	H	H]	H
COs / PSOs	PS	501	PSO	02	PS	O3 PSO4			PSO5				
CO1]	H	Н	[l	H]	H	Н				
CO2]	H	H	[]]	H]	H	Н				
CO3]	H	H	[H]	H	Н				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	igh, M- l	Medium	, L-Low						
egory	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Ski	Soft Skills				
Cat								\checkmark					



Subject Code BBI18006	: Si E	Subject Name : DIAGNOSTIC AND THERAPEUTIC TY / L T / P/ R C EQUIPMENTS II LB/ ETL S.Lr P/ R C											
	Pı	rerequisi	te: Diagi	nostic ai	nd Ther	apeutic	Equipn	nents	T	3	1/0	0/0	4
	Ι	_											
L : Lecture T :	Tutori	al SLr:	Supervis	ed Learr	ning P:	Project	R : Res	earch C	C: Credits				
T/L/ETL : The	eory/La	b/Embed	ded Theor	y and L	ab								
OBJECTIVE	:	1	·		(
• 10	b learn a	about Ult	rasonic Te	echnique	es for Di	agnosis	1 .						
• 10	o gain k	nowledge	e on Patie	nt Moni	toring ai	nd Biote	lemetry						
• 10	o study	about Dia	athermy	n a ati a T	.								
• 10) learn a	about Spe	cial Diag	nostic 1	ecnniqu	es							
• 10) gain k	nowledge	e on Patie	nt Salet	у								
COURSE OU	TCOM	IES (CO	s): (3-5))									
CO1	A	Acquires	knowledg	e on Ult	rasonic	Techniq	ues for l	Diagno	sis				
CO2	(Graduate	understan	ds Patie	nt Moni	toring a	nd Biote	lemetry	1				
CO3	τ	Understar	nds Diathe	ermy									
CO4	(Graduate	braduate gains knowledge on Special Diagnostic Tec										
CO5	τ	Understar	nds Patien	t Safety									
Mapping of C	<u>Course</u> (Outcome	utcomes with Program Outcomes (POs)										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	H	L	Μ	Н	L	Μ	L	H	Μ	L	H	
CO2	H	Μ	L	H	Μ	L	H	L	Μ	H	L	Μ	
CO3	H	Μ	L	Μ	H	L	Μ	H	L	Μ	H	L	
CO4	M	L	M	H	L	M	H	L	M	H	L	M	
<u>CO5</u>	L	Μ	L	Μ	Н	L	M	Н		M	H	L	
	D		DC		DO		DC		DCOT				
COs / PSOs		501	PSC	52	PS	03		604	PS05				
			M				H						
	H M								H M				
	M		н		L T		M		H				
C05	T.		M		H		L		M				
H/M/L indicat	es Strer	ngth of C	orrelation	H- Hi	gh. M-1	Medium	L-Low		111				
							,	illi					
		Sk											
		es cial											
		suc	So		es		t.	ind					
	S	Scie	pu	0	tiv	Se	ojec	Tec					
	nce	36, 61	ss a	Ore	ilec	tiv	Pro	s / '					
	cie	erii	itie 3S	n C	n F	llec	al /	hip	ills				
ory	ic S	inee ani						ms	Sk				
teg	3asi	gu	Hun Scie	ros	rog	Dpe	rac	nte	oft				
Ca	Щ			<u> </u>				I					
				1		1							



BBI18006 DIAGNOSTIC AND THERAPEUTIC 1/03 0/0 4 **EOUIPMENTS II**

UNIT I **ULTRASONIC TECHNIQUES FOR DIAGNOSIS**

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

PATIENT MONITORING AND BIOTELEMETRY UNIT II

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

UNIT III DIATHERMY

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

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

UNIT V **PATIENT SAFETY**

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

12

12

12

12

12



	DE	PARTN	IENT OF	ELEC	TRICA	L AND	ELECT	RONI	CS ENGIN	VEERIN	IG										
Subject Code:	Su	bject Na	ame : TR	OUBLE	SHOO	TING C)F		TY /	L	Τ/	P/ R	C								
BBI18007	BI	OMEDI	ICAL EQ	UIPME	INTS				LB/		S.Lr										
	Pr	oroquisi	ter BION	IFDICA	I INST	PRIME	NTATI	ION	EIL T	3	1/0	0/0	4								
										5	1/0	0/0	-								
L : Lecture T :	Tutoria	I SLr:	Supervis	ed Learr	ning P:	Project	R : Res	earch C	: Credits												
T/L/ETL : The	ory/Lat	/Embed	ded Theor	y and L	ab																
OBJECTIVE	:																				
• To	provid	e adequa	te technic	al infor	mation c	on opera	ting prin	ciples o	of medical	instrume	ents										
• To	- attain 1	nastervi	in fault de	tection a	and corr	ective m	easures.	-													
COURSE OU	TCOM	TS (CO	(3 - 5))																	
COURSE OU			(3-3)) 				6	1. 1												
COI	L	nderstar	nds the inf	ormatio	n on ope	erating p	orinciple	s of me	dical instru	iments											
CO2	C	apable i	n finding	fault det	ection a	nd corre	ective me	easures.													
Mapping of C	ourse (e Outcomes with Program Outcomes (POs)																			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12								
CO1	Н	Μ	L	М	Н	L	Μ	Н	М	L	M]	H								
CO2	М	Н	М	L	М	Н	Μ	L	М	М	H	I	М								
COs / PSOs	PS	501	PSO	02	PS	03	PS	504	PSO5												
CO1	1	М	L	ı	J	H	I	M	Н												
CO2]	H	M	[]	Ĺ	I	М	Н												
H/M/L indicate	es Stren	gth of C	orrelation	H- Hi	gh, M- 1	Medium	, L-Low	,													
								dill													
			-					1 Sk													
		ces	ocia					li ca													
		ien	I S		ves		ect	echi													
	lces	S So	and	ore	ecti	ives	Proj	/ T6													
	cier	sring	ities	Ŭ	n El	lecti	l / I	nips	lills												
ry	ic S	ine	nan	gran	gran	n E	ctice	rnsł	Sk												
ego	Bas	Eng	Hur Scie	Proį	Proį	Ope	Prac	Inte	Sofi												
Cat				✓																	



BBI18007 TROUBLESHOOTING OF BIOMEDICAL 3 1/0 0/0 4 EQUIPMENTS

UNIT IBASIC OF TROUBLESHOOTING PROCEDURES12

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

UNIT II TESTING OF DEVICES

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 INCIRCUITS

Fault Diagnosis Circuits- Digital Troubleshooting Methods- Circuit board Troubleshooting

UNIT IV BIOMEDICAL EQUIPMENT I TROUBLESHOOTING

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

UNIT V BIOMEDICAL EQUIPMENT IITROUBLESHOOTING

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

12

12

12

12

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



.....

Subject Code			LENI OF	ELEC.			ELECI	KUNIC			<u></u>	D/D	C
Subject Code BBI18FT2	: Su	oject na	ime : BIC	-MECI	HANIC	5			IY/ IP/	L	1/ SIr	P/ K	C
DDIIOE I 2									LD/ FTI		S.LI		
	Pre	ereanisi	te• None						ETL ETL	1	0/1	3/0	3
L · Lecture T ·	Tutoria	$\frac{1}{1}$ SLr ·	Supervise	ed Learr	ing P·	Project	R · Res	earch C	Credits		0/1	5/0	5
$T/L/ETL \cdot The$	eorv/Lab	/Embed	ded Theor	v and L	ah	Tiojeet	R . Res		cicuits				
OBJECTIVE	:			j una E	ue								
To stu	dv abou	t Bioflui	d mechan	ics									
To lea	rn about	Cardiac	mechanic	CS									
• The st	udent wi	ill analy	ze Respira	tory me	chanics								
To lea	rn about	Soft tis	sue mecha	nics									
Studen	nt will le	arn abou	it Orthope	dic mec	hanics								
COURSE OU	TCOM	ES (CO	$\frac{1}{s}$: (3-5)	<u></u>									
CO1	U	nderstar	ds the Bi	ofluid m	echanic	s							
CO2	C	apable t	o analyze	Cardiac	mechan	ics							
CO3	С	apable t	o analyze	Respirat	tory med	chanics							
CO4	U	nderstar	ds the So	ft tissue	mechan	ics							
CO5	S	tudent ca	an analyze	orthop	edic me	chanics							
Mapping of C	Course C	e Outcomes with Program Outcomes (POs)											
COs/POs	PO1	1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12											12
CO1	Μ	Μ	Н	Μ	Н	Μ	L	L	Μ	H	Μ		L
CO2	Μ	H	Μ	L	Μ	L	Н	Μ	L	H	Μ		L
CO3	Η	Μ	L	Н	Μ	L	Μ	Η	L	Μ	Η	I	Ν
CO4	L	L	Μ	Н	L	Μ	Н	L	Μ	Η	L]	H
CO5	Н	Μ	L	Н	Μ	Н	Μ	L	H	Μ	L	I	Ν
COs / PSOs	PS	01	PSC)2	PS	03	PS	SO4	PSO5				
CO1	N	Л	Н		N	Л]	L	H				
CO2	N	A	Μ	[N	Л]	L	Μ				
CO3]	H	Μ	[I]	H	Μ				
CO4	N	Л	Н		I		I	M	H				
CO5	J	H	Μ	[l			H	H				
H/M/L indicat	es Streng	Strength of Correlation H- High, M- Medium, L-Low											
			al					cal					
		ces	oci					nnic					
		ien	Ň		ves		sct	ecł					
	es	Sci	pur	e	ctiv	/es	oje	T/ Tli					
	enc	ng	es :	Col	Ele	ctiv	$/P_1$	ips Sk	S				
~	Sci	Serie Serie M M											
jor	ic	gine	mai enc	gra	gra	en]	ctic	terr	t SI				
ateg	Bas	Εnξ	Hun Sci	Pro	Pro	Opí	Pra	In	Sof				
Ũ				\checkmark		_			-		1		



BBI18ET2 BIO-MECHANICS 1 0/1 3/0 3

UNIT I BIOFLUID MECHANICS

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

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

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

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

UNIT V ORTHOPAEDIC MECHANICS

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

9

9

9

9

9



Su BI	bject Na OMEDI	Name : TROUBLESHOOTING OF DICAL EQUIPMENTS LAB						TY / LB/	L	T / S.Lr	P/ R	С	
Pr	erequisi	te: None						ETL L	0	0/0	3/0	1	
Futoria	l SLr:	Supervise	ed Learr	ning P:	Project	R : Res	earch C	: Credits					
ry/Lab	/Embed	ded Theor	y and L	ab	U								
ide ad	equate te	chnical ir	formati	on on op	perating	principl	es of me	edical instr	uments				
n mast	ery in fa	ult detecti	on and o	correctiv	ve measu	ires.							
COM	ES (CO	s) : (3- 5))										
U	Understands the information on operating principles of medical instruments												
C	Capable in finding fault detection and corrective measures.												
urse (Outcome	s with Pr	ogram	Outcom	es (POs	;)							
PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
Н	M	L	Μ	Н	L	М	Н	М	L	M	1	Н	
Μ	Н	М	L	М	Н	M	L	М	Μ	H	N	A	
PS	501	PSC)2	PSO3		PSO4		PSO5					
I	М	L		I	H	М		Н					
]	H	Μ	[1	L	I	М	Н					
Stren	gth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low							
3asic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills					
	Su BI Pr Futoria ry/Lab ide ad n mast COM U C U U C U U C U U C U U C U U C U U C U U S Stren	Subject Na BIOMEDI Prerequisi Futorial SLr : ry/Lab/Embedd ide adequate term n mastery in fa COMES (CO Understar Capable in urse Outcome PO1 PO2 H M M H Strength of Co Str	Subject Name : TRO BIOMEDICAL EQ Prerequisite: None Futorial SLr : Supervise ry/Lab/Embedded Theor ide adequate technical in n mastery in fault detection COMES (COS) : (3-5) Understands the infi Capable in finding in urse Outcomes with Pr PO1 PO2 PO3 H M M H PSO1 PSO PSO1 PSO Strength of Correlation Strength of Correlation Strength of Correlation	Subject Name : TROUBLE BIOMEDICAL EQUIPME Prerequisite: None Prerequisite: None Futorial SLr : Supervised Learnery ry/Lab/Embedded Theory and L ide adequate technical information n mastery in fault detection and or COMES (COS) : (3-5) Understands the information Capable in finding fault det urse Outcomes with Program PO1 PO2 PO3 PO4 H M M L M H M H M L Strength of Correlation H- Hi Strength of Correlation H- Hi Strength of Correlation H- Hi Strength Strength Strength	Subject Name : TROUBLESHOO' BIOMEDICAL EQUIPMENTS LA Prerequisite: None Futorial SLr : Supervised Learning P : ry/Lab/Embedded Theory and Lab ide adequate technical information on open mastery in fault detection and corrective COMES (COS) : (3-5) Understands the information on open capable in finding fault detection and corrective COMES (COS) : (3-5) Understands the information on open capable in finding fault detection and corrective COMES (COS) : (3-5) Understands the information on open capable in finding fault detection and corrective Capable in finding fault detection and corrective Capable in finding fault detection and corrective Capable in finding fault detection and corrective Comes with Program Outcom PO1 PO1 PO2 PO3 PO4 PO5 H M L M M H M L M PSO1 PSO2 PS PS M L I I H M L I G Strength of Correlation H- High, M- I I Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Solution Soluti	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Futorial SLr : Supervised Learning P : Project ry/Lab/Embedded Theory and Lab ide adequate technical information on operating in mastery in fault detection and corrective measures (COS) : (3-5) Understands the information on operating p Capable in finding fault detection and correct Understands the information on operating p Capable in finding fault detection and correct Understands the information on operating p Capable in finding fault detection and correct UNDER (COS) : (3-5) Understands the information on operating p Capable in finding fault detection and correct UPO2 PO3 PO4 PO5 PO6 H M L M H L M L M H L M L M H L Sciences Sciences Sciences Sciences Sciences Sciences <th c<="" td=""><td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Cutorial SLr : Supervised Learning P : Project R : Resery/Lab/Embedded Theory and Lab ide adequate technical information on operating principle: n mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principle: Capable in finding fault detection and corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 H M L M H M PSO1 PSO2 PSO3 PS M L H M I Generation H- High, M- Medium, L-Low Image: Signal Signal Correlation Picitive Signal Signal Correlation Strength of Correlation I - Picific II -</td><td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Cutorial SLr : Supervised Learning P : Project R : Research C ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of mean mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principles of mean mastery in finding fault detection and corrective measures. Indext corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 H M L M H M H M H M L PSO1 PSO2 PSO3 PSO4 M L H M L M H M L H M L M Sciences PSO1 PSO2 PSO3 PSO4 M L H M I M Identifies au au</td><td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / LB/ ETL Prerequisite: None L Futorial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of medical instrunt n mastery in fault detection and corrective measures. COMES (COS) : (3-5) Understands the information on operating principles of medical instru Capable in finding fault detection and corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H M M M PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H M M M M L M H M L M M L H M L M H M M L M H M L M M M M M</td><td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / LB/ ETL L Prerequisite: None L 0 Cutorial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of medical instruments ide adequate technical information on operating principles of medical instruments n mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principles of medical instruments Capable in finding fault detection and corrective measures. rese Outcomes with Program Outcomes (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 H M L M H M L M PSO1 PSO2 PSO3 PSO4 PSO5 M L M H H M H H M H M H M H M H M H M H M H M M M M M M M M</td><td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / L LB/ ETL L T / S.Lr Prerequisite: None L 0 0/0 Prerequisite: None Image: Comparison of the exact th</td><td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / L LB/ LB/ ETL T / R S.Lr Prerequisite: None L 0 0/0 3/0 Introial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab 0 0/0 3/0 ide adequate technical information on operating principles of medical instruments in mastery in fault detection and corrective measures. 0 0/0 9/0 COMES (COS) : (3 - 5) Understands the information on operating principles of medical instruments 0 0/1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 H M L M H M I M I PSO1 PSO2 PSO3 PSO4 PSO5 I</td></th>	<td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Cutorial SLr : Supervised Learning P : Project R : Resery/Lab/Embedded Theory and Lab ide adequate technical information on operating principle: n mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principle: Capable in finding fault detection and corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 H M L M H M PSO1 PSO2 PSO3 PS M L H M I Generation H- High, M- Medium, L-Low Image: Signal Signal Correlation Picitive Signal Signal Correlation Strength of Correlation I - Picific II -</td> <td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Cutorial SLr : Supervised Learning P : Project R : Research C ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of mean mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principles of mean mastery in finding fault detection and corrective measures. Indext corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 H M L M H M H M H M L PSO1 PSO2 PSO3 PSO4 M L H M L M H M L H M L M Sciences PSO1 PSO2 PSO3 PSO4 M L H M I M Identifies au au</td> <td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / LB/ ETL Prerequisite: None L Futorial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of medical instrunt n mastery in fault detection and corrective measures. COMES (COS) : (3-5) Understands the information on operating principles of medical instru Capable in finding fault detection and corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H M M M PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H M M M M L M H M L M M L H M L M H M M L M H M L M M M M M</td> <td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / LB/ ETL L Prerequisite: None L 0 Cutorial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of medical instruments ide adequate technical information on operating principles of medical instruments n mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principles of medical instruments Capable in finding fault detection and corrective measures. rese Outcomes with Program Outcomes (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 H M L M H M L M PSO1 PSO2 PSO3 PSO4 PSO5 M L M H H M H H M H M H M H M H M H M H M H M M M M M M M M</td> <td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / L LB/ ETL L T / S.Lr Prerequisite: None L 0 0/0 Prerequisite: None Image: Comparison of the exact th</td> <td>Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / L LB/ LB/ ETL T / R S.Lr Prerequisite: None L 0 0/0 3/0 Introial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab 0 0/0 3/0 ide adequate technical information on operating principles of medical instruments in mastery in fault detection and corrective measures. 0 0/0 9/0 COMES (COS) : (3 - 5) Understands the information on operating principles of medical instruments 0 0/1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 H M L M H M I M I PSO1 PSO2 PSO3 PSO4 PSO5 I</td>	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Cutorial SLr : Supervised Learning P : Project R : Resery/Lab/Embedded Theory and Lab ide adequate technical information on operating principle: n mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principle: Capable in finding fault detection and corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 H M L M H M PSO1 PSO2 PSO3 PS M L H M I Generation H- High, M- Medium, L-Low Image: Signal Signal Correlation Picitive Signal Signal Correlation Strength of Correlation I - Picific II -	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB Prerequisite: None Cutorial SLr : Supervised Learning P : Project R : Research C ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of mean mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principles of mean mastery in finding fault detection and corrective measures. Indext corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 H M L M H M H M H M L PSO1 PSO2 PSO3 PSO4 M L H M L M H M L H M L M Sciences PSO1 PSO2 PSO3 PSO4 M L H M I M Identifies au au	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / LB/ ETL Prerequisite: None L Futorial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of medical instrunt n mastery in fault detection and corrective measures. COMES (COS) : (3-5) Understands the information on operating principles of medical instru Capable in finding fault detection and corrective measures. PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H M M M PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 H M L M H M M M M L M H M L M M L H M L M H M M L M H M L M M M M M	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / LB/ ETL L Prerequisite: None L 0 Cutorial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab ide adequate technical information on operating principles of medical instruments ide adequate technical information on operating principles of medical instruments n mastery in fault detection and corrective measures. COMES (COs) : (3-5) Understands the information on operating principles of medical instruments Capable in finding fault detection and corrective measures. rese Outcomes with Program Outcomes (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 H M L M H M L M PSO1 PSO2 PSO3 PSO4 PSO5 M L M H H M H H M H M H M H M H M H M H M H M M M M M M M M	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / L LB/ ETL L T / S.Lr Prerequisite: None L 0 0/0 Prerequisite: None Image: Comparison of the exact th	Subject Name : TROUBLESHOOTING OF BIOMEDICAL EQUIPMENTS LAB TY / L LB/ LB/ ETL T / R S.Lr Prerequisite: None L 0 0/0 3/0 Introial SLr : Supervised Learning P : Project R : Research C: Credits ry/Lab/Embedded Theory and Lab 0 0/0 3/0 ide adequate technical information on operating principles of medical instruments in mastery in fault detection and corrective measures. 0 0/0 9/0 COMES (COS) : (3 - 5) Understands the information on operating principles of medical instruments 0 0/1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 H M L M H M I M I PSO1 PSO2 PSO3 PSO4 PSO5 I



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

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.



Subject Code BBI18L06	: Su EQ	Subject Name : DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS II LAB								L	T / S.Lr	P/ R	C
	-	<u> </u>	·		1 (75)		.		ETL				-
		erequisi	te: Diagi	iostic ai	nd Ther	apeutic	Equipn	ients	L	0	0/0	3/0	1
I. · Locture T.	Tutorio	$\frac{AB}{1 SIr}$	Suporvio	ad Loorr	ning D.	Drojact	D · Dog	oorch C	Cradita			l	
$T/I / FTI \cdot The$	I utoria	I SLI. /Embed	ded Theor	v and I	nng r. ah	Floject	R. Res		. Cleans				
OBJECTIVE	•			y and L	aU								
• To lea	• rn about	Ultraso	nic Techn	iques fo	r Diagn	osis							
To gai	n knowl	ledge on	Patient N	Ionitorir	ng and B	ioteleme	etrv						
To stu	dv abou	t Diather	rmv				, in the second s						
To lea	rn about	t Special	Diagnost	ic Techr	niques								
 To gai 	n knowl	ledge on	Patient Sa	afety	1								
6		8		J									
COURSE OU	TCOM	ES (CO	s) : (3- 5))									
CO1	A	cquires	knowledg	e on $\overline{\text{Ult}}$	Diagnos	sis							
CO2	G	Graduate understands Patient Monitoring and Biotelemetry											
CO3	U	Understands Diathermy											
CO4	G	raduate	gains kno	wledge	on Spec	ial Diag	nostic Te	echniqu	ies				
CO5	Understands Patient Safety												
Mapping of C	Course C	Outcome	es with Pr	ogram (Outcom	es (POs)			1			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10) PO11	<u> </u>	<u>D12</u>
CO1	M	H	L	M	H	L	M	L		M			<u>H</u>
<u>CO2</u>	H	M	L	H	M	L	H		<u>M</u>	H		_	<u>M</u>
<u>CO3</u>	H	M		M	H		M	H		M			
<u>CO4</u>	M		M	H		M	H		M	H			M T
05	L	M	L	M	H	L	M	Н	L	M	H		L
	DC	<u>'01</u>	DC					DCO5					
CO1	PS		PSC	<u>J2</u> r	PS05		PS04		P505				
	r I	VI LI	IV.	L								-	
C02	ر ۲	LI M	L L	<u> </u>	ر ۱	<u></u>		VI I	M				
CO4		M	H	[л М	H				
C05	1	<u>.</u>	M	[[I	<u>-</u> T	1	<u>.</u>	M				
H/M/L indicat	es Stren	gth of Co	orrelation	H- Hi	gh. M- 1	- Medium	L-Low						
					<i>,</i>		,	ill					
			_					Sk					
		S	cia					ical					
		enc	So		es		t	hni					
	S	Scie	pu		tiv	SS	ojec	Tec					
	ince	a a	is a	Ore	llec	tive	Pro	s / '					
	cie	erir	itie	n C	пE	lec	la /	iip	ills				
ory	ic S	ine	nan nce	grai	grai	пE	tica	msl	Sk				
teg	3 asi	gui	Hun	rog	rog)pe	rac	nte	oft				
Ca	щ		L S					Π	S				
L		I		1	L	1				1			



BBI18L06

DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS II LAB 0/0 3/0 1

0

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



Subject Code	: Sul	bject Na	me: SC	OFT SK	ILLS II	(QUA	LITAT	IVE	TY/	L	T /	P/ R	С
BEN18SK2	AN	D QUA	NTITAT	IVE SK	(ILLS)				LB/		S.Lr		
									ETL				
	Pre	erequisi	te: Soft S	kills - I					ETL	0	0/0	3/0	1
L : Lecture T :	Tutoria	SLr :	Supervise	ed Learn	ing P:	Project	R : Res	earch C	: Credits				
T/L/ETL : The	eory/Lab	/Embedd	ded Theor	y and L	ab	5							
OBJECTIVE	: The I	nain obj	ective is t	o streng	then the	logical	and aritl	nmetic r	easoning s	kills of t	he studer	nts.	
• To hel	p studen	ts to imp	prove thei	r Logica	l reason	ing.							
To helTo hel	p studen p studen	ts to imp ts impro	ove their d	r arithm ata inter	pretation	oning. n skills							
COURSE OU	TCOM	ES (CO	s) : (3- 5))									
CO1	Prepare	Prepare students for Logical reasoning											
CO2	Prepare	repare students for arithmetic reasoning											
CO3	Prepare students for data interpretation skills												
Mapping of C	Course O	utcome	s with Pr	ogram (Outcom	es (POs)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	L	L	L	L	L	Μ	Μ	H	Μ	Н	Μ	I	H
CO2	L	L	L	L	L	Μ	Μ	Н	Μ	Н	Μ	I	H
CO3	L	L	L	L	L	Μ	Μ	H	Μ	H	Μ	I	H
COs / PSOs	PS	01	PSC)2	PSO3		PSO4		PSO5				
CO1	I		L		Н		L		L				
CO2	I		L		H	ł	L		L				
CO3	I	_	L		I	I		Ĺ	L				
H/M/L indicat	es Streng	gth of Co	orrelation	H- Hi	gh, M- N	Medium	, L-Low						
		iences	Social		/es		sct	chnical Skil					
ıry	Basic Sciences	Engineering Sci	Humanities and Sciences	Program Core	Program Electiv	Open Electives	Practical / Proje	Internships / Te	Soft Skills				
Catego									\checkmark				



1

BEN18SK2	SOFT SKILLS II (QUALITATIVE AND QUANTITATIVE SKILLS) 0 0/0 3/0
UNIT Logica	I LOGICAL REASONING I 6
UNIT Logica	II LOGICAL REASONING II 6 l conclusions – Deriving conclusions from passages – Theme detection 6
UNIT Numbe Propor	IIIARITHMETICAL REASONING I6or system – H.C.F and L.C.M – Problem on ages – Percentage – Profit and Loss – Ratio and tion – Partnership6
UNIT Time a – Odd	IVARITHMETICAL REASONING II6nd Work – Time and Distance – Clocks – Permutations and Combinations – Heights and Distances6man out and Series
UNIT Tabula	VDATA INTERPRETATION6tion - Bar graphs - Pie graphs - Line graphsTotal No of Periods: 30
REFE 1. 2. 3. 4.	RENCE BOOKS: R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand and Co., (2017). R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand and Co., (2017). R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand and Co., (2017). 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).



Subject Code	DE : Su	PARTM bject Na	IENT OF ame : MI	<u>ELEC</u> NI PRO	JECT/	L AND	<u>eleci</u> NT	RONI	CS ENGI TY /	L L	<u>NG</u> Т/	P/ R	C
BBI18L07	TR	AININ	G/ INDUS	STRIAI	L TRAI	NING			LB/ ETI		S.Lr		
	Pro	erequisi	te: None						L	0	0	3/0	1
L : Lecture T :	Tutoria	1 SLr:	Supervise	ed Learr	ning P:	Project	R : Res	earch C	: Credits				
T/L/ETL : The	eory/Lab	/Embed	ded Theor	y and L	ab								
OBJECTIVE	: The n	nain obj	ective of t	the Inpla	ant train	ing is to	provide	e a sho	rt-term wo	rk expe	ience in	an Indu	stry/
Company/ Org	ganizatio	n											
COURSE OU	тсом	ES (CO	s) : (3- 5))									
CO1	To get	an insig	ht of an in	dustry /	organiz	ation/co	mpany p	ertainii	ng to the de	omain o	f 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 C	Course C	Outcome	es with Pr	ogram	Outcom	es (POs	5)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	6 PO7 PO8		PO9	PO10	PO11	PO	12
CO1	Μ	L	L	L	L	Н	Н	Н	Н	H	H]	H
CO2	Н	Μ	Н	Μ	Μ	Μ	Μ	Μ	Н	Н	H	Γ	M
CO3	Н	H	Н	Н	М	Н	М	Н	Н	Н	Н	I	М
COs / PSOs	PSO1		PSO2	1	PSO3		PSO4		PSO5				
CO1	Н		Н		Н Н		Η						
CO2	Н		Н		Н		Н		Η				
CO3	Н		Н		Н	H H			Η				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low			1			
	c Sciences	ineering Sciences	nanities and Social ences	gram Core	gram Electives	en Electives	ctical / Project	rnships / Technical Skill	t Skills				



E C: Credits C: Credits ield of study ts of the em PO PO PO	dy nploye	er or PO 10	industr PO1 1	y and the PO12
C: Credits ield of study ts of the em PO PO9 B H	dy nploye	er or PO 10 M	industr PO1 1	y and the PO12
ield of study ts of the em PO PO9 B H	dy nploye	er or PO 10 M	industr PO1 1	y and the PO12
ield of study ts of the em PO PO9 M H	dy nploye	PO 10 M	industr PO1 1	y and the PO12
ield of study ts of the em PO PO9 B H	dy nploye	PO 10 M	industr PO1 1	y and the PO12
PO PO9	dy nploye	PO 10 M	industr PO1 1	y and the PO12
PO PO9 M H	nploye	PO 10 M	PO1 1	PO12
PO PO9) [] []	PO 10	PO1 1	PO12
PO PO9		PO 10 M	PO1 1	PO12
PO PO9) [] [PO 10 M	PO1 1	PO12
PO PO9) [] I	PO 10 M	PO1 1	PO12
м н	I	10 	1 	
мн	I	М	ц	
	-			M
M H	I	H	H	H
M H	I	Η	Н	Н
4 PSO5)5			
Н	I			
Н	I			
H	I			
nternships / Technical Ski Soft Skills				
nternships / Technical Skill	E E	Soft Skills	Soft Skills	H H H



Subject Code:	Su	ubject Na	me : ME	DICAL	IMAG	E PRO	CESSIN	IG	TY/	L	Τ/	P / R	С
BBI18008									LB/		S.Lr		
									ETL				
	P	rerequisi	te: None						Т	3	1/0	0/0	4
L : Lecture T :	Tutori	al SLr:	Supervise	ed Learn	ning P:	Project	R : Res	earch C:	Credits				
T/L/ETL : The	ory/La	b/Embed	ded Theor	y and L	ab								
OBJECTIVE	:												
To lease	rn the c	different r	nethods a	nd moda	alities us	ed for m	nedical i	maging					
To lease	rn the p	preferred	medical ir	naging 1	nethods	for rout	ine clini	cal appl	ications				
To und	lerstan	d the engi	ineering n	nodels u	sed to de	escribe a	and analy	yze med	ical image	s			
COURSE OU	TCOM	AES (CO	s):(3-5)										
CO1		The gradu	ate under	stands tl	he differ	ent meth	nods and	l modali	ties used f	or medi	cal imagi	ng	
CO2		The graduate is capable of understanding the preferred medical imaging methods for routine											
	0	clinical applications											
CO3	(Graduate	is capable	to expla	ain the e	ngineeri	ing mod	els and a	analyze me	edical ir	nages		
Mapping of C	ourse	Outcome	s with Pr	ogram (Outcom	es (POs)		-				
COs/POs	PO1	PO2	PO3	PO4	PO5 PO6 PO7		PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	M	H	L	Μ	H	Μ	L	Μ	Н	Μ]	H
CO2	Н	Μ	L	Μ	Н	L	Μ	Н	L	Μ	Н	Ι	M
CO3	L	Μ	Н	L	Μ	H	L	Μ	Н	L	Μ]	H
COs / PSOs	P	SO1	PSC	02	PSO3		PSO4		PSO5				
CO1		Μ	H	-	N	1]]	H	Μ				
CO2		L	Μ	[I	ł	I	М	L				
CO3		H	Μ	[Ι		1	М	H				
H/M/L indicate	es Strei	ngth of Co	orrelation	H- Hi	gh, M- 1	Medium	, L-Low			1			
	S	ciences	nd Social		tives	SS	jject	Fechnical Skil					
Category	Basic Science	Engineering S	Humanities at Sciences	Program Core	Program Elec	Open Elective	Practical / Prc	Internships /]	Soft Skills				



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

UNIT I IMAGE FUNDAMENTALS

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

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

UNIT III IMAGE ANALYSIS AND CLASSIFICATION

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

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

Medical image data compression and transmission - transform coding pixel coding- predictive codinginterframe 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 Jersery, 1983
- 2. Gonzalez. R and Wintz P., "Digital Image Processing", Addision Wesley Publishing Co. USA, 1987

REFERENCE BOOKS:

- 1. Eric Krestel, "Imaging Systems for Medical diagnosis", Siemens Aktlengesellschaft, 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



12

12

12

12



Subject Code: BMG18009	: St F(ibject Na OR BIOI	t Name : TOTAL QUALITY MANAGEMENT SIOMEDICAL ENGINEERS							L	T / S.Lr	P/ R	C
	Pr	roroquisi	te: None						ETL T	3	0/0	0/0	3
L · Lecture T ·	Tutoria	al SLr	Supervise	ed Learr	ning P ·	Project	R · Res	earch C	· Credits	5	0/0	0/0	5
T/L/ETL : The	orv/La	b/Embed	ded Theor	v and L	ab	roject	10.1005		. creates				
OBJECTIVE	:			<u> </u>									
• To und	lerstand	d the vari	ous qualit	y standa	urds								
• To und	lerstand	d regulati	ons used f	for healt	hcare								
To get	an ove	rview of	various m	ethodol	ogies								
To und	lerstand	d about r	nanageme	nt in he	althcare								
To und	lerstand	d about t	he Recent	trends									
COURSE OU	COURSE OUTCOMES (COs) : (3- 5)												
CO1	A	Acquires	knowledg	e on the	e various	s quality	standar	ds					
CO2	(Capable t	o regulati	ons use	d for hea	lthcare							
CO3	(Capable o	of analyzir										
CO4	A	Acquires knowledge of management in healthcare											
CO5	0	Graduate knows the Recent trends											
Mapping of C	ourse	Outcome	s with Pr	ogram	Outcom	es (POs	s)	•	T	1	1		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	H	Μ	L	Μ	H	L	Μ	H	L	Μ]	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
<u>CO4</u>	Μ	H	M	L	M	H	L	M	H	L	M]	H
CO5	L	M	H	L	M	L	M	H	L	M	H]	Ĺ
	D	501	DSC	<u>ר</u>	PSO3		DS	504	PSO5			_	
$\frac{COS/150S}{CO1}$	L \	<u>301</u> M	150 H	<u> </u>	1303 I		<u> </u>		<u>1303</u> Н				
		T	M	<u> </u>	1	<u>,</u>	M		н				
CO3		H	M	[M	H				
CO4		M	L			<u>л</u>	1	H	L				
CO5		M	H	[I		I	M	H			<u> </u>	
H/M/L indicate	es Strer	ngth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low	,					
					8,			Skill					
yıc	c Sciences	neering Sciences	lanities and Social nces	ram Core	ram Electives	1 Electives	tical / Project	nships / Technical S	Skills				
Catego	Basi	Engi	Hum Sciel	Prog	Prog	Opei	Prac	Inter	Soft			<u> </u>	


BMG18009

TOTAL QUALITY MANAGEMENT FOR BIOMEDICAL ENGINEERS

0/0

3

9

3

0/0

UNIT I FUNDAMENTALS OF QUALITY MANAGEMENT Definition of Quality- Dimensions of Quality-Quality Planning - Quality costs - Analy

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

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

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

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

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.

9

9

9



Subject Code: BBI18ET3	Sul FO	bject Na DR MED	ame :VIR DICAL A	TUAL I PPLICA	INSTRU ATION	U MENT	TATION	1	TY / LB/	L	T / S.Lr	P/ R	С	
									ETL					
	Pro	erequisi	te: BIOM	IEDICA	AL INST	RUME	NTATI	ON	ETL	1	0/1	3/0	3	
L : Lecture T :	Tutoria	I SLr:	Supervise	ed Learn	ing P:	Project	R : Rese	earch C:	Credits					
T/L/ETL : The	ory/Lab	/Embed	ded Theor	y and L	ab									
OBJECTIVE	:													
• To edu	icate abo	out the B	Basic conc	epts of V	VI									
To mal	ke them	underst	and the pr	ogramm	ing con	cepts of	VI.							
To pro	vide an	insight t	o various	Commo	on Instru	ment In	terface.							
To ena	ble then	n to imp	lement V	in med	ical syst	ems								
To imp	oart kno	wledge o	on various	s analysi	s tools									
COURSE OU	TCOM	ES (CO	s) : (3- 5))										
CO1	U	nderstar	nds the Ba	sic conc	epts of '	VI								
CO2	U	nderstar	nds the pro	ogramm	ing conc	epts of	VI.							
CO3	C	apable to	o analyze	various	Commo	n Instru	ment Int	erface						
CO4	C	apable to	o implem	ent VI ir	n medica	l system	is							
CO5	U	nderstar	nds variou	s analys	is tools									
Mapping of C	ourse O	outcome	itcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
CO1	Н	Μ	L	Μ	Μ	L	M	H	L	Μ	Н		Μ	
CO2	Μ	Μ	M	L	Μ	H	L	Μ	H	L	Μ		H	
CO3	Μ	H	L	Μ	L	Μ	L	Μ	L	H	Μ		L	
CO4	Н	Μ	L	Μ	H	Μ	L	Μ	H	L	Μ		H	
CO5	L	Μ	H	Μ	L	Μ	H	L	Μ	H	Μ		L	
COs / PSOs	PS	01	PSC	02	PS	03	PS	SO4	PSO5					
CO1	Ν	N	H	[]	L	I	М	Н					
CO2	Ν	N	L	i i	I	H	I	М	L					
CO3	I	H	H	[Ν	A]	L	Н					
CO4	Ν	N	H	[]	L	I	М	Н					
CO5	N	N	Н	[]	L	I	М	H					
H/M/L indicate	es Streng	gth of Co	orrelation	H- Hi	gh, M- M	Medium	, L-Low							
		ses												
		enc			es		ct	∕ ili						
	es	Sci	und ces	e	ctiv	es	oje	ips						
	suc	an Bg	es a ien	Cor										
~	cie	eri	Sc	л (nH	ilec	al /	teri	dills					
ory	ic S	ine	nan ial	grai	grai	n F	tic	In ⁻ Tec	St					
teg	as	gu	Hun	roį	roį	Dpe	rac	L '	oft					
	\sim													



BBI18ET3VIRTUAL INSTRUMENTATION FOR
MEDICAL APPLICATION10/13/03

UNIT I INTRODUCTION

Virtual instrumentation (VI): Evolution –Definition –Architecture- Conventionaland 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

Front panel- Block diagram- LABVIEW Environment: Startup-Shortcutand 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

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 –HardwareandSoftware

UNIT IV COMMON INSTRUMENT INTERFACE

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

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

9

9

Q

9

9

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, NewJersey, First edition, 1997

REFERENCE BOOKS:

- 1. Gupta S J, Gu.pta 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



	DF	EPARTM	ENT OF	ELEC	TRICA	LAND	ELECT	'RONI(CS ENGIN	NEERIN	١G			
Subject Code	: S	ubject Na	me : BIC)-SIGN	AL AC	QUISIT	ION LA	AB	TY/	L	Τ/	P/ R	C	
BBI18L08									LB/ ETL		S.Lr			
	P	rerequisi	te: None						L	0	0/0	3/0	1	
L : Lecture T :	Tutori	al SLr :	Supervis	ed Leari	ning P:	Project	R : Res	earch C	: Credits					
T/L/ETL : The	eory/La	b/Embed	ded Theor	ry and L	.ab									
OBJECTIVE	:													
• To	o repres	sent the ba	asic discre	ete time	signals a	and anal	yze it							
• To	o desig	n the IIR a	and FIR f	ilter										
• To	o acqui	re various	types of	bio sign	als and s	study its	characte	eristics						
COURSE OU	TCON	MES (CO	s) : (3- 5)										
CO1	,	The gradu	ate is cap	able of	represen	ting the	basic di	screte ti	me signals	s and and	alyze it			
CO2		Capable to	o design t	he IIR a	nd FIR f	filter								
CO3		Capable to	o acquire	various	types of	f bio sig	nals and	study i	ts characte	ristics				
Mapping of C	Course	Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12												
CO1	Н	М	L	Η	M	L	М	Н	L	М	H	I	М	
CO2	Н	М	L	М	Н	L	М	Н	L	М	H]	L	
CO3	Μ	L	Н	Μ	L	М	L	Н	М	L	M]	H	
COs / PSOs	P	SO1	PSC	02	PS	03	PS	604	PSO5					
CO1		Н	Μ	[1	L	I	M	Н					
CO2		L	Μ	[J	L	Γ	M	Н					
CO3		Μ	L	I	I	I]	H	М					
H/M/L indicat	es Stre	ngth of C	orrelation	H- Hi	igh, M-	Medium	, L-Low	7						
		SS	cial					ical						
		ienc	l So		ves		ect	echn						
	nces	g Sc	s anc	ore	lecti	tives	Proj	S / T						
	Scie	eerin	nitie čes	m C	un E	Eleci	cal /	ship	kills					
gory	asic	ngin	uma	rogré	rogré	pen	ractio	nterr	oft S					
Cate	В	Ц	N H	<u> </u>	- L	0	<u> </u>	<u> </u>	Ň					
-			1	1	1	1	1			1	1	1		



BBI18	L08 BIO-SIGNAL ACQUISITION LAB	0	0/0	3/0	1
LIST (DF 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



	DE	PARTM	IENT OF	ELEC	FRICA	L AND	ELECT	RONI	CS ENGIN	VEERIN	IG			
Subject Code	: Su	bject Na	ame : BIC	OMEDI	CAL IM	IAGE			TY /	L	Τ/	P/ R	C	
BBI18L09	PR	OCESS	SING LA	в					LB/		S.Lr			
	-								ETL			• 10		
	Pro	erequisi	te: MEDI	ICAL I	MAGE	PROCE	ESSING		L	0	0/0	3/0	1	
L : Lecture T :	Tutoria	1 SLr:	Supervise	ed Learr	ning P:	Project	R : Res	earch C	: Credits				•	
T/L/ETL : The	eory/Lab	/Embed	ded Theor	y and L	ab									
OBJECTIVE	:													
• To ana	alyze var	rious typ	bes of bio	signals a	and study	y its cha	racterist	ics						
COURSE OU	ТСОМ	ES (CO	s):(3-5))										
CO1	C	apable t	o analyze	various	types of	bio sig	nals and	study i	ts character	ristics				
Mapping of C	Course C	Dutcomes with Program Outcomes (POs) PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12												
COs/POs	PO1	PO2	O2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12											
CO1	Н	Μ	L	Μ	Н	Μ	L	Н	М	Μ	L]	H	
COs / PSOs	PS	01	PSC	02	PS	03	PS	504	PSO5					
CO1	N	M	Н	[I	Ĺ	I	М	Н					
H/M/L indicat	es Streng	gth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low			1				
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills					
\cup										1				



BBI18L09 BIOMEDICAL IMAGE PROCESSING LAB 0 0/0 3/0 1

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



		DE	PARTN	IENT OF	FELEC	TRICA	L AND	ELECT	RONIC	S ENGIN	EERIN	G		
Subjec	t Code:	Su	bject Na	me :PRC	JECT	PHASE	- I			TY /	L	Τ/	P/ R	С
BBI18	L10									LB/		S.Lr		
										ETL				
		Pre	erequisi	te: None						L	0	0/0	3/3	2
L : Lec	ture T :	Tutorial	SLr:	Supervise	ed Learn	ing P: I	Project	R : Rese	arch C:	Credits	I			
T/L/ET	L : The	ory/Lab	/Embedd	led Theor	y and La	ab								
OBJE	CTIVE	The ob	jective of	of the Ma	in Proje	ect is to	culmin	ate the a	academi	c study ar	nd provid	le an op	portuni	ty to
explore	a prob	lem or i	ssue,ado	dress through	ugh focu	used and	l applied	l researc	h under	the direct	ion of a	faculty	mentor.	The
project	demon	strates th	ne studer	nt's ability	to synt	hesize a	nd apply	the kno	owledge	and skills	acquired	l to real-	world is	sues
and pro	blems.	This pro	oject affi	irms the s	tudents	to think	criticall	y and cr	eatively	find an o	ptimal s	olution, 1	nake et	hical
decision	ns and t	o presen	t effecti	vely.							_			
COUR	SE OU	TCOM	ES (CO	s):(3-5)										
CO1	Appl	y the know	owledge	and skills	acquire	d in the	course c	of study a	addressi	ng a specif	ïc proble	em or iss	ıe.	
CO2	To en	ncourage	e studen	ts to thin	k critica	lly and	creative	ly about	societa	l issues a	nd devel	op user :	friendly	and
	reach	able solu	utions											
CO3	To re	fine rese	search skills and demonstrate their proficiency in communication skills.											
CO4	To ta	ke on th	the challenges of teamwork, prepare a presentation and demonstrate the innate talents.											
Mappi	ng of C	ourse O	utcome	s with Pro	ogram (Jutcom	es (POs))						
COs/P	<u>Os</u>	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1		Н	Н	Н	Н	Μ	Н	Н	L	Μ	Μ	Н]	H
CO2		Н	Н	Н	Н	H	Н	Н	M	Μ	Μ	H]	H
CO3		Н	Н	Н	Н	H	Н	Н	Μ	Μ	Н	H	I	M
CO4		Н	Μ	Н	Н	Н	Н	Μ	Н	Н	Н	Н]	H
COs / 1	PSOs	PS	01	PSC	02	PS	03	PS	50 4	PSO5				
C01		I	I	Н	[I	H]	H	Н				
CO2		I	I	Н	[I	H]	H	Н				
CO3		I	I	Н	[I	H	1	и	Н				
CO4								H H H						
		I	I											
H/M/L	indicate	I Es Streng	H th of Co	H	I H- His	gh. M- N	H Iedium.	L-Low	H	H				
H/M/L	indicate	I es Streng	I gth of Co	H prrelation	[H- Hig	gh, M- M	H Iedium,	L-Low	H	H				
H/M/L	indicate	I Es Streng	H gth of Co	Dirrelation	[H- Hig	gh, M- N	H Iedium,	L-Low	H H ical	H				
H/M/L	indicate	I es Streng	H gth of Co	H prrelation Octar	I H- Hig	gh, M- M	H Iedium,	L-Low	H Shnical	H				
H/M/L	indicate	I es Streng	H gth of Co	H Soccial	I H- Hiį	gh, M- N	H Iedium,	L-Low	Technical	H				
H/M/L	indicate	es Streng	H the of Co	H prrelation Social	H- Hig	gh, M- N	H Iedium,	L-Low	R Technical H	H				
H/M/L	indicate	es Streng	H th of Co sciences	H notices and Social	H- Hig	gh, M- N	H Aedium, sectives	T-Project	ships / Technical H	S S				
H/M/L	indicate	Sciences Streng Sciences	H the of Co	H anities and Social Ices	tam Core	I gh, M- N gh, M- N	H Iedium, Electives	ical / Project	ernships / Technical H	Skills				
H/M/L	indicate	asic Sciences	H ugineering Sciences	H unmanities and Social siences	ogram Core	I gh, M- N	H Aedium, beu Electives	ractical / Project	Internships / Technical H	oft Skills				
H/M/L	indicate	Basic Sciences Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	H Iedium, Oben Electives	Practical / Project	Internships / Technical H	Soft Skills				
H/M/L	ategory	Basic Sciences Basic Sciences	Engineering Sciences	H Humanities and Social Sciences	Program Core	Program Electives	H Aedium, Obeu Electives	Practical / Project	Internships / Technical Skill	Soft Skills				



Subject Code: BHS18FLX	: Su	bject Na	me :FOF	REIGN	LANGU	JAGE			TY / LB/ ETL	L	T / S.Lr	P/ R	C	
	Pre	erequisi	te: None						L	0	0/0	3/0	1	
L : Lecture T : T/L/ETL : The	Tutoria ory/Lab	l SLr : /Embedø	Supervise led Theor	ed Learn y and La	ing P: ab	Project	R : Rese	earch C:	Credits					
OBJECTIVE	:To reco	ognize tl	ne cultural	values,	practice	es, and h	neritage	of the fo	reign coui	ntry, con	nmunicat	e effect	ively	
in a foreign lar	nguage a	nd intera	act in a cu	lturally	appropri	ate man	ner with	native s	peakers of	f that lan	guage.			
COURSE OU	TCOM	ES (CO	s) : (3-5)											
CO1	Achie	ve functi	ional prof	iciency i	in listeni	ng, spea	aking, re	ading, aı	nd writing	•				
CO2	Devel	op an in	sight into	the natu	re of lan	guage it	self, the	process	of langua	ge and c	ulture acc	luisitio	n.	
CO3	Decod	le, analy	ze, and in	terpret a	uthentic	texts of	differer	nt genres	•					
Mapping of C	course O	se 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	Н	L	Н	Μ	Н	H	-	L	
CO2	M	L	L	L	L	Н	L	H	H	H	H		L	
CO3	L	L	М	Μ	L	H	M	H	M	H	H		L	
COs / PSOs	PS	01	PSC	02	PS	03	PS	504	PSO5					
CO1]	L	L	1]	L		L	L					
CO2]	L	L	1]	Ĺ		L	L					
CO3]	Ĺ	L	1]	Ĺ		L	L					
H/M/L indicate	es Strenş	gth of Co	orrelation	H- Hi	gh, M- N	Medium,	, L-Low			-				
gory	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills					
Cate			\checkmark											



Subject Code BBI18010	: Su	bject Na	ame :ME	DICAL	WAST	E MAN	AGEM	ENT	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Pr	erequisi	te: None						Т	3	1/0	0/0	4
L : Lecture T :	Tutoria	l SLr:	Supervise	ed Learr	ning P:	Project	R : Res	earch C	: Credits				
T/L/ETL : The	eory/Lab	/Embed	ded Theor	y and L	ab	-							
OBJECTIVE	:												
• The st	udy wou	uld ensur	e safe pra	ctices									
• The st	udy of p	proper ma	anagemen	t of med	lical was	ste							
• The st	udy orde	er to safe	eguard the	patient									
• The st	udy of h	ealth car	re	_									
• The st	udy of c	ommuni	ty and the	enviror	nment.								
COURSE OU	TCOM	ES (CO	(3-5))									
CO1	U	Inderstar	nds safe pi	ractices									
CO2	C	apable t	o understa	and prop	er mana	gement	of medi	cal wast	e,				
CO3	C	apable t	o analyze	safegua	rd of the	patient							
CO4	U	Inderstar	nds health	care									
CO5	F	amiliariz	zed with c	ommuni	ity and t	he envir	onment.						
Mapping of C	Course (Outcomes with Program Outcomes (POs)											
COs/POs	PO1	PO2	D2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12										
CO1	Μ	Н	Μ	Н	Μ	L	L	Μ	Н	L	Н	I	M
CO2	Μ	Н	L	Μ	Н	L	Μ	Н	L	Μ	H	ľ	M
CO3	Н	Μ	L	Н	Μ	L	Н	Μ	L	Н	Μ	J	L
CO4	Μ	Н	Μ	L	Μ	Н	L	Μ	Н	L	Μ	J	H
CO5	Μ	Н	L	Μ	Н	L	Μ	Н	L	Μ	Н	J	L
COs / PSOs	PS	501	PSC	02	PS	03	PS	504	PSO5				
CO1	I	М	H	[I	Ĺ	I	М	Н				
CO2]	H	Μ	[I	Ĺ]	H	Μ				
CO3	I	М	H	[Ν	N]	H	L				
CO4]	H	Μ	[I	Ĺ	I	М	Μ				
CO5]	H	Μ	[J	L	1	М	H				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low	,					
	ences	ng Sciences	es and Social	Core	os / Technical Skil	S							
Category	Basic Sci	Engineeri	Humaniti Sciences	Program (Program	Open Ele	Practical ,	Internship	Soft Skill				



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

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**

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

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

UNIT IV TYPES OF WASTE DISPOSAL

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**

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.6thEdition, 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

12

12

12



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING Subject Code: Subject Name: BIOPROCESS TECHNOLOGY P/RTY/ L Τ/ С **BBI18011** LB/ S.Lr ETL **Prerequisite:** None Т 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) To learn introduction` and technology of bioprocess, screening, preservation **CO1 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 To learn Kinetics and thermodynamics of enzyme-catalyzed reactions, techniques of enzyme **CO4** 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 PO7 PO9 PO10 PO6 PO8 PO11 PO12 CO1** Μ Η Μ Η Μ L L Μ Η L Н Μ **CO2** Μ Η L Μ Η L Μ Η L Μ Η Μ **CO3** Н Μ L Η Μ L Η Μ L Η Μ L **CO4** Η Μ L Μ Η L Μ Μ L Μ Η Η **CO5** Η Μ Η L Μ Η Μ Η Μ L L L COs / PSOs PSO1 PSO₂ PSO3 PSO4 PSO5 **CO1** Μ Η L Μ Η **CO2** Η Μ L Η Μ **CO3** М Μ Η Η L **CO4** Н Μ L М Μ **CO5** Η Η Μ L Μ H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Internships / Technical Skil Social **Engineering Sciences** Program Electives ractical / Project **Humanities and Open Electives Basic Sciences** Program Core Soft Skills Sciences Category



BBI18011 BIOPROCESS TECHNOLOGY 3 0/0 0/0 3

UNIT I INTRODUCTION OF BIOPROCESS TECHNOLOGY

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

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

Growth rate parameters: Specific growth rate- doubling time- validity of exponential growth law- growth yield- metabolic quotient- Effect of substrate concentration- Monod Kinetics- Determination of Ks-Definition of lag period

UNIT IV ENZYME TECHNOLOGY

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

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

9

9

9

9



Subject BBI18I	Code:	Su	bject Na	me : PRO	OJECT	PHASE	E - II			TY / LB/	L	T / S.Lr	P/ R	C
										ETL				
		Pre	erequisi	te: None						L	0	0/0	12/12	8
L : Lect	ure T :	Tutoria	I SLr:	Supervise	ed Learr	ing P:	Project	R : Res	earch C:	Credits				
T/L/ET	L : The	ory/Lab	/Embed	ded Theor	y and L	ab	-							
OBJEC	TIVE	The ob	jective of	of the Ma	in Proje	ect is to	culmina	ate the a	academic	study ar	nd prov	ide an o	pportuni	ty to
explore	a prob	lem or i	ssue,add	lress throu	ugh focu	used and	applied	l researc	h under	the direct	ion of	a faculty	mentor.	The
project	demons	strates th	ne studer	nt's ability	to synt	hesize a	nd apply	the kno	wledge a	and skills	acquire	d to real	-world is	ssues
and pro	blems.	This pro	oject affi	rms the st	tudents	to think	criticall	y and cr	eatively,	find an o	ptimal	solution,	make et	hical
decision	ns and t	o preser	nt effecti	vely.										
COURS	SE OU	TCOM	ES (CO	s) : (3-5))									
CO1	Appl	y the kn	owledge	and skills	s acquire	ed in the	course	of study	addressi	ng a spec	ific pro	blem or i	ssue.	
CO2	To en	ncourage	e studen	ts to thinl	c critica	lly and	creative	ly about	t societal	issues a	nd deve	elop user	friendly	and
	reach	able sol	blutions											
CO3	To re	fine rese	search skills and demonstrate their proficiency in communication skills.											
CO4	To ta	ke on th	he challenges of teamwork, prepare a presentation and demonstrate the innate talents.											
Mappir	ng of C	ourse O	utcome	s with Pr	ogram	Outcom	es (POs	;)						
COs/PC	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1	1 PO	12
CO1		Н	Н	Н	Н	Н	Н	Н	Н	Н	H	Н]	H
CO2		Н	Н	Н	Н	Н	Н	Н	Н	Н	Η	H]	H
CO3		Н	Н	Н	Н	Н	Н	Н	Н	Н	Η	H]	H
CO4		Н	Н	Н	Н	Н	Н	Н	Н	Н	Η	H]	H
COs / P	PSOs	PS	01	PSC	02	PS	03	PS	504	PSO5				
CO1		I	I	Н	[I	I]	H	Н				
CO2		I	H	Н	[I	I]]	H	Н				
CO3		I	I	Н	[I	I]]	H	Н				
CO4		I	H	Н	[I	I]]	H	Η				
H/M/L	indicate	es Streng	gth of Co	orrelation	H- Hi	gh, M- I	Medium	, L-Low						
						/es		ç						
		ses		and	ſe	ctiv	ves	roje	dill					
		ienc	ing	ies cieı	Co	Ele	ctiv	/ Pi	ps / I SI	ls				
		Sci	neer ces	anit 1 S	am	am	Ele	ıshi ica	škil					
		asic	ien	umé	ogr	ogr	pen	acti	tern schr	off S				
	Z	B	Еr S	Hı Sc	Pr	Pr	Ō	Pr	In T€	S				
	loge							\checkmark						
	Cat													
	-		1		1	1	1			1	1	1		



Subject Code BBI18E01	: Su	bject Na	ame : BIC	O CONT	TROL S	YSTEM	I		TY / LB/	L	T / S.Lr	P/ R	C
									ETL				-
		erequisi	te: None			. .	D D		<u>T</u>	3	0/0	0/0	3
L : Lecture T :	Tutoria	I SLr:	Supervise	ed Learr	ing P:	Project	R : Rese	earch C:	Credits				
1/L/EIL: Ihe	eory/Lab	/Embed	ded Theor	y and L	ab								
OBJECTIVE	· :	.		. 1		1	- (1			·	1	1	.1
• Io pr	ovide st	rong tou	indation 1	n basic	science	and ma	athemati	ics neces	ssary to I	ormulate	, solve a	and ana	ilyze
		strument	ation prot	otion nuc	hlama								
• 10 sol		of allu fi		utori pre									
• 10 and	dometer d		Instrume	ntation j	orion in	5 taamala	motivity t	haamin		theory	-		
• To un		and app	ladaa af i	niai equ	ntotion a	liegrais,	matrix t	neory, p	tions	theory e	lC		
	TCOM		$\frac{1}{2}$	istrume	mation s	ystems	and then	rapplica	uons				
COURSE OU		LS (CO Inderstar	<u>s) . (3- 3)</u> de strong	foundat	ion in h	osio soio	nce and	matham	atics nace	scory to f	Formulate	solva	and
COI	21	nalyze co	ontrol and	instrum	entation	nrohler	ne anu	mainem	alles nece	ssary 10 1	omulau	, solve	anu
CO2		anable to	$\frac{1}{0}$ solve co	ntrol an	d instrur	nentatio	n proble	ems					
CO3		apable t	o analyze	control	and inst	umentat	tion prol	olems					
CO4		Inderstar	$\frac{1}{1}$ of and $\frac{1}{2}$	plies di	fferentia	l equatic	on integ	rals mat	rix theory	probabi	lity theo	vetc	
CO5	F	amiliariz	zed with g	ood kno	wledge	of instru	mentati	on system	ns and the	<u>, produci</u>	ations	jete	
Mapping of (Course C	Dutcome	s with Pr	ogram (Outcom	es (POs)	on syster		on upphe	utions		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	M	H	M	H	M	L	L	M	H	L	H	N	N
CO2	Μ	Н	L	Μ	Н	L	Μ	Н	L	Μ	Н	N	N
CO3	Н	M	L	Н	Μ	L	Н	Μ	L	Н	Μ]	Ĺ
CO4	Μ	Н	М	L	Μ	Н	L	Μ	Н	L	Μ]	H
CO5	Μ	Н	L	Μ	Н	L	Μ	Н	L	Μ	Н]	Ĺ
COs / PSOs	PS	501	PSC	02	PS	03	PS	504	PSO5				
CO1	I	М	Н	[]	1	I	М	Н				
CO2]	H	M	[I]	H	Μ				
CO3	I	M	Н	[Ν	Л]	H	L				
CO4]	H	M	[]	L	1	М	Μ				
CO5]	H	Ν	[]]	L	I	М	H				
H/M/L indicat	es Stren	gth of Co	orrelation	H- Hi	gh, M- N	Aedium,	L-Low	,r			-	T.	
			IJ					al					
		ses	DCIE					mic					
		enc	Š		/es		ct	ech					
	es	Sci	Scie und ctive es ojec										
	enc	ng	ng S es an Core Elect tive										
~	Scie	eri	nitie es	ц Ш	m	Ilee	al /	idai	cills				
(ior)	ic S	ine	nar mc	gra	gra	'nF	ctic	terr	t SJ				
Iteg	3as	Eng	Hur Scie	lo	Proj	Ope	Prac	Int	ofi				
C []					<u> </u>				√ ↓	1			
L	ı	1	I	ı	1	1	1	ı i		1	1		



BBI18E01 BIO CONTROL SYSTEM 3 0/0 0/0 3

UNIT I CONTROL SYSTEM MODELING

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

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

UNIT III FREQUENCY RESPONSE & STABILITY ANALYSIS

Frequency response- Bode plot-Nyquist plots- Nyquist stability criterion- Relative stability- Gain marginphase margin- bandwidth magnitude plots- constant circles- Nichol's chart –stability –Routh-Hurwitz criteria

UNIT IV PHYSIOLOGICAL CONTROL SYSTEMS

Introduction to physiological control systems- modeling of human movements- parameter estimationlinearizing

UNIT V STUDY OF BIOLOGICAL SYSTEMS

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

9

9

9

9



Subject Code BBI18E02	: Su	bject Na	ame : RE	HABIL	ITATIC	ON ENG	GINEEI	RING	TY / LB/	L	T / S.Lr	P/ R	C
									ETL		0.40	0.10	
	<u> Pr</u>	erequisi	te: None			<u>.</u>		1.0	T	3	0/0	0/0	3
L : Lecture T :	Tutoria	d SLr:	Supervise	ed Learr	iing P:	Project	R : Res	earch C	: Credits				
1/L/EIL: Inc	ory/Lat	/Embed	ded Theor	y and L	ad								
	dy bogi	on of Dah	abilitation	- Engina	oring								
• 10 stu	rn tho d	osign of	Wheel Ch	I Eligine	ening								
	in know	lodge of	the recent	davalor	monte i	n tha fia	ld of rok	obilitat	ion onging	oring			
• To gai	dorstand	leuge of		toohnolo	one for y	ision on	d boorin	auman	ion engine	ering.			
• To uno	du voric	various	tio and pr		dovices	ISIOII all	u nearm	g					
		FS (CO	$\frac{100 \text{ and } \text{pr}}{(3-5)}$		devices								
COURSE OC		Inderstar	<u>s) . (5- 5)</u> de the ha) sics of R	Pehabilit	ation Fr	aineerir	ισ					
C02		anable t	o design V	Wheel C	hairs		ignicern	Ig					
CO3	U	Inderstar	nds the rec	ent dev	elonmen	ts in the	field of	rehabil	itation eng	ineering	T		
CO4	A	cauires	various as	sistive t	echnolo	gy for y	ision and	1 hearin	g	,1110011112	2		
CO5	A	nalvsis	various or	thotic a	nd prostl	netic dev	vices		D				
Mapping of C	Course (Outcomes with Program Outcomes (POs)											
COs/POs	PO1	Outcomes with Program Outcomes (POs)PO2PO3PO4PO5PO6PO7							PO9	PO10	PO11	PO	12
CO1	Μ	L	PO2PO3PO4PO5PO6PO7LMHLMH						M	H	H		H
CO2	Н	Μ	Н	Μ	L	Μ	H	L	М	Н	L	J	М
CO3	Н	Μ	Н	Μ	L	Μ	Н	Н	Μ	Н	L	J	Μ
CO4	L	Н	Μ	L	Н	Μ	Н	L	L	Н	Μ		H
CO5	Μ	Н	L	Н	Μ	L	Н	L	Μ	Н	L	J	Μ
COs / PSOs	PS	501	PSC	02	PS	03	PS	604	PSO5				
CO1	I	М	H	[I		1	М	Н				
CO2	I	М	L	ı	I	H	1	М	Н				
CO3]	H	L	1	N	Л]	H	L				
CO4		L	Μ	[Ν	Л]	L	Μ				
CO5]	H	Μ	[I]	H	Μ				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low			1			
								kil					
			al					al S					
		ces	oci					nica					
		So S											
	ses	Science Scienc						Te					
	enc	ng	es al core es al Elec Core						S				
y	Sci	eeri	niti es	E	E	Ele	cal	shij	kill				
gor	sic	gin(mai	gra	1 1 1 1 1 1	en]	ctic	erne	î S				
ateş	Bat	Εnį	Hu Sci	Pro	\Pr	Op	Pra	Inte	Sof				
Ŭ					✓								



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 9 UNIT II **REHABILITATION SCIENCE** 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

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

UNIT IV REHABILITATION MEDICINE

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

UNIT V REHABILITATION ENGINEERING

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

9

9

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



Subject Code BBI18E03	: Si IN	ubject Na MPLANI	ame : BI(FABLE D)MATE DEVICE	CRIALS S	AND			TY / LB/ ETL	L	T / S.Lr	P/ R	C
	P	rerequisi	te: BION	IEDICA	AL INST	FRUME	NTATI	ON	Т	3	0/0	0/0	3
L : Lecture T :	Tutori	al SLr :	Supervis	ed Learr	ning P:	Project	R : Res	earch C	: Credits				
T/L/ETL : The	eory/La	b/Embed	ded Theor	ry and L	ab								
OBJECTIVE	:												
• Learn	charact	teristics a	nd classif	ication of	of Bioma	aterials							
• Under	stand d	ifferent n	netals and	ceramic	es used a	is bioma	terials						
• Learn	polyme	eric mater	rials and c	ombinat	tions tha	t could l	be used a	as a tiss	ue replace	ment im	plants		
Know	the var	rious artif	ficial orga	ns devel	oped usi	ing these	e materia	als to pe	erform mee	dical app	lication.		
COURSE OU	TCON	IES (CO	s):(3-5)									
CO1	1	Analyze o	lifferent ty	ypes of l	Biomate	rials and	l its class	sificatio	n.				
CO2]	Perform c	combination	ons of m	aterials	that cou	ld be use	ed as a t	issue repl	acement	implant.		
CO3]	Know abo	out the var	rious po	lymeric	material	s used for	or medio	cal applica	ations			
CO4	1	About bio	o-ceramics	s and its	applicat	ions in 1	nedicine	e					
CO5	۲	The gradu	uate will b	e capab	le to per	form me	edical ap	plicatio	n.				
Mapping of C	Course	Outcome	tcomes with Program Outcomes (POs)										
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	Η	Μ	Н	Μ	L	Н	Μ	Η	L	L	Μ	
CO2	Μ	Μ	H	Μ	L	H	Μ	L	H	Μ	L	H	
CO3	Η	H	Н	Μ	H	Μ	H	L	H	Μ	H	Μ	
CO4	Η	Η	Μ	L	Н	Μ	L	H	Μ	L	H	Μ	
CO5	Μ	H	Μ	L	H	Μ	L	H	Μ	L	H	Μ	
	P	SO1	PS	02	PS	03	PS	SO4	PSO5				
CO1	M	501	H		M	00	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 indicat	es Strei	ngth of C	orrelation	H- Hi	igh, M- I	Medium	, L-Low						
	-	Ĩ			Ĭ			cill					
sgory	asic Sciences	Engineering Sciences Humanities and Social Sciences Program Core Program Electives Open Electives					actical / Project	ternships / Technical Sk	oft Skills				
Zate	B	E	Hı Sc	Pr	Pr	Ō	Pr	In	Sc				
C					✓								



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

UNIT I BIOCOMPATIBILITY AND HEMOCOMPATIBILITY

Overview of Biomaterials used as medical devices - Classification of biomaterials - Impact and future of biomaterials - performance of implants - Interfacial phenomena and tissue response to biomaterials - Metals and alloys for 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

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

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

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

UNIT V BIOCERAMICS, TYPES

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
- F. Silver and C. Dillon, "Biocompatibility: Interactions of Biological and Implantable Materials" Vol.1, VCH Publishers, New York, 1989.
 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



9

9

9

3



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING Subject Code: Subject Name : EMBEDDED SYSTEM **P/ R** TY/ L Τ/ С **BEI18E05** LB/ S.Lr ETL **Prerequisite: ADVANCEMENT IN ELECTRONICS** Т 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 f 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 PO9 PO8 PO10 PO11 PO12 CO1** Μ Η Μ Η Μ L Η Η L L Μ Μ L **CO2** Μ Μ Η Μ L Η Μ L Η Μ Η H CO3 Η Н Η Μ Η Μ Н L Μ Η Μ **CO4** Η Н Μ L Н Η Μ L Η Μ L Μ **CO5** М Н М L Н Μ L Н Μ L Н М COs / PSOs **PSO1** PSO2 PSO3 PSO4 PSO5 **CO1** Μ Η Μ L Η **CO2** Н Μ Η Μ L CO3 Μ Μ L H Μ **CO4** Н Μ L L Η **CO5** Μ Μ Η Μ L H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Internships / Technical Social **Engineering Sciences** Program Electives Practical / Project Humanities and Skill **Dpen Electives Basic Sciences** Program Core

Sciences

Category

Soft Skills



BEI18E05 EMBEDDED SYSTEM 3 0/0 0/0 3

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

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

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

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

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

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",
- 1. 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

9

9

9

9



Subject Code BBI18E04	: Su Al	bject Na PPLICA	ame : LAS TION IN	SER AN MEDI	ND ULT CINE	RASO	NIC		TY / LB/	L	T / S.Lr	P/ R	C
									ETL				
	Pr	erequisi	te: None						Т	3	0/0	0/0	3
L : Lecture T :	Tutoria	il SLr:	Supervise	ed Learr	ning P:	Project	R : Res	earch C	: Credits				
T/L/ETL : The	eory/Lat	o/Embed	ded Theor	y and L	ab								
OBJECTIVE	:												
• To Ga	in Knov	vledge of	f Laser										
 To Stu 	idy Abo	ut Ultras	sonic										
To Le	arn Abo	ut Ultras	sonic Scan	ners									
 To Stu 	idy Abo	ut High	Energy U	ltrasonic	;								
To Ga	in Knov	vledge of	f Holograj	phic Ap	plication	InMedi	cine						
COURSE OU	TCOM	ES (CO	s) : (3-5)										
CO1	A	Acquires	Knowledg	ge of La	ser								
CO2	(Braduate	acquires k	nowled	ge on Ul	ltrasonic	:						
CO3	(apable t	o analyze	Ultraso	nic Scan	ners							
CO4	I	Inderstar	nds High I	Energy U	Jltrasoni	c							
CO5	A	Acquires	knowledg	e on Ho	lographi	c Appli	cation Ir	Medici	ne				
Mapping of C	Course (Jutcome	es with Pr	ogram	Outcom	es (POs	3)			1			
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	Н	Μ	L	Μ	H	Μ	L	H	Μ	L	1	M
CO2	H	Μ	L	Μ	H	L	M	L	H	Μ	L	I	M
CO3	L	Μ	H	L	Μ	H	L	Μ	H	L	Μ]	H
CO4	H	Μ	L	Μ	Н	L	Μ	H	L	Μ	H]	H
CO5	Μ	L	H	H	Μ	L	H	Μ	L	Μ	H	ľ	M
COs / PSOs	PS	501	PSC	02	PS	03	PS	504	PSO5				
CO1]	М	Н	[I		1	М	H				
CO2]	M	L		I	ł	1	М	L				
CO3		H	Μ	[I		1	М	H				
CO4]	M	H	[I		1	М	H				
CO5		L	Μ	[I	I	I	M	L				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- 1	Medium	, L-Low			1	-		
								kill					
			-					1 S					
		ses	ocié					ica					
		enc	S		es		t (chn					
	SS	Sci	nd	c	, tiv	es	oje	Tec					
	suce	38	ss a	OD	Ilec	tiv	\mathbf{Pr}	s /					
	cie	erii	itie	n C	n E	llec	al /	hip	ills				
ory	cS	ine	nan nce	grai	grai	пн	tic	ms	Sk				
teg	asi	gu	Hun cie	roξ	roξ	be	rac	nte	oft				
Cai	В	Щ	$\Xi $					Ī	S			-	
					•		L						



BBI18E04 LASER AND ULTRASONIC APPLICATION IN 3 0/0 0/0 MEDICINE

UNIT I LASER

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

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

Real Time Echo -2-D Scanners -Colour Doppler

UNIT IV HIGH ENERGY ULTRASONICS

Effects due to High energy ultrasonics applications in Surgery -Cell destruction -Cleaners

UNIT V HOLOGRAPHIC APPLICATION IN MEDCINE

Wave front Recording and Reconstruction -Recording Media -Image forming application -Motion Induced Constrast -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



9

3

9

9



Subject Code: BBI18E05	: Su IN	ubject Name :COMPUTER BASED MEDICAL ISTRUMENTATION							TY / LB/	L	T / S.Lr	P/ R	C
					I ING				ETL		0.10	0.10	
	<u>Pr</u>	erequisi	te: BION	IEDICA	L INSI	RUME	NTATI	ON	T	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research													
1/L/EIL: Ineory/Lab/Embedded Ineory and Lab													
UDJEUIIVE: To Goin Knowledge on Introduction of Computer Read Medical Instrumentation													
• 10 Gai	 To Gain Knowledge on introduction of computer based Medical Instrumentation To Study About the Microcontrollers 												
 To Study About the Wherocontrollers To Learn About the System Design 													
 To Learn About the System Design To Gain Knowledge on Computers in Patient Monitoring 													
 I o Gain Knowledge on Computers in Patient Monitoring To Study About Medical Equipments System 													
To Study About Medical Equipments System													
COURSE OU	COURSE OUTCOMES (COs) : (3-5)												
	F	Tanable t	Analyze	the con	cept of N	Aicrocor	omputer	Daseu		Istrumen	lation		
$\frac{CO2}{CO3}$		apable t	o analyze	System	Design	menocon	nuoneis						
CO4		^T anable t	$\frac{0}{0} \frac{1}{2} \frac{1}$	Knowle	dge On (Comput	ers In Pa	atient M	onitoring				
C05		Acquires	Knowlede	re on M	edical E	auinmer	nts Syste	em	ointoring				
Manning of C	ourse (Dutcome	es with Pr	ogram	Outcom	es (POs	()						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	M	H	M	L	M	H	L	M	H	L	M		
CO2	Н	Μ	L	Μ	Н	L	Μ	Н	L	Μ	Н	I	M
CO3	Н	Μ	L	Μ	Н	L	Μ	Н	L	Μ	Н	J	L
CO4	L	Μ	L	Μ	L	Н	Μ	L	Μ	Н	L	I	М
CO5	L	Μ	Н	L	Μ	Μ	L	Μ	L	Н	L	1	М
COs / PSOs	PS	501	PSC	02	PSO3 PSO4			504	PSO5				
CO1]	Μ	H	[L		M		H				
CO2		H	Μ	[I	L M		М	Н				
CO3		L	Μ	[I	H]	L	Μ				
CO4]	M	H	[]]	L	1	M	H				
CO5		M			I	I		L	Μ				
H/M/L indicate	es Stren	igth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low						
								ikil					
			al					al S					
		ces	oci					nic					
		ien	S		ves		sct	schi					
	ces	Sc	and	re	cti	ves	roje	, Te					
	enc	ing	es	Co	Ele	cti	-P	/ sd	S				
∧	Sci	eer	niti	am	am	Ele	cal	shi	kil				
gor	sic	gin	enc	gr;	gr;	en	acti	ern	ft S				
ate	Ba	En	Hu Sci	Prc	Prc	Op	Pra	Int	Soj				
C					\checkmark								



BBI18E05 COMPUTER BASED MEDICAL 3 0/0 0/0 3 INSTRUMENTATION

UNIT I INTRODUCTION

8086 Architecture - system connections and timing - Instruction set and assembly language programming - Macro assemblers - BIOS and DOS Services - memory and I/O interfacing - Advanced Intel 32 bit processors

UNIT II MICROCONTROLLERS

Introduction - 8051 architecture and programming - micro controller based medical systems - TMS 320 series - architecture and programming - applications in bio-signal processing - IDE51 - C Cross Assemblers

UNIT III SYSTEM DESIGN

Multichannel computerized ECG,EMG and EEG data acquisition – storage -analysis - retrieval techniques - Medical image acquisitions through video - card - storage and retrieval techniques - Moderns and computer networking in the hospital

UNIT IV COMPUTERS IN PATIENT MONITORING

Physiological monitoring - automated intensive care units - computerized arrhythmia monitoring - information flow in a clinical lab - computerized concepts - interfacing to HIS

UNIT V MEDICAL EQUIPMENTS SYSTEM

Microprocessor based medical system - pulmonary instrumentation - anesthesia machine - EEG system - microprocessor based blood pressure monitor - prosthetic systems - bio- chemical measuring systems and microprocessor based medical devices - Radiological Information system.

Total No of Periods: 45

TEXT BOOKS:

1. Kenneth J. Ayala, "The 8051 Micro Controller – Architecture Programming and Applications", Second Edition, Penram International, 1996

REFERENCE BOOKS:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and hardware", Mcgrase Hill, Singapore, 1999

9

9

9

9



Subject Code: BBI18E06	Su NA	Subject Name :BIOMEDICAL MEMS AND NANOTECHNOLOGY								L	T / S.Lr	P/ R	C
	Pr DF	Prerequisite: BIOMATERIALS & IMPLANTABLE DEVICES								3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C								: Credits	1 1				
T/L/ETL : Theory/Lab/Embedded Theory and Lab													
OBJECTIVE	OBJECTIVE :												
To und	To understand the working principle of MEMS and Microsystems												
To und	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 OU	COURSE OUTCOMES (COs) : (3- 5)												
CO1	u	nderstan	ds the wor	rking pr	inciple o	f MEM	S and M	licrosyst	tems				
CO2	u	nderstan	ds the wor	rking of	MOEM	S Techn	ology						
CO3	u	nderstan	ds the con	cepts of	BioME	MS and	its appl	ication i	in healthca	ire			
CO4	A	cquires	knowledg	e on the	DNA ba	ased Bio	MEMS						
CO5	A	cquires	knowledg	e on the	ology an	d its applic	cation in	research	domain				
Mapping of C	ourse C	<u>)utcome</u>	s with Pr	ogram	Outcom	es (POs)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	H	L	L	Μ	H	L	Μ	H	L	Μ]	H
CO2	H	H	H	L	L	Μ	H	Μ	H	L	Μ]	H
CO3	Μ	H	L	Μ	Н	L	Μ	H	L	Μ	H]	L
CO4	H	Μ	L	Μ	Н	L	Μ	H	L	Μ	Н]	L
CO5	L	Μ	Н	L	Μ	Н	L	Μ	Η	L	Μ]	H
COs / PSOs	PS	601	PSC)2	PS	03	PSO4		PSO5				
CO1	I	Μ	L		H L		L	M					
CO2	I	M	H		I		1	M	H				
CO3]	H	H		I	I	1	M	L				
CO4	1	M	Н		I	_	1	M	H				
CO5			M			1		L	Μ				
H/M/L indicate	es Stren	gth of Co	orrelation	H- H1	<u>gh, M- N</u>	Aedium	, L-Low	-		1			
			ial					al Skil					
		tience	d Soc		ves		ect	echnic					
	ences	ng Sc	es and	Core	Electi	ctives	' Proj	J / J	S				
	Scie	eri	niti(es	m (ml	Elec	al/	hip	killt				
(or)	ic S	ine	nar snce	gra	gra	'nF	ctic	sms	L SI				
iteg	3as	gug	Hur Scie	Pro	Pro	Эре	Prac	nte	ofi				
Ŭ Ü					✓	- -					1		



3

0/0

0/0

BBI18E06

BIOMEDICAL MEMS AND NANOTECHNOLOGY

UNIT I MEMS

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

Fundamental principle - Light Modulators -Beam splitter - Micro-lens -Micro-mirrors - Digital Micromirror 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

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

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

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 and applications", 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.



9

9

3

9



Subject Code: BBI18E07	Su	Subject Name : COMPUTER NETWORKS							TY / LB/	L	T / S.Lr	P/ R	C
	D		4 NT						ETL	2	0.0	0./0	2
L. Lesture T.	Pr Tutorio	Prerequisite: None								3	0/0	0/0	3
L: Lecture 1 : $T/I / ETI \cdot The$	L. Lecture T. Tutoriai SLI. Supervised Learning F. Floject K. Research C T/L/ETL : Theory/Lab/Embedded Theory and Lab												
ORIECTIVE	OBJECTIVE :												
To learn about Transmission media, Data encoding, Interface and Modems													
To lear	 To learn about Multiplexing clear view ISO – OSI lavered 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. FDDL Wireless LAN 													
COURSE OUTCOMES (COs) : (3-5)													
CO1	T	To learn about transmission media, data encoding, interface and modems, Multiplexing											
CO2	Т	'o get a c	lear view	of ISO -	– OSI la	yered ar	chitectu	re					
CO3	Т	'o learn a	about Fran	nes relay	y operati	on – lay	vers and	traffic c	ontrol; AT	M netwo	orks		
CO4	Т	'o clear v	view LAN	topolog	y, Ether	net ,Toł	ken bus ,	Token r	ing, FDDI	,Wireles	ss LAN		
CO5	Т	'o learn a	bout Tran	sport la	yer issue	es, sessi	on layer,	, Synchr	onization	,Presenta	tion laye	r	
Mapping of C	ourse (Jutcome	s with Pr	ogram (Outcom	es (POs	5)	-					
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	Μ	Μ	L	Н	L	Μ	Н	L	Μ	Н		L
CO2	Μ	Н	L	Μ	Н	L	Μ	Н	L	Μ	Н		L
CO3	Μ	Н	L	Μ	Н	L	Μ	Н	L	Μ	Н		L
CO4	Μ	Н	L	Μ	L	Μ	H	L	Μ	Н	L	I	M
CO5	Μ	Н	L	Μ	Н	L	Μ	H	L	Μ	Н		L
COs / PSOs	PS	501	PSC)2	PSO3 PSO4			SO4	PSO5				
CO1	1	М	H		L M			М	H				
CO2	1	M	H	[I		1	M	H				
CO3]	H	M	[I]	H	L				
CO4		L	M	[ŀ	I]	L	M		_		
CO5		H	M	<u> </u>				M	H				
H/M/L indicate	es Stren	gth of C	orrelation	H- H1	gh, M- I	Medium	, L-Low	=		T	1		
	nces	ig Sciences	s and Social	ore	lectives	tives	Project	s / Technical Ski					
Category	Basic Scie	Engineerir	Humanitie Sciences	Program C	Program E	Open Elec	Practical /	Internship:	Soft Skills				



BBI18E07COMPUTER NETWORKS30/00/03

UNIT I DATA COMMUNICATION CONCEPTS

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

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

Frames relay operation - layers and traffic control - ATM networks - Architecture switching - layers service classes

UNIT IV LOCAL AREA NETWORK

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

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

9

9

9

9



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING **Subject Code:** Subject Name: NEUROSCIENCE FOR BIOMEDICAL **P**/**R** TY/ L Τ/ С **BBI18E08** APPLICATIONS LB/ S.Lr ETL **Prerequisite:** None Т 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) Understands System Concept **CO1 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) **PO1 PO2 PO4** PO5 **PO6 PO7 PO8 COs/POs PO3** PO9 **PO10 PO11 PO12 CO1** Μ Μ Η Μ \mathbf{M} L L Η L \mathbf{M} Η L **CO2** L L Μ Η L Μ Η Μ Η L Μ Η **CO3** Μ Η L Μ Н L Μ Η L Μ Η L **CO4** Η L Μ L Μ L Μ L Μ Μ Η Η **CO5** Н Μ Η Η L Μ L L Μ Η L Μ COs / PSOs **PSO1** PSO₂ PSO3 PSO4 PSO5 **CO1** Μ Η L Μ Η **CO2** Μ Η L Μ Η **CO3** Η Μ L Η L **CO4** L L Μ Η Μ **CO5** Η Μ L Μ Η H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Internships / Technical Skil Social **Engineering Sciences** Program Electives Practical / Project Humanities and **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category



BBI18E08 NEUROSCIENCE FOR BIOMEDICAL 3 0/0 0/0 3 APPLICATIONS

UNIT I INTRODUCTION TO NEUROSCIENCE

An overview of neuroscience - Applications of neuroscience - Neurons and Neuroglia - Neurotransmitters

UNIT II NERVOUS SYSTEM

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

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

Current flow in neurons - Introduction to electro diagnostic signals and their measurement - nerve conduction study - evoked potentials and EEG

UNIT V CHALLENGES

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 & Wikkins, 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



9

9

9



Subject Code: BBI18E09	: Si R	ubject Na ADIATI)ject Name :BIOLOGICAL EFFECTS OF DIATION						TY / LB/	L	T / S.Lr	P/ R	C	
	Р	rereauisi	nisite: MEDICAL PHYSICS						T	3	0/0	0/0	3	
L: Lecture T: Tutorial SLr: Supervised Learning P: Project							R : Res	earch C	: Credits		0,0	010		
T/L/ETL : The	eory/La	ab/Embed	ded Theor	y and L	ab	5								
OBJECTIVE	OBJECTIVE :													
To Stu	To Study About Actionof Radiation on Living Cells													
To Lea	To Learn About Somatic Application of Radiation													
To Ga	To Gain Knowledge on Genetic Effects of Radiation													
To Study About Effectof Microwave and RF With Matters														
• To Gain Knowledge on UV Radiation														
COURSE OUTCOMES (COs) : (3-5)														
CO1	1	Understan	nds Action	n of Rad	iation or	n Living	Cells							
CO2	(Capable to	o analyze	Somatic	c Applica	ation of	Radiatio	on						
CO3		Acquires	Knowledg	ge on Ge	enetic Ef	fects of	Radiatio	on						
CO4	1	Understan	nds Effect	of Micr	owave a	nd RF V	Vith Ma	tters						
CO5		Acquires	Knowledg	ge on U	V Radiat	ion								
Mapping of C	ourse	Outcome	s with Pr	ogram	Outcom	es (POs	;)	1		1				
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
CO1	Μ	H	M	L	H	Μ	L	Μ	H	L	Μ	H		
CO2	Μ	H	L	Μ	H	L	Μ	H	L	Μ	H			
CO3	H	Μ	L	Н	Μ	Н	Μ	H	L	Μ	H			
CO4	L	Μ	H	L	Μ	Н	L	Μ	H	L	Μ	H		
CO5	H	Μ	L	Μ	H	L	Μ	H	L	Μ	H			
			DC		D G		- DC		DCOF					
COs / PSOs	P V	501	PSC	J 2	PSO3 PSO4			604	PS05	-				
			H		L M						_	<u> </u>		
<u>CO2</u>	H		M		H				H		_	<u> </u>		
<u>CO3</u>			IVI T		H							_		
<u>C04</u>	H M						H T					_		
UM/L indicat	IVI og Stro	noth of C	L	и ц	n ah M N	Andium			IVI			<u> </u>		
n/wi/L mulcat				п- пі	ign, wi- r		, L-LOW	Π				Т		
tegory	asic Sciences	ngineering Sciences	lumanities and Social ciences	rogram Core	rogram Electives	pen Electives	ractical / Project	nternships / Technical Ski	oft Skills					
Ca	<u> </u>				<u> </u>									



BBI18E09 BIOLOGICAL EFFECTS OF RADIATION 3 0/0 0/0 3

UNIT I ACTION OF RADIATION ON LIVING CELLS

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

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

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

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

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

9

9

9

9

9

TEXT BOOKS:

- 1. Glasser.O., "Medical Physics", vol I, II, III, The year book Publishers Iinc., 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



				ELEC	MCA			NOMIC	O LITOI		J		
Subject Code: BBI18E10	Su	bject Na	ame : DR	UG DE	LIVER		TY / LB/	L	T/ S Lr	P/ R	C		
DDIIOLIO									ED,		5.11		
	Pr	ereauisi	te: None						T	3	0/0	0/0	3
L : Lecture T :	L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Researce										0,0	0,0	
T/L/ETL : Theory/Lab/Embedded Theory and Lab													
OBJECTIVE	DBJECTIVE :												
• To edu	• To educate the student on drug delivery system which would enable a comprehensive analysis												
Givedi	• Givedirection of these drug delivery systems as an important tool in improving the efficacy												
• safety	• safety of the release of drugs in the body												
• explore	• explores the present and future strategies within the drug delivery market.												
• Unders	 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												
	a	nalysis				8	j					I	
CO2	(Capable of	of giving t	hese dru	ıg delive	ry syste	ms as ar	n import	ant tool in	improvir	ng the eff	ficacy	
CO3	U	Jnderstar	nds safety	of the re	elease of	f drugs i	n the bo	dy					
CO4	(Graduates	s can unde	erstand a	bout pre	esent and	l future	strategie	es within the	ne drug d	elivery r	narket.	
CO5	ι	Jnderstar	nds Imple	mentatio	on of pla	ns and n	nethod						
Mapping of C	ourse (Outcome	es with Pr	ogram	Outcom	es (POs	s)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	12
CO1	Η	Μ	L	Н	Н	Η	Μ	L	Η	Μ	Η	L	
CO2	Μ	Η	Μ	L	Н	Μ	L	Η	Μ	L	H	Μ	
CO3	Η	H	Μ	L	H	L	Μ	Η	L	Μ	H	L	
CO4	L	Μ	H	L	H	Μ	L	Μ	H	L	Μ	H	
CO5	H	Μ	L	Н	L	Μ	H	L	Μ	H	L	H	
					~								
COs / PSOs	PS T	501	PSO	02	PSO3		PSO4		PSO5				
	H				L H		H		H			_	
CO2			П				H M		IVI T			<u> </u>	
CO4	п		п		п		T						
C04	Н		Н		M		L I		M			_	
H/M/L indicate	s Strer	orth of C	orrelation	H- Hi	igh M-1	Medium	L-Low	,	171				
	5 Buer						, <u>L L0</u>						
			I					cal					
		Ses	oci					hni					
		ene	Ň		es		t	lec					
	es	Sci	pu	ę	ctiv	es	oje	[∕] kill					
	snc	នួព	SS SS	O	Elle.	sti v	Pr	ips SI					
~	Scit	eri	nitic	u C	ml	Ilec	al /	nsh	dille				
ory	ic 5	ine	nar mc	gra	gra	'nF	ctic	iter.	Š				
lteg	3as	ng	Hur Scié	Proj	Proj	Dpe	Prac	In	Sofi				
Ca					✓								



BBI18E10DRUG DELIVERY SYSTEMS30/00/03

UNIT I SUSTAINED AND CONTROLLED DRUG DELIVERY

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

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

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

Implantable micro - pump systems - peristaltic micro pump - osmotic micro pump - diaphragm micro pump - Fluorocarbon propellent driven micro pump - solenoid driver reciprocates micro pump - programmable implanted drug administrative device (DAD)

UNIT V SITE SPECIFIC DRUG DELIVERY SYSTEMS

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

9

9

9

9

9

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


Subject Code: BEI18E12	: Si E	ubject Na XPERT S	me : AR SYSTEM	FIFICIA S	AL INT	ELLIG	ENCE A	AND	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Р	rerequisi		Т	3	0/0	0/0	3					
L : Lecture T :	Tutor	ial SLr :	Supervis	ed Learr	ning P:	Project	R : Res	earch C	: Credits	I		1	
T/L/ETL : The	eory/La	b/Embed	ded Theor	y and L	ab	-							
OBJECTIVE	:												
• Re	epreser	enting the concept of intelligent agents, search technique, knowledg									and plan	ıning.	
• Pr	ovidin	g the idea	s of intelli	igent age	ents and	search r	nethod.						
• Le	earning	about kn	owledge r	epresent	tation.								
• G1	raduate	es to under	rstand abc	out planr	ning and	learning	g methoo	lologies	•				
• Im	pleme	ntation of	plans and	l method	d for des	igning c	controlle	rs					
COURSE OU	TCON	MES (CO	s) : (3- 5))									
CO1		The grad	uate can	represe	nt the c	concept	of intel	lligent a	agents, sea	arch tec	hnique,	knowle	dge,
		reasoning	and plani	ning.									
CO2		Capable c	of giving i	deas of i	intellige	nt agents	s and sea	arch met	thod.				
CO3		Understar	nds knowl	edge rep	presentat	ion							
CO4		Graduates	s can unde	erstand a	bout pla	nning a	nd learni	ing meth	nodologies				
CO5		Understands Implementation of plans and method for designing controllers											
Mapping of C	ourse	Outcome	s with Pr	ogram	Outcom	es (POs	5)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Η	Μ	L	H	H	H	Μ	L	H	Μ	H]	Ĺ
CO2	Μ	Н	Μ	L	H	Μ	L	H	Μ	L	Н	I	M
CO3	H	H	Μ	L	H	L	Μ	H	L	Μ	H]	Ĺ
CO4	L	Μ	H	L	H	Μ	L	Μ	H	L	Μ]	H
CO5	H	Μ	L	H	L	Μ	H	L	Μ	H	L]	H
			_ ~ ~										
COs / PSOs	P	SO1	PSC)2	PSO3 PSO4			PSO5					
<u>CO1</u>		H	M	[]	[H	H				
<u>CO2</u>		M	H	[1			H	M				
<u>CO3</u>		H	H	[<u>1</u>	1	M					
<u>CO4</u>		M	M	<u> </u>		<u>1</u>			M				
	C.	H	H					L	M				
H/M/L indicate	es Stre	ngth of C	orrelation	H- H1	igh, M- I	Medium	, L-Low						
								Ski					
			ial					al 5					
		ICes	oci oci										
		ien	T S		ves		ect	ech					
	ces	Sc	and	Ite	ecti	ves	roj	/ T6					
	ien	ing	ies	C	Еľ	scti	/P	' sd	ls				
ъ.	Sc	eer	unit ces	am	am	Εlέ	cal	shi	ikil				
103	sic	gin	iene	ngc	ngc	en	acti	cern	ft S				
ate	Ba	En	Hu Sci	Pr(Pr(Op	Prí	Int	So				
C					✓								



BEI18E12 ARTIFICIAL INTELLIGENCE AND EXPERT 3 0/0 0/0 3 SYSTEMS

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Overview of AI-general concepts-problem spaces and search - search techniques - BFS - DFS-Heuristic search techniques

UNIT II KNOWLEDGE REPRESENTATION

Knowledge - general concepts- predicate logic-representing simple fact- instance and ISA relationships - resolution - natural deduction

UNIT III KNOWLEDGE ORGANISATION AND MANIPULATION

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 ERCEPTION – COMMUNICATION AND EXPERT SYSTEMS

Natural language processing - pattern recognition - visual image understanding - expert system architecture

UNIT V KNOWLEDGE ACQUISITION

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 Hal, 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.



9

9

9



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING Subject Code: Subject Name :MEDICAL INFORMATICS TY/ Τ/ **P/R** С L **BBI18E11** LB/ S.Lr ETL **Prerequisite:** None Т 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) Acquires Knowledge on Biomedical Information Technology **CO1 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) **PO1 PO2 PO3 PO4 PO5 PO7 PO8 COs/POs PO6 PO9 PO10 PO11 PO12 CO1** Η Μ Μ Η Μ L L L L Η L Μ **CO2** L Μ Η L Μ Η L Μ Η L Μ Η **CO3** Н L H L Μ Η L Μ Η L Μ Μ **CO4** Μ Μ L Н Μ Η L Η L Η Μ L **CO5** Μ L Μ L Η L Μ Η L Μ Η L COs / PSOs **PSO1** PSO2 PSO₃ PSO4 PSO5 **CO1** L Μ Η Μ Η **CO2** Η М L Μ Η **CO3** L Μ Η L Μ **CO4** Μ L Μ Η L **CO5** Η М L Μ Η H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Program Electives **Technical** Skill Practical / Project Social Sciences Internships / Humanities and **Open Electives Basic Sciences** Program Core Engineering Soft Skills Sciences Category



BBI18E11 MEDICAL INFORMATICS 3 0/0 0/0 3

UNIT I BIOMEDICAL INFORMATION TECHNOLOGY

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

Motherboard and its logic - memory and I/O interfacing -memory and I/O mapI/O peripherals - add-on cards -RS 232-C - various IEEE standards

UNIT III HOSPITALS INFORMATION SYSTEMS

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

Visuals Basic principles and programming – Design - Production and testing of multimedia based medical information systems

UNIT V INTEGRATED MEDICAL INFORMATION SYSTEMS

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

9

Q

9

9



Subject Code: BEI18E16	Su	bject Na	me : PRI	NCIPLE	ES OF R	OBOTI	CS		TY / LB/	L	T/ S.Lr	P/ R	С
	Pre	erequisit	e:						Т	3	0/0	0/0	3
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits													
T/L/ETL : Theo	ory/Lab/	Embedde	ed Theory	and Lab									
OBJECTIVE :	duga th	o hosia a	onconta or	nd norta	ofrobota								
• Io IIIu • Unders	tanding	the work	ving of rob	nu parts	or robots	vpes of r	obote						
• Familia	arizing v	vith the v	arious driv	ve syster	ns of rob	ots sens	ors and	their anr	lications i	n robots :	and proor	mmino	of
robots.	viizing v	vitil the v	unous un	ve syster	115 01 100	, sent	sons and	then upp	incutions i	11000013	ind progra	E	, 01
• The va	rious ap	plication	s of robots	s, justific	ation and	d implen	nentation	of robo	ts.				
Studyin	ng about	the man	ipulators,	activator	rs and gri	ippers an	d their d	lesign co	onsideration	ns			
								_					
COURSE OUT	ГСОМЕ	ES (COs)):(3-5)										
CO1	U	nderstan	ds the bas	ic conce	pts and p	arts of re	obots.						
CO2	U	nderstan	ding the w	orking o	of robots	and vari	ous type	s of robo	ots.				
CO3	F	amiliariz	ed with th	he vario	us drive	systems	of rob	ots, sens	ors and th	eir appli	cations in	robots	and
	p	rogramm	ing of rob	ots.		-							
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									IS				
Mapping of Co	ourse O	utcomes	with Prog	gram Ou	itcomes	(POs)							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	H	Μ	L	Η	Μ	Н	Μ	L	Н	Μ]	L
CO2	H	M	L	H	L	M	H	L	M	H	L	I	M
<u>CO3</u>	H	H	M	L	H	M	L	M		H	<u>M</u>		
<u>CO4</u>	M	H	M	M	H							1	
05	IVI	п	IVI	L	IVI	п	L	IVI	п	L	п	1	VI
	PS	01	PSO	$\mathbf{D}2$	PS	03	PS	504	PSO5				
CO1		H	M	<u> </u>		L		H	M				
CO2	Ι	M	L	4	I	H	I	М	Н				
CO3]	L	Н	[N	N]	H	Μ				
CO4	Ι	Ν	H	[]	L	I	М	Н				
CO5	I	N	H	[L]	М	Μ				
H/M/L indicate	s Streng	th of Cor	relation	H- High	<u>ı, M- Me</u>	dium, L-	Low	1		1			
		lces											
		cier	es d		ive	s	ject	os / Skil					
	Ğ	S S	s an enco	ore	lect	ive	Pro	ship :al 9					
	ž			ccie cci Ele CCo cie								1	
	ciene	srin,	itie Sci	U C	d	μ	Ч	ън	E				
ory	c Scienc	ineering	anitie al Sci	gram (gram	n Ele	tical	Inter	Skill				
tegory	asic Scien	Ingineerin	Humanitie locial Sci	rogram (rogram)pen Ele	ractical	Inter Techr	oft Skill				
Category	Basic Sciend	Engineerin	Humanitie Social Sci	Program (Program.	Open Ele	Practical	Inter Techr	Soft Skill				



BEI18E16

PRINCIPLES OF ROBOTICS

UNIT I BASIC CONCEPTS

Definition and origin of robotics - different types of robotics - various generations of robots - degrees of freedom - Asimov's laws of robotics - dynamic stabilization of robots

UNIT II POWER SOURCES AND SENSORS

Hydraulic - pneumatic and electric drives - determination of HP of motor and gearing ratio - variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging - laser - acoustic – magnetic -fiber optic and tactile sensors

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits - end effectors - U various types of grippers - design considerations

UNIT IV KINEMATICS AND PATH PLANNING

Solution of inverse kinematics problem - multiple solution jacobian work envelop - hill climbing techniques - robot programming languages

UNIT V CASE STUDIES

Multiple robots - machine interface - robots in manufacturing and non-manufacturing applications - robot cell design - selection of robot

Total No of Periods: 45

3

0/0

0/0

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



9

9

9

3



	DE	PARTN	IENT OF	ELEC	FRICA	L AND I	ELECT	RONI	<u>CS ENGI</u>	NEERIN	G		
Subject Code:	Su	bject Na	ame :BIO	MEDIO	CAL SI	GNAL			TY /	L	Τ/	P/ R	С
BBI18E12	PR	OCESS	SING						LB/		S.Lr		
									ETL				
	Pr	erequisi	te: None						Т	3	0/0	0/0	3
L : Lecture T :	Tutoria	1 SLr :	earch C	: Credits									
T/L/ETL : The	ory/Lab	/Embed	ded Theor	y and L	ab								
OBJECTIVE	:												
•	Introd	uction to	o periodic	and pul	se signal	ls, vario	is syster	ns					
•	To be	able to t	ime doma	in analy	sis.								
•	To un	derstand	the prope	rties of	Z-transf	orm							
•	To be	able sol	ve the Fou	irier seri	es.								
•	To stu	dy Over	view of F	FT and	problem	s in the	fast Four	rier trar	nsforms.				
COURSE OU	тсом	ES (CO	s):(3-5))									
CO1	U	nderstar	nds period	ic and p	ulse sigi	nals, var	ious sys	tems					
CO2	С	apable of	of analysis	of time	domain	specific	ation.						
CO3	U	nderstar	nds the pro	operties	of Z-trai	nsform							
CO4	С	apable t	o solve th	e Fourie	r series.								
CO5	U	nderstar	nds Overv	iew of F	FT and	problem	s in the	fast Fo	urier transf	orm.			
Mapping of C	ourse C	Jutcome	es with Pr	ogram	Outcom	es (POs)						
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	Μ	Н	М	L	Μ	Н	Μ	Н	М	L	Н]	М
CO2	Н	Μ	L	Μ	Н	Μ	L	Н	Μ	L	Μ		H
CO3	Н	Μ	L	Н	Μ	Н	Μ	L	Μ	Н	Μ		L
CO4	Н	Μ	Μ	Н	Μ	L	Н	Μ	Н	М	L		H
CO5	L	M	Н	M	L	M	Н	L	M	Н	H		M
COs / PSOs	PS	01	PSC)2	PS	03	PS	604	PSO5				
CO1		[]	M	[H		M		L				
CO2		H	M	[M	H				
CO3	, I	M	M	 [I			H	Н				
CO4		H	M	 [M	Н				
CO5	ľ	vi Vi	H	[N	 /[M	H				
H/M/L indicate	es Stren	gth of C	orrelation	H- Hi	gh. M- N	Medium	L-Low						
					8,			ill					
								Sk					
		S	2 jal					cal					
		nce	Soc		ş			ini					
		cie	p		ive	s	jeci	ect					
	lce	\mathbf{S}	an	ore	ect	ive	² ro	L /					
	ier	ling	ties	Ŭ	E	ect	I/1	ips	lls				
Ŋ	Sc	leel	anit	am	am	Ē	ical	ilsh	<u>Ski</u>				
og	asic	ıgir	ien	ogr	ogr	Den	acti	ten	fft (
late.	Bí	Ēr	Hı Sc	Pr	Pr	0 ¹	Pr	In	Sc				
0					\checkmark								



BBI18E12 BIOMEDICAL SIGNAL PROCESSING 3 0/0 0/0 3

UNIT I DISCRETE – TIME SIGNALS AND SYSTEMS

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

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

EEG analysis - Linear prediction theory-Autoregressive method adaptive segmentation - Transient detection - Overall performance -classification of sleep stages

UNIT IV CARDIOLOGICAL SIGNAL PROCESSING

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

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., "Biomedial signal processing", Academic press 1994

2. Kok FL, "Biomedical signal processing", PHI, 1999

3. Mitra SK, "Digital signal processing", TMH, 2001



9

9

9



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING Subject Code: Subject Name : BIO-MATERIALS AND ARTIFICIAL TY/ L Τ/ P/RС **BBI18E13** ORGANS LB/ S.Lr ETL **Prerequisite:** None Т 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) The graduate understands about the different classes of materials used in medicine **CO1 CO2** Familiar with the application of biomaterials in medicine **CO3** Graduate understands the concept of biocompatibility and the methods of biomaterial testing The graduate will be able to use technologies of biomaterial processing, clinical trials, ethical **CO4** issues and regulatory standards. **CO5** Acquires knowledge in some of the existing designs of artificial organs. Mapping of Course Outcomes with Program Outcomes (POs) **PO5 COs/POs PO1 PO2 PO3 PO4 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1** Μ Μ Μ Η Μ Η Μ Μ Η L L L **CO2** Η Μ Μ L Μ L Н Н Η Η Μ Μ **CO3** Η L Μ L Η L Η L Μ Μ Μ Μ **CO4** Η Η Μ L Μ L Η Μ L Μ Η L **CO5** COs / PSOs PSO1 PSO2 PSO3 PSO4 PSO5 **CO1** Μ Η Μ L Μ **CO2** Η Μ L Μ Η **CO3** Η Μ Μ Η Μ **CO4** Μ L Η L Μ CO5 Μ Η L Μ Η H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low nternships / Technical Skill Social **Engineering Sciences** Program Electives ractical / Project Humanities and **Dpen** Electives **Basic Sciences** Program Core Soft Skills Sciences Category √



BBI18E13 BIO-MATERIALS AND ARTIFICIAL ORGANS 3 0/0 0/0 3

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

Definition and classification of bio-materials -mechanical properties -visco elasticity -wound-healing process - body response to implants - blood compatibility

UNIT II IMPLANT MATERIALS

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

Polymerization –polyolefin – polyamicles –Acrylic –polymers –rubbers -high strength thermoplastics - medical applications

UNIT IV TISSUE REPLACEMENT IMPLANTS

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

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:

 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)

9

9

9

9



Subject Code BBI18E14	: Su H	ıbject Na OSPITA	xt Name :RECENT ADVANCES APPLIED TO TTAL ENGINEERING							L	T / S.Lr	P/ R	C
	Pı	rereauisi	te• None						<u>EIL</u> T	3	0/0	0/0	3
L · Lecture T ·	Tutori	al SLr.	Supervise	earch C	· Credits	5	0/0	0/0	5				
T/L/ETL : The	eory/La	b/Embed	ded Theor	y and L	ab	rojeet	11.1105	curen e	· creatts				
OBJECTIVE	:			2									
To lea	rn abou	ıt Standar	dizationo	f Hospit	al Equip	ment's							
To gai	in know	ledge on	Clinical H	Engineer									
• To stu	idy abou	ut Networ	rking										
To gai	in know	ledge on	Fiber Opt	tic Sense	ors for M	<i>leasurin</i>	g Physic	ological	Parameter	rs			
To lea	rn abou	ıt EMIano	d EMC Aj	oplied to) Hospita	al Equip	ment's						
COURSE OU	TCON	IES (CO	s) : (3-5))									
CO1	1	Acquires	knowledg	e on Sta	ndardiza	ationof I	Hospital	Equipm	nent's				
CO2	(Gains kno	owledge o	n Clinic	al Engin	eering							
CO3	(Graduate	understan	ds Netw	orking								
CO4	(Gains kno	owledge o	n Fiber	Optic Se	ensors fo	or Measu	ring Ph	ysiologica	l Parame	ters		
CO5	1	Acquires	knowledg	e EMI a	ind EMC	C Applie	d to Hos	spital Ec	uipment's	5			
Mapping of C	Course	Outcome	es with Pr	ogram	Outcom	es (POs	5)				1	-	
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
<u>CO1</u>	H	M	L	M	L	M	H	L	M	H	L	1	<u> </u>
<u>CO2</u>	M		H	M		M	H	L	M	H		1	<u>1</u>
<u>CO3</u>		M	H		M	H		M	H	L			<u>d</u>
<u>CO4</u>	H	M	L	M	H		M	H		M	H		L
<u>CO5</u>	M	H	L	M	H	L	M	H		M	H		L
	P	501	DS(<u>ן</u> זי	PS	03	DS	504	PSO5				
$\frac{C03/1303}{C01}$	1	<u>зот</u> н		<u>J2</u> [I M			<u>р04</u> М	<u>1303</u> Н				
CO^2		M	H	ι <u> </u>			M		н				
CO2		T.	M	<u>ر</u> ا	I I	<u>ц</u> Ч	1	ν <u>ι</u> Γ.	M				
CO4		M	H	[1	. . [_	1	<u>и</u>	H				
CO5		H	M	[N	<u> </u>]	H	L				
H/M/L indicat	es Strei	ngth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low						
		Ĭ						ill					
			_					SI					
		es	cia					ical					
		enc	So		es		ы С	hn					
	S	Scie	pu	0	tiv	Se	ojec	Tec					
	nce	30	ss a	OIC	ilec	tiv	Pro	s / '					
	cie	erii	itie ss	n C	пH	llec	al /	hip	ills				
ory	ic S	ine	nan	grai	grai	in E	tic	Ins	Sk				
iteg	3as	gur	Hur Scie	rog	roį	Ope	rac	nte	ofi				
Ca					<u> </u>					1			
						•	•	• • • •				-	



BBI18E14 RECENT ADVANCES APPLIED TO HOSPITAL 3 0/0 0/0 3 ENGINEERING

UNIT I STANDARDISATION OF HOSPITAL EQUIPMENTS

Need for standardization -classification of equipment's -international standards -Experimental methods of testing standards -maintenance of standards and recalibration

UNIT II CLINICAL ENGINEERING

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

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

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

9

9

9

9

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 Jersery, 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. Bajbai, P.K., "Ceramic a novel device for sustained long term delivery of drugsBio 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: Subject Name :HOSPITAL MANAGEMENT P/RTY/ L Τ/ С **BBI18E15** LB/ S.Lr ETL **Prerequisite:** None Т 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) Understands need and scopes of clinical engineering **CO1 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) **PO1 PO2 PO4** PO5 **PO6 PO7 PO8 COs/POs PO3** PO9 **PO10 PO11 PO12 CO1** Μ Μ Η Μ Η Μ L L L Μ Η L **CO2** L L Μ Η L Μ Η Μ Η L Μ Η **CO3** Μ Η L Μ Н L Μ Η L Μ Η L **CO4** Η L Μ L Μ L Μ L Μ Μ Η Η **CO5** Н Μ Η Η L Μ L L Μ Η L Μ COs / PSOs PSO1 PSO₂ PSO3 PSO4 PSO5 **CO1** Μ Η L Μ Η **CO2** Μ Η L Μ Η **CO3** Η Μ L Η L **CO4** L L Μ Η Μ **CO5** Η Μ L Μ Η H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low nternships / Technical Skil Social **Engineering Sciences** Program Electives Practical / Project Humanities and **Open Electives Basic Sciences** Program Core Soft Skills Sciences Category



BBI18E15 HOSPITAL MANAGEMENT 3 0/0 0/0 3

UNIT I NEED AND SCOPES OF CLINICAL ENGINEERING

Clinical engineering program - educational responsibilities - role to be performed by them in hospital - staff structure in hospital

UNIT II NATIONAL HEALTH POLICIES

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

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

Computer application in ICU - X-Ray department - laboratory administration - patient data - medical records - communication - simulation

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

Total No of Periods: 45

9

9

9



	DE	PARIN	IENI OF	ELEC	IKICA	LAND	ELECI	KUNI	CS ENGI	NEEKIN	G		
Subject Code	: Su	bject Na	ame :SYS	TEM T	HEOR	Y APPL	LIED TO)	TY/	L	T /	P/ R	C
BBI18E16	BIO	OMEDI	CAL EN	GINEE	RING				LB/		S.Lr		
									ETL				
	Pr	erequisi	<u>te: BIO (</u>	<u>CONTR</u>	3	0/0	0/0	3					
L : Lecture T :	Tutoria	I SLr:	Supervis	ed Learr	iing P:	Project	R : Res	earch C	: Credits				
T/L/ETL : The	eory/Lat	/Embed	ded Theor	y and L	ab								
OBJECTIVE	:	~	~										
• To Le	arn abou	it Systen	n Concept										
• To Ga	in Knov	vledge o	n Transdu	cer Fund	ction								
• To Stu	idy aboi	it Imped	ance Con	cept									
To Lease	arn abou	it Period	ic Signals	, Feedba	ack								
To Ga	in Knov	vledge o	n Simulati	ion of B	iologica	l System	ıs						
COURSE OU	TCOM	ES (CO	s) : (3-5)									
<u>CO1</u>	U	Inderstar	nds Syster	n Conce	pt								
<u>CO2</u>	A	cquires	knowledg	e on Tra	ansducer	Functio	on						
CO3	C	aduate	understan	ds Impe	dance C	oncept							
<u>CO4</u>	Ŭ	Inderstar	nds Period	lic Signa	als, Feed	back							
<u>CO5</u>	S	imulatio	n of Biolo	ogical Sy	stems								
Mapping of C	Course (Jutcome	es with Pr	ogram	Outcom	es (POs	5)				1		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1	M	Μ	M	L	H	L	M	H	L	Μ	H		L
CO2	M	H	L	M	H	L	M	H	L	Μ	H		L
CO3	M	H	L	M	H	L	M	H	L	Μ	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	Μ	H		L
COs / PSOs	PS	501	PSC	52	PS	03	PS	504	PSO5				
<u>CO1</u>	1	M	H	[1		l	M	H				
<u>CO2</u>	1	M	H	<u> </u>			1	M	H				
<u>CO3</u>		H	M	[]]	H	L				
<u>CO4</u>		L	M	[I	H		L	M		_		
CO5		H	M N	[M	H				
H/M/L indicat	es Stren	gth of C	orrelation	H- Hi	gh, M- I	Medium	, L-Low	_					
								kil					
			al					al S					
		ces	oci					nica					
		len	Ň		/es		ct	chı					
	es	Sci	pur	ė	ctiv	'es	oje	Te					
	enc	gu	es se	Col	E G	ctiv	P_1	/ SC	s				
<u>></u>	Scie	eri	niti es	E U	m	Elec	al /	hip	dill				
Ciot	ic	ine	nar mc	gra	gra	n I	ctic	sms	t SI				
uteg	3as	Eng	Hur Scie	Pro	Pro	Jp€	Prac	nte	Sofi				
Ca	<u> </u>							I	9 1				
L		1		1	1	1	1			1	1		



BBI18E16SYSTEM THEORY APPLIED TO
BIOMEDICAL ENGINEERING30/00/03

UNIT I INTRODUCTION

System Concept -System Properties -Piece Wiser Linear Approximation -Electrical Analog for Compliance -Thermal Storage -Mechanical Systems -Step response of a Resistance/Compliant Systems - Pulse Response of First Order System

UNIT II TRANSFER FUNCTION

System as an Operator use of Transfer Function -bioengineering of a Coupled System -Example of Transformed Signals

UNIT III IMPEDANCE CONCEPT

Circuits for the Transfer Function with Impedance Concept Prediction of Performance.

UNIT IV PERIODIC SIGNALS, FEEDBACK

Sinusoidal Functions -Sinusoidal Analysis of Instrumentation System -Evaluation of Transfer Function s from Frequency Response -Relationship between Phase Lag and Time Delay Transient Response of an Undamped Second Order system - General Description of Natural Frequency Damping -Physical Significance of Under Damped Responses - Characterization of Physiological FeedbackSystem -Uses and Testing of System Stability

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS

Simulation of Skeletal music servomechanism -thermo Regulation -Cardiovascular control System - Respiration controls -Occulo Motor System -Endocrine control system and Modeling of receptors

Total No of Periods: 45

TEXT BOOKS:

- 1. William B. Blesser, "A System Approacg to Biomedicine", McGraw Hill Book Co., New York, 1969
- 2. ManfreoClynes and John H. Milsum, "Biomedical Engineering System", McGraw Hill and Co, New York, 1970

REFERENCE BOOKS:

- 1. Douglas S. Rigg, "Control Theory and Physiological Feedback Mechancis", The William and Wilkins Co., Baltimore, 1970
- RiechardSkalak and Shu Chien, "Handbook of Biomedical Engineering", McGraw Hill and Co., New York, 1987

9

9

9

9





DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING **Subject Code:** Subject Name :SPECIAL TRANSDUCERS AND TY/ L Τ/ **P**/**R** С **BBI18E17 INSTRUMENTATION** LB/ S.Lr ETL т 3 **Prerequisite:** 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 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 PO3 PO4 CO1** Μ Μ Μ L Η L Μ Η L Μ Η L L L L **CO2** Η Μ Η L Η Μ Η Μ Μ **CO3** Μ Η L Μ Н L Μ Η L Μ Η L L L L **CO4** Н Μ Μ L Μ Н Μ М Н **CO5** Η Μ Н Н Μ L Η L Μ L Μ L COs / PSOs PSO1 PSO₂ PSO3 PSO4 PSO5 **CO1** Μ Η L Μ Η **CO2** М Η L Μ Н **CO3** Н Μ L Η L **CO4** L Μ Η L Μ **CO5** Н L Μ Н Μ H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Social Internships / Technical **Engineering Sciences** Program Electives Practical / Project Humanities and **Dpen Electives Basic Sciences** Program Core Skill Soft Skills Sciences Category



BBI18E17	SPECIAL TRANSDUCERS AND INSTRUMENTATION	3	0/0	0/0	3
UNIT I	BASIC CONCEPTS OF MEASUREMENT				9

UNIT I BASIC CONCEPTS OF MEASUREMENT

Transducer Categories - Characteristics of Transducers Static and Dynamic Characteristics of Measurement

UNIT II FORCE, PRESSURE AND MOTION MEASUREMENT

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

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, AND **TEMPERATURE** 9 **RADIATION MEASUREMENT**

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-Various Thermal Sensors Including Integrated Circuit Thermal Sensors - Radiation Thermometry and Chemical Thermometry - Scintillation technique - Gas ionization type films

UNIT V DATA ACOUISITION RECORDING

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

9

9

9

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