

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING B.TECH-Electronics And Instrumentation And Engineering 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	Ty	1	0/0	2/0	2				
2	BMA18001	Mathematics - I	Ty	3	1/0	0/0	4				
3	BPH18001	Engineering Physics - I	Ty	2	0/1	0/0	3				
4	BCH18001	Engineering Chemistry - I	Ty	2	0/1	0/0	3				
5	BES18001	Basic Electrical and Electronics Engineering	Ty	2	0/1	0/0	3				
6	BES18002	Basic Mechanical and Civil Engineering	Ty	2	0/1	0/0	3				
		PRACTICALS*									
1	BES18L01	Basic Engineering Workshop	Lb	0	0/0	2/0	1				
2	BES18ET1	Orientation to Entrepreneurship and Project Lab	ETL	0	0/0	2/0	1				

**Credits Sub Total: 20** 

	II SEMESTER										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BMA18003	Mathematics – II	Ty	3	1/0	0/0	4				
2	BPH18002	Engineering Physics –II	Ty	2	0/1	0/0	3				
3	BCH18002	Engineering Chemistry – II	Ty	2	0/1	0/0	3				
4	BES18003	Environmental Science*	Ту	NO:	N CREI	OIT 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	C
1	BEI18001	Analytical Instruments	Ty	3	1/0	0/0	4
2	BEI18002	Circuit Theory	Ty	3	1/0	0/0	4
3	BEI18003	Electrical Machines	Ty	3	0/0	0/0	3
4	BEI18004	Industrial Instrumentation-I	Ty	3	0/0	0/0	3
5	BME18I03	Thermodynamics and Fluid Mechanics	Ty	3	0/0	0/0	3
		PRACTICALS*					
1	BEI18L01	Electrical Technology Lab	Lb	0	0/0	3/0	1
2	BEI18L02	Electric Circuits Lab	Lb	0	0/0	3/0	1
3	BME18IL2	Fluid Mechanics and IC Engine Lab	Lb	0	0/0	3/0	1

**Credits Sub Total: 20** 

	IV SEMESTER										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BMA18011	Numerical Methods for Electrical Engineers	Ty	3	1/0	0/0	4				
2	BEI18005	Transducer Engineering	Ty	3	1/0	0/0	4				
3	BEI18006	Digital Electronics	Ту	3	0/0	0/0	3				
4	BCS18I06	Introduction to OOPS with C++ and JAVA	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	BEI18ET1	Measurements and Instrumentation	ETL	1	0/1	3/0	3				
2	BEI18L03	Transducer Lab	Lb	0	0/0	3/0	1				
3	BEI18L04	Digital Design Lab	Lb	0	0/0	3/0	1				
4	BCS18IL6	OOPS Lab Using C++	Lb	0	0/0	3/0	1				
5	BEI18TS1	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 SEMESTER										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	С				
1	BEI18007	Industrial Instrumentation-II	Ту	3	1/0	0/0	4				
2	BEI18008	Control Engineering	Ту	3	0/0	0/0	3				
3	BXX18EXX	Elective I	Ty	3	0/0	0/0	3				
4	BXX18OEX	Open Elective I	Ту	3	0/0	0/0	3				
		PRACTICALS*									
1	BEI18ET2	Power Electronics	ETL	1	0/1	3/0	3				
2	BEI18L05	Microprocessor, Microcontroller and its Applications Lab	Lb	0	0/0	3/0	1				
3	BEI18L06	Industrial Instrumentation Lab	Lb	0	0/0	3/0	1				
4	BEE18L10	Microgrid Lab	Lb	0	0/0	3/0	1				
5	BEI18TS2	Technical Skill 2	Lb	0	0/0	3/0	1				

**Credits Sub Total: 20** 

	VI SEMESTER									
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C			
1	BEI18009	Computer Network and Distributed Control System	Ту	3	1/0	0/0	4			
2	BEI18010	Process Control	Ty	3	1/0	0/0	4			
3	BXX18EXX	Elective II	Ty	3	0/0	0/0	3			
4	BXX180EX	Open Elective	Ty	3	0/0	0/0	3			
		PRACTICALS*								
1	BEI18ET3	Virtual Instrumentation	ETL	1	0/1	3/0	3			
2	BEI18L07	Process Control Lab	Lb	0	0/0	3/0	1			
3	BEI18L08	Digital Control 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	BEI18L09	Mini Project/Inplant Training/Industrial Training	Lb	0	0/0	3/0	1			
6	BEI18TS3	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 SEMESTER					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C
1	BEI18011	Introduction to Biomedical Instrumentation	Ту	3	1/0	0/0	4
2	BXX18EXX	Elective III	Ту	3	0/0	0/0	3
3	BXX18EXX	Elective IV	Ty	3	0/0	0/0	3
4	BMG18002	Management Concepts and Organization Behavior	Ту	3	0/0	0/0	3
		PRACTICALS*					
1	BEI18ET4	Industrial Automation	ETL	1	0/1	3/0	3
2	BBI18L03	Biomedical Instrumentation Lab	Lb	0	0/0	3/0	1
3	BEI18L10	Embedded System Lab	Lb	0	0/0	3/0	1
4	BEI18L11	Project Phase – I	Lb	0	0/0	3/3	2
5	BHS18FLX	Foreign Language	Lb	0	0/0	3/0	1
6	BXX18OLX	Open Lab	Lb	0	0/0	3/0	1

Credits Sub Total: 22

	VIII SEMESTER										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BEI18012	Computer Control Process	Ty	3	1/0	0/0	4				
2	BEI18013	Power Plant Instrumentation	Ty	3	0/0	0/0	3				
3	BXX18EXX	Elective V	Ty	3	0/0	0/0	3				
	PRACTICALS*										
1	BEI18L12	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

#### **CREDIT SUMMARY**

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



	ELECTIVE -I										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BEI18E01	Fibre Optics and Laser Instruments	Ty	3	0/0	0/0	3				
2	BEI18E02	PC Based Instrumentation	Ty	3	0/0	0/0	3				
3	BEI18E03	Control System Design	Ty	3	0/0	0/0	3				
4	BEI18E04	Nano Technology	Ty	3	0/0	0/0	3				

	ELECTIVE -II										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BEI18E05	Embedded System	Ty	3	0/0	0/0	3				
2	BEI18E06	Systems Theory	Ту	3	0/0	0/0	3				
3	BEI18E07	System Identification and Adaptive control	Ty	3	0/0	0/0	3				
4	BEI18E08	Neural and Fuzzy Logic Control	Ty	3	0/0	0/0	3				

	ELECTIVE -III										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BEI18E09	Instrumentation in Petrol Chemical Industry	Ty	3	0/0	0/0	3				
2	BEI18E10	Intelligent Controllers	Ty	3	0/0	0/0	3				
3	BEI18E11	Advanced Process control	Ty	3	0/0	0/0	3				
4	BEI18E12	Artificial Intelligence and Expert Systems	Ty	3	0/0	0/0	3				

	ELECTIVE –IV										
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C				
1	BEI18E13	Digital Image Processing	Ty	3	0/0	0/0	3				
2	BEI18E14	Digital Instrumentation	Ty	3	0/0	0/0	3				
3	BEI18E15	Digital Control Systems	Ty	3	0/0	0/0	3				
4	BEI18E16	Principles of Robotics	Ty	3	0/0	0/0	3				

	ELECTIVE -V												
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ SLr	P/R	C						
1	BEI18E17	Modern Control Systems	Ty	3	0/0	0/0	3						
2	BEE18E03	Mechatronics	Ту	3	0/0	0/0	3						
3	BEI18E19	Instrumentation in Paper and Pulp Industries	Ty	3	0/0	0/0	3						
4	BEI18E20	Instrumentation in Iron and Steel Industries	Ty	3	0/0	0/0	3						

		OPEN ELECTIVE					
S.NO.	SUBJECT CODE	SUBJECT NAME	Ty/ Lb / ET L	L	T/ SLr	P/R	С
1	BEE18OE1	Electrical Safety for Engineers	Ty	3	0/0	0/0	3
2	BEE18OE2	Energy Conservation Techniques	Ty	3	0/0	0/0	3
3	BEE18OE3	Electric Vehicle Technology	Ty	3	0/0	0/0	3
4	BEE180E4	Biomedical Instrumentation	Ty	3	0/0	0/0	3
5	BEE18OE5	Introduction to Power Electronics	Ty	3	0/0	0/0	3
6	BEE18OE6	Industrial Instrumentation	Ty	3	0/0	0/0	3
7	BEE18OE7	Solar Energy Conversion System	Ty	3	0/0	0/0	3
8	BEE18OE8	Wind Energy Conversion System	Ty	3	0/0	0/0	3
9	BEE18OE9	Energy Storage Technology	Ty	3	0/0	0/0	3
		OPEN LAB					
1	BEE18OL1	Transducer Laboratory	Lb	0	0/0	3/0	1
2	BEE18OL2	PLC and SCADA Laboratory	Lb	0	0/0	3/0	1
3	BEE18OL3	Electrical Maintenance Laboratory	Lb	0	0/0	3/0	1
4	BEE18OL4	Power Electronics Laboratory	Lb	0	0/0	3/0	1
5	BEE18OL5	Bio Medical Instrumentation Laboratory	Lb	0	0/0	3/0	1

## DEPARTMENT OF ENGLISH

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

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

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

## **OBJECTIVES:**

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

# COURSE OUTCOMES (Cos): (3-5)

Students completing the course would be able to

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

## **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	0. 10	Program Electives	Open Electives	Practical / Project	Internship	Soft Skills

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

#### UNIT I VOCABULARYBUILDING

6

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

#### UNIT II BASIC WRITING SKILLS

6

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

#### UNIT III IDENTIFYING COMMON ERRORS IN WRITING

6

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

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

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

#### UNIT V ORAL COMMUNICATION AND INTERACTIVE LEARNING

6

(This unit involves interactive practice sessions in Language Lab)

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

Total No of Periods: 30

## **TEXT BOOK:**

Quest: A Textbook of Communication Skills, Vijay Nicole, 2017.

Pushkala, R. Padmasani Kannan S. Anuradha V. Chandrasena M Rajeswaran

### SUGGESTED READINGS:

- (i) Practical English Usage. Michael Swan. OUP. 1995.
- (ii) Remedial English Grammar. F.T. Wood. Macmillan. 2007
- (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
- (iv) Study Writing. Liz Hamp-Lyons and Ben 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



## **DEPARTMENT OF MATHEMATICS**

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

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

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

#### **OBJECTIVES:**

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

## **COURSE OUTCOMES (Cos): (3 – 5)**

Students completing the course were able to

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

## **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

2000	Category	Basic Sciences	Engg Sciences	Humaniti es & Social	Program core	Program Electives	Open Electives	Practical / Project	Internship s / Technical Skills	Soft Skills
		$\sqrt{}$								

BMA18001 MATHEMATICS – I 3 1/0 0/0 4

#### UNIT I ALGEBRA

12

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

#### UNIT II MATRICES

12

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

#### UNIT III TRIGONOMETRY

12

Expansions of Sin  $n\theta$ , Cos  $n\theta$  in powers of Sin $\theta$  and Cos $\theta$  – Expansion of Tan  $n\theta$  – Expansions of Sin $^n\theta$  and Cos $^n\theta$  in terms of Sines and Cosines of multiples of  $\theta$  – Hyperbolic functions – Separation into real and imaginary parts.

#### UNIT IV DIFFERENTIATION

12

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

## UNIT V FUNCTIONS OF SEVERAL VARIABLES

12

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

**Total No of Periods: 60** 

#### **TEXT BOOKS:**

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

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



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF PHYSICS

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

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

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

## **OBJECTIVES:**

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

## **COURSE OUTCOMES (Cos): (3 – 5)**

Students completing this course were able to

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

## **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	0.10	Program Electives	Open Electives	Practical / Project	Internship s / Technical Skills	Soft Skills
	V								



BPH18001 ENGINEERING PHYSICS - I 2 0/1 0/0. 3

#### UNIT I MECHANICS & PROPERTIES OF MATTER

9

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

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

#### UNIT II SHM AND ACOUSTICS

9

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

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

#### UNIT III WAVE OPTICS

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

## UNIT IV ELECTROMAGNETIC THEORY

9

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

UNIT V LASER 9

Laser principle and characteristics - amplification of light by population inversion - properties of laser beams: mono-chromaticity, coherence, directionality and brightness - different types of lasers - Ruby laser-Nd-YAG laser-He-Ne laser-CO $_2$  laser - semiconductor laser - applications of lasers in science, engineering and medicine.

**Total No of Periods: 45** 

## **TEXT BOOKS:**

- Brijlal, M. N. Avadhanulu& N. Subrahmanyam, Text Book of Optics, S. Chand Publications, 25<sup>th</sup> 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

- 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



#### DEPARTMENT OF CHEMISTRY

DETAILITER OF CHEMISTRY													
Subject Code:	Subject Name :ENGINEERING CHEMISTRY – I	Ty/	L	T/S	P/R	С							
BCH18001		Lb/		Lr									
		ETL											
	Prerequisite : None	Ту	2	0/1	0/0	3							
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits													
T/L/ETL: Theory / Lab / Embedded Theory and Lab													

## **OBJECTIVES:**

- Providing an insight into basic concepts of chemical thermodynamics.
- To create awareness about the water quality parameters, water analysis and softening of water from industrial perspective.
- Imparting fundamentals of emf, storage and fuel cells.
- Creating awareness about corrosion and its control methods.

• Int	Introducing modern materials such as composites along with basic concepts of polymer chemistry and plastics.														
COURSE	OUTCO	OMES (C	Cos): (1	<b>-5</b> )											
CO1		clear un				s of cher	nical	thermo	dyn	amics w	hich inclu	ide conce	epts such		
CO2		an overa			r quality	paramet	ers, B	oiler re	equii	ements,	problems	, Water	softening		
CO3	_	ing the b les of sto		_	e in elect	rical con	ductai	nce and	d em	ıf and al	so underst	tand the	chemical		
CO4		Observe the information about corrosion and understand the mechanisms of corrosion and the methods of corrosion control.  Articulate the science of polymers and composites													
CO5	Articulate the science of polymers and composites.														
	of Course Outcomes with Program Outcomes (POs)														
COs/PO	PO1	PO1   PO2   PO3   PO4   PO5   PO6   PO7   PO8   PO9   PO10   PO11   PO12													
CO1	Н	Н											M		
CO2	Н	Н	M	Н		Н	Н						M		
CO3	Н	M	Н				L						L		
CO4	Н		L	Н									L		
CO5	Н												M		
H/M/L inc	licates s	trength (	of corre	lation	H – Hig	h, M – N	<b>Iediu</b> i	n, L -	- Lo	W					
Category	Basic Sciences	Basic Sciences Engg Sciences Sciences Rumanitie s & Social Sciences Program core Program Electives Blectives Project Project Technical Skills Soft Skills													
	V														

# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BCH18001 ENGINEERING CHEMISTRY – I 2 0/1 0/0 3

#### UNIT I CHEMICAL THERMODYNAMICS

8

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

#### UNIT II TECHNOLOGY OF WATER

9

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

#### UNIT III ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES 10

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

#### UNIT IV CORROSION AND PROTECTIVE COATING

9

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

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

#### UNIT V POLYMERS AND COMPOSITES

C

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

**Total No of Periods: 45** 

## **TEXTBOOKS:**

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

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



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Name :BASIC ELECTRICAL AND

Subject Code:

Ty/ Lb/ L T/S P/R

BES18001	ac.		LECTRONICS ENGINEERING								Lr	17.			
		Prer	equisite	: None	e				Ty	2	0/1	0/	0 3		
L : Lecture T/L/ETL :							t R:	Researc	h C: Cred	its					
OBJECTI	VES:														
	Acq Gair Iden Dem OUTCO	Understand the concepts of circuit elements, circuit laws and coupled circuits.  Acquire knowledge on conventional &non conventional energy production.  Gain information on measurement of electrical parameters.  Identify basic theoretical principles behind the working of modern electronic gadgets.  Demonstrate digital electronic circuits and assemble simple devices.  DUTCOMES (Cos): (3 – 5)  Students understand Fundamental laws and theorems and their practical applications													
CO1															
CO2	Predict t	dict the behavior of different electric and magnetic Circuits.													
CO3		ntify conventional and Non-conventional Electrical power Generation, Transmission and cribution.													
CO4	Identify	entify & Apply schematic symbols and understand the working principles of electronic devices													
CO5	Analyze	basics o	of digital	electro	onics and	solving	probl	ems and	d design co	ombina	ational	circu	its		
Mapping of	of Course	Outcon	nes with	Progr	am Outo	omes (F	POs)								
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO'	7 PO	8 PO9	PO1	.0 P	O11	PO1	2	
CO1	Н	Н	Н	Н								M	L		
CO2	Н	Н	Н	M	M		M					M			
CO3	Н	M	H	M	Н		M		M				L		
CO4	Н	M		M			M					M	L		
CO5	Н	M	Н	M	Н				M			M	L		
H/M/L ind	licates str	ength o	h of correlation H – High,		n, M – N	<b>Iediu</b>	m, L –	Low		L					
Category	Basic Sciences	Engg Sciences	Humaniti	es & Social	Program core	Program Electives Open Electives		Practical / Project	Internship	Technical	STEP	Soft Skills			

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

#### UNIT I ELECTRIC CIRCUITS

g

Electrical Quantities – Ohms Law – Kirchhoff's Law – Series and Parallel Connections – Current Division and Voltage Division Rule - Source Transformation – Wye (Y) – Delta  $(\Delta)$  , Delta  $(\Delta)$  – Wye (Y) Transformation – Rectangular to Polar and Polar to Rectangular.

#### UNIT II MACHINES & MEASURING INSTRUMENTS

9

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

#### UNIT III BASICS OF POWER SYSTEM

9

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

#### UNIT IV ELECTRON DEVICES

9

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

#### UNIT V DIGITAL SYSTEM

9

Number System – Binary, Decimal, Octal, Hexadecimal – Binary Addition Subtraction, Multiplication & Division–Boolean Algebra – Reduction of Boolean Expressions – Logic Gates - De-Morgan's Theorem , Adder – 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 Halkias 1991, 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.



## DEPARMENT OF MECHANICAL ENGINEERING

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

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

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

#### **OBJECTIVES:**

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

# **COURSE OUTCOMES (Cos) : (3 – 5)**

Students completing the course were able to

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

## **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	Program core	Program Electives	Open Electives	Practical / Project	Internship s / Technical Skills	Soft Skills

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

#### UNIT I THERMAL ENGINEERING

Q

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

#### UNIT II MANUFACTURING PROCESS

13

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

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

#### UNIT III MECHANICS

9

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

## UNIT IV BUILDING MATERIALS AND CONSTRUCTION

7

<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

7

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

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

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

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



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Subject C BES18L		Subject	Name :	BASIC	ENGIN	EERIN	J WUKI	KSHOP		Lb/ ΓL	L	T/ SL	P/ R	С
BE319L	U1								E	LL		SL r	K	
												1		
		Prerequ	isite : N	one					L	b	0	0/0	2/0	1
L : Lectu			•		C	3	ct R:R	esearch	C: Credit	S				
T/L/ETL	: Theory	/ Lab / E	Embedde	d Theor	y and La	ab								
OBJEC	TIVES:													
	Familiari	•	_		_									
	Identify			_					ities.					
	Identify		•			es and so	oldering p	process						
	Display	•			•									
•	Execute	a project	independ	dently ar	nd make	a worki	ng model	l						
COURS	F OUTC	OMES	Cos) • (3	8 – 5)										
Students					)									
CO1	Demons	trate fitti	ng tools	and carp	entry to	ools, & F	Perform t	he proce	ss of Fili	ng, Chi	ppin	g, Cut	ing.	
CO2	Perform	the proc	ess of fa	brication	of trav	, cones a	nd funne	ls, Tee H	Halving C	ross, L	ap Jo	oint M	artise	<u>&amp;</u>
	Joints					,		,		,	Τ.			
CO3	Demons	trate vari	ous type	s of wir	ings and	d other ec	quipment	s.						
CO4	Measure	fundam	ental par	ameters	using th	ne electro	onic instr	uments						
Mapping	g of Cou	rse Outc	omes wit	th Progr	ram Ou	tcomes (	(POs)							
COs/PO	s PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	0	PO11	PC	)12
	1													
CO1	Н	Н	Н	M	M			L	M					L
CO2	Н		Н	L	M			L	L					
CO3	ш	<del>                                     </del>	M	T		+	+	Т	T					

CO2	п		п	L	IVI		L	L		
CO3	Н		M	L			L	L		
CO4	Н	Н	M	L			L	L		M
COS										

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	Program core	Program Electives	Open Electives	Practical /	Internship s / Technical Skills	Soft Skills
							√		

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

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

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

## **OBJECTIVES:**

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

COURSE OUTCOMES	(Cos)	):(	(3 - 5)	)
-----------------	-------	-----	---------	---

CO1	Develop a Business plan & improve ability to recognize business opportunity
CO2	Do a self analysis to build a entrepreneurial career.
CO3	Articulate an effective elevator pitch.
CO4	Analyze the local market environment & demonstrate the ability to find an attractive market
C05	Identify the required skills for entrepreneurship & develop

## **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	rogra ore	Program Electives	Open Electives	Practical / Project	Internship s / Technical	of Ki
							$\sqrt{}$		

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

#### UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR

3

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

#### UNIT II ENTREPRENEURIAL STYLE

3

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

#### UNIT III DESIGN THINKING

3

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

#### UNIT IV RISK MANAGEMENT

3

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

#### UNIT V PROJECT

3

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

**Total No of Periods: 15** 

#### **REFERENCE BOOKS & WEBSITE:**

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



## **DEPARTMENT OF MATHEMATICS**

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

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

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

## **OBJECTIVES:**

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

	Analyze the Basic concepts of Vector Calculus								
COUR	SE OUTCOMES (Cos): (3 – 5)								
CO1	Integrate given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation.								
CO2	Evaluate the multiple integrals / area /volume and to change the order of integration.								
CO3	Solve the ordinary differential equation and to solve Eulers differential equation.								
CO4	Find the equation of planes, lines and sphere and to find the shortest distance between to skew lines.								
CO5	Find the gradient, maximum directional derivative and work done by a force and to verify Green/ Stokes/ Gauss divergence theorem								
Mappii	Mapping of Course Outcomes with Program Outcomes (POs)								
GG /BG	DOL								

Mapping	or Course	Outcom	ics with	11051	ıııı Out	comes (1	(03)					
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н	Н			M	M			M	M		Н
CO2	Н	Н			M	Н			H	Н		M
CO3	Н	Н			M	Н			H	Н		M
CO4	Н	Н			L	M			M	Н		M
CO5	Н	Н			M	M			M	Н		M

H/M/L i	ndicates s	trength of	correlation	H – Hig	<u>h, M – N</u>	1edium, L –	Low		
Category	Basic Sciences	Engg Sciences	Humaniti es & Social	Program core	Program Electives	Open Electives	Practical / Project	Internship s /	Soft Skills
	$\sqrt{}$								

BMA18003 MATHEMATICS – II 3 1/0 0/0 4

## UNIT I INTEGRATION

12

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

#### UNIT II MULTIPLE INTEGRALS

12

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

#### UNIT III ORDINARY DIFFERENTIAL EQUATIONS

12

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

#### UNIT IV THREE DIMENSIONAL ANALYTICAL GEOMETRY

12

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

#### UNIT V VECTOR CALCULUS

12

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

Total No of Periods: 60

## **TEXTBOOKS:**

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

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



## **DEPARTMENT OF PHYSICS**

Subject	Subject Name : ENGINEERING PHYSICS -II	Ty /	L	T/	P/R	С
Code:		Lb/		SL		
BPH18002		ETL		r		
	Prerequisite : None	Ty	2	0/1	0/0	3

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

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

#### **OBJECTIVES:**

- Design, conduct experiment and analyze data.
- Develop a Scientific attitude at micro and nano scale of materials
- Understand the concepts of Modern Physics
- Apply the science of materials to Engineering & Technology

## **COURSE OUTCOMES (Cos): (3 – 5)**

#### Students completing the course were able to

CO1	Demonstrate skills necessary for conducting research related to content knowledge and
	laboratory skills.
CO2	Apply knowledge and concepts in advanced materials and devices.
CO3	Acquired Analytical, Mathematical skills for solving engineering problems.
CO4	Ability to design and conduct experiments as well as function in a multi disciplinary teams.
CO5	Generate analytical thought to interpret results & place them within a broader context

## **Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	PO1	PO2	PO3	PO	PO	PO	PO7	PO8	PO	PO1	PO1	PO1
				4	5	6			9	0	1	2
CO1	Н	Н	M	M	M	L				M		L
CO2	Н	Н		M	M							L
CO3	Н	Н	Н	Н	M					M		
CO4	Н	Н	Н	Н	M				Н	M		L
CO5	Н	M	M	M	M	L			M	M		L

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

Category	Basic Sciences Engg Sciences	Humaniti es & Social crises Program core	Program Electives Open Electives	Practical / Project	Internship s / Soft Skills
	√				

BPH18002 ENGINEERING PHYSICS - II 2 0/1 0/0 3

#### UNIT I OUANTUM PHYSICS

Q

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

#### UNIT II SEMICONDUCTORS

9

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

#### UNIT III LIGHT SEMICONDUCTOR INTERACTION

9

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

#### UNIT IV OPTO ELECTRONIC DEVICES

9

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

#### UNIT V ENGINEERED MATERIALS

9

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

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

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

- 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, 14<sup>th</sup> edition, S. Chand & Co, 2008
- 4. Pallab Bhattacharya, Semiconductor optoelectronic devices, second edition, Pearson Education, 2003
- 5. V Rajendran & A. Marikani, Materials Science, Tata McGraw- Hill, New Delhi, 2004



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF CHEMISTRY

Subject	Subject Name: ENGINEERING CHEMISTRY –	Ty / Lb/	L	T/SL	P/R	С
Code : BCH18002	п	ETL		r		
	Prerequisite : None	Ty	2	0/1	0/0	3

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

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

#### **OBJECTIVES:**

- Imparting the basic concepts of phase rule and apply the same to one and two component systems.
- Introducing the chemistry of engineering materials such as cement, lubricants, abrasives, refractories, alloys and nano materials.
- To impart a sound knowledge on the principles of chemistry involving different application-oriented topics
- Introducing salient features of fuels and combustion.

•	<ul> <li>To give an overview on modern analytical techniques</li> </ul>												
COUR	COURSE OUTCOMES (Cos): (1 – 5)												
CO1		Ur	Understand the science of phase equilibria and apply the phase rule to different systems.										
CO2		Ga	in an ove	erview of	f Engin	eering	Materia	als such a	as Lime	, Cement	, Lubric	ants, Al	orasives,
			fractories	•									
CO3			cognize										ips and
		De	etergents,a	Iso gaini	ng the I	basic ki	nowledg	ge about E	Explosive	es and Pr	opellants	S.	
CO4		Di	scover the	fuel Che	emistry	and Co	mbusti	on proces	s.				
CO5		Inf	ferring fev	v importa	ınt Ana	lytical '	Technic	ues and t	heir app	lications.			
Mappi	ng o	f Course	Outcome	es with P	rogran	n Outc	omes (l	POs)					
COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO12
											0	1	
CO1		Н											L
CO2		Н		Н			L	Н					L
CO3		Н					Н						L
CO4		Н	M	Н	Н			Н					M
CO5		Н				M							Н
H/M/L	ind	icates str	tes strength of correlation H – High, M – Medium, L – Low										
Category	Basic	Sciences	Engg Sciences Humaniti es & Social core Program Core Open Electives Project Internship s / Technical Skills Soft Skills										
		$\sqrt{}$											

#### BCH18002

#### **ENGINEERING CHEMISTRY – II**

2 0/1 0/0 3

#### UNIT I PHASE EQUILIBRIA

8

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

#### UNIT II MATERIAL CHEMISTRY

10

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

#### UNIT III APPLIED CHEMISTRY

9

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

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

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

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

## UNIT IV FUELS & COMBUSTION

9

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

#### UNIT V ANALYTICAL AND CHARACTERIZATION TECHNIQUES

9

Electron microscopes: Scanning electron microscope & Transmission electron microscope, instrumentation and applications Absorption and Emission Spectrum - Beer - Lambert's law. Visible and UV Spectroscopy - instrumentation - Block diagram - working. IR Spectroscopy - instrumentation - Block diagram - molecular vibrations - stretching and bending -  $H_2O$ ,  $CO_2$ . -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).
- 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).

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



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF ENGINEERING SCIENCES

Subject	Subje	ect Name	: ENVI	RON	MENTA	L SCI	ENCE	_	L	T/S	P/R	C
Code:	(Non-	- Credite	d)					Lb/		Lr		
BES18003		• • •	NT.					ETL				
	Prere	equisite :	None					Ty	-	-	-	-
L : Lecture	T : Tuto	rial SLr:	Supervi	ised Le	earning F	P : Proi	ect R :	Research	1 C: C1	redits		
T/L/ETL:			•		•	·						
OBJECTI	VES:											
<ul> <li>To</li> </ul>	acquire l	knowledg	e of the	Enviro	nment a	nd Eco	system	& Biodi	versity			
<ul> <li>To</li> </ul>	acquire l	knowledg	e of the	differe	nt types	of Env	ironme	ental pollu	ıtion			
<ul> <li>To</li> </ul>	know me	ore about	Natural	Resou	rces							
<ul> <li>To</li> </ul>	gain und	erstandin	g of soci	ial issu	es and the	he Env	ironme	nt				
<ul> <li>To</li> </ul>	attain fa	miliarity o	of humai	n popu	lation ar	nd Env	ironme	nt				
COURSE	OUTCO	MES (Co	os) : (3 -	- 5)								
Students co	mpleting	the cours	se were	able to								
CO1	To kr	own abou	ıt Enviro	onmen	t and Ec	osystei	n & Bi	odiversity	7			
CO2										Nucles	r Pollutio	ns and
CO2		To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest,										
		, and food	•		ia iaciii	ily tile	impo	italice of	matura	i icsou	ices like	101030
CO3		To discover water conservation and watershed management										
CO4										rmina	acid rain,	07006
CO4		depletion	_	iis aiiu	Concer	iis Ciiii	iate Cir	ange, gio	Dai wa	immig,	aciu iaiii,	OZOIIC
CO5				are nro	oramme	es and	role of	informati	on tech	nology	in humar	<u> </u>
COS		and envi	-	_	gramme	25 and	1010 01	momat	ion teen	mology	III IIuIIIai	L
Mapping o					om Out	oomoc	(DOc)					
COs/POs	PO1	PO2	PO3	PO	PO	PO	PO7	PO8	PO	PO1	PO1	PO1
005/105		102	1 00	4	5	6	10,		9	0	1	2
CO1						M	Н	M				M
CO2						M	Н			M		M
CO3						M	Н	M				M
CO4						M	H	M		M		M
CO5						M	H			M		M
H/M/L ind	licates st	rength of	correla	tion	H – Hig	h, M -	Mediu	ım, L – 1	Low			
			Se								/ S	
ory	es	es	nitie ial	S	Ħ	E E	Š	'es	al/	,	ship ical	Zills
Category	Basic Sciences	Engg Sciences	Humanities & Social	Sciences	Program core	Program		Open Electives	Practical Project		Internships Technical Skills	Soft Skills
Cai	Basic Science	Engg Scienc	Hu & \$	Sci	Prog core	Program Electives Cloen Cloen Electives Fractical Project Technica					Interns Techn Skills	Sof
			√									
		1					,					



#### **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).

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

#### DEPARTMENT OF ENGLISH

Subject Code:	Subject Name : COMMUNICATION LAB	Ty / Lb/ ETL	L	T/S Lr	P/R	С
BEN18ET1	Prerequisite : None	ETL	1	0/0	2/0	1

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

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

## **OBJECTIVES:**

The student should be able to

- Use appropriate vocabulary and structure for effective interpersonal and academic communication.
- Interpret charts, diagrams, advertisements, etc..
- Participate in group discussions and present projects effectively.
- Present projects and ideas effectively

• 1	Attend interviews
COURS	E OUTCOMES $(Cos):(3-5)$
Students	s completing the course were able to
CO1	Use appropriate vocabulary and structure for effective interpersonal and academic communication
CO2	Interpret charts, diagrams, advertisements, etc.
CO3	Participate in group discussions and present projects effectively
CO4	Present projects and ideas effectively
CO5	Attend interviews

# **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	¥ 5	Program Electives	Open Electives	Practical / Project	Internship s / Technical Skills	Soft Skills
			$\sqrt{}$						



BET18ET1	COMMUNICATION LAB	1	0/0	2/0	1
UNIT I					6
	formal and Formal Contexts				Ü
UNIT II Interpretation of charts / Da	iagrams – Group Discussion				6
UNIT III Compeering -Anchoring -C	Group Discussion				6
<b>UNIT IV</b> Formal Presentation -Powe	er point presentation of charts/ Diagrams				8
UNIT V Interview					4

### **SUGGESTED READINGS:**

RET18ET1

- (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 BES18	Subject Name : BASIC ENGINEERING GRAPHICS	Ty / Lb/ ETL	L	T/SL r	P/R	С
	Prerequisite : None	ETL	1	0/0	2/0	1

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

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

#### **OBJECTIVES:**

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

COURSE OUTCOMES (	Cos):	(3-5)
-------------------	-------	-------

## Students completing the course were able to

CO1	Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in
	Indian Standards
CO2	Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in
	engineering applications.

CO3 Identify basic sketching techniques of engineering equipments

CO4 Demonstrate the projections of Points, Lines, Planes and Solids.

CO5 Draw the sectional view of simple buildings and utilize Auto CAD Software.

#### **Mapping of Course Outcomes with Program Outcomes (POs)**

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

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

Category	Basic Sciences	Engg Sciences	Humaniti es & Social	Program core	Program Electives	Open Electives	Practical / Project	Internship s / Technical Skills	Soft Skills
							$\sqrt{}$		

BES18ET2

#### **BASIC ENGINEERING GRAPHICS**

1 0/0 2/0 2

#### **CONCEPTS AND CONVENTIONS (Not for examination)**

3

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

#### UNIT I PROJECTION OF POINTS, LINES AND PLANE SURFACES

6

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

## UNIT II PROJECTION OF SOLIDS

6

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

## UNIT III DEVELOPMMENT OF SURFACES AND ISOMETRIC PROJECTION 6

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

## UNIT IV ORTHOGRAPHICS PROJECTIONS

6

Orthographic projection of simple machine parts – missing views

#### **BUILDING DRAWING**

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

## UNIT V COMPUTER AIDED DRAFTING

3

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

**Total No of Periods:30** 

Note:First angle projection to be followed.

## **TEXT BOOKS:**

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

Subject C BES18L0		Subject	Name :	PHYS	ICAL		Ty / L ETL		L	T/S	L F	P/R		С
		SCIENCE LAB												
		Prerequ	iisite : N	one			Lb		0	0/0	)   2	2/0		1
		rial SLr : S Lab / Embe	•		•	Project R	: Resea	arch C	C: Cre	dits	l l		<u> </u>	
OBJECT	IVES:													
		e the abili	ity to m	nake pł	nysical	measuren	nents &	und	erstan	d th	e limi	ts of	pre	cision in
	easuremen				C		4		. <b></b> 1	ا محمد	1	.4		
		ability to m ners measu	•	•		•				_	icai sys	stems	i.	
	•	nd the anal		•		•		• •		•				
• To	familiari:	ze the conc	cepts of c	heminf	_									
		MES (Cos g the cour												
		the correc			ion in th	ne results (	of meas	ureme	nte					
				•										
		and comp	pare the	proper	ties of	variety o	of mech	ianical	, opt	ıcal,	electri	cal a	and e	electronic
	systems.													
CO3	Familiariz	ing the titra	ation me	thods us	sing con	ductomet	ry & po	tentio	netry					
CO4	Developin	g the Rese	arch spir	it throu	gh the k	nowledge	of Che	minfo	rmatio	es &	Analyt	ical s	kills.	
	_	Outcome			_			1				1		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PC	9	PO10	PC	)11	PO12
CO1	Н	Н	L	Н	Н									
CO2	Н	Н	M	Н	Н						M			
CO3	Н	Н	M	Н	Н				Н	[				
CO4	Н	Н	Н	Н	Н				Н	[		H		M
						) NA NA 1	<u> </u>	_					_	
H/M/L in	aicates sti	rength of c	correlation	on H-	- Hign,	M – Mea	ium, L	- Lo	<b>W</b>					
ıry	S	Se	niti			m es	es		al /		hip			
Category	Basic Sciences	Engg Sciences	Humaniti es &	Social Socianos Program	ا بو د	Program Electives	Open Electives		Practical Project		Internship s /	Technical	ft ills	
Ca	Sci	En	Humes &	No.	core	Pr. Ele	Op Ele		Pr: Pr:		Inte s/ Tec		Soft Skills	
	<u> </u>													



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BES18L02 INTEGRATED PHYSICAL SCIENCE LAB 0 0/0 2/0 1

#### LIST OF EXPERIMENTS

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



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF COMPUTER SCIENCE

Subject (		Subje	ct Name	e:C PI	ROGRAI	MMING	AND L	AB	Ty / Lb/	L	T/S Lr	P/R	C
BES18E'	13								ETL				
		Prere	quisite :	None					ETL	1	0/0	2/0	2
L : Lectu	re T : Tu	torial S	Lr : Sup	ervised	Learning	P : Proje	ct R:F	Researcl	h C: Cı	edits			
T/L/ETL	: Theory	/ Lab /	Embedd	ed Theo	ory and L	ab							
OBJECT	TIVES:												
• (	Outline th	ne basics	of C La	nguage.									
• A	apply fur	ndament	als in C	program	nming.								
• P	roduce a	and prese	ent activ	ities ass	ociated w	ith the co	ourse.						
COURS	E OUTC	COMES	(Cos):	(3-5)									
Students	completi	ng the c	ourse we	ere able	to								
CO1	Acquire	knowle	dge how	to writ	e and exe	cute c pro	ograms						
CO2	Underst	and the	fundame	ental exp	pression a	and staten	nents of	C Lang	guage.				
CO3	Work w	ith array	ys, funct	ions, po	inters, str	uctures, S	Strings a	and File	es in C.				
CO4	Identify	and pro	vide sol	utions fo	or engine	ering pro	blems in	ı C pro	grammi	ng			
Mapping													
COs/POs		PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	n	PO10	PO11	PO12
COS/FO	1	FU2	103	104	103	100	107	100	TO:		roiv	FOII	FOL
CO1	Н	Н			M	M		Н	N	I			Н
CO2	Н	M			Н	M		M	H	[			M
CO3	Н			Н		M		M	E	[			M
CO4	Н			M		M		Н	N	I I			M
H/M/L iı		strengt]	h of cor		H_Hi		Mediun						
11/141/12 11	luicates	June	01 (01)	Clation	11-111	Ign, IVI — I		II, II —	LUW	1		1	
Category	Basic Sciences	Engg	Humaniti	ial	Program core	Program Electives	u	Electives	Practical / Project	:	Internship s / Technical	13	ls
Cate	Basic Scienc	Engg	Hum	es & Social	Prog	Prog Elec	Open	Elec	Practica Project	,	Intel s / Tecl	Skills Soft	Skills
									$\sqrt{}$				

BES18ET3

### C PROGRAMMING AND LAB

1 0/0 2/0 2

#### UNIT I INTRODUCTION

6

Fundamentals, C Character set, Identifiers and Keywords, Data Types, Variables and Constants, Structure of a C Program, Executing a C Program.

### UNIT II EXPRESSION AND STATEMENT

6

Operators, Types-Complex and Imaginary, Looping Statement-For, While, Do, Break, continue, Decision Statement-If, If else, Nested if, Switching Statement, Conditional Operator.

# UNIT III ARRAYS AND FUNCTIONS

6

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

#### UNIT IV STRUCTURES AND POINTERS

6

Working with Structures -Introduction -Syntax of structures -Declaration and initialization -Declaration of structure variable -Accessing structure variables, Understanding Pointers -Introduction -Syntax of Pointer.

### UNIT V STRINGS AND FILE HANDLING

6

Strings -Syntax for declaring a string -Syntax for initializing a string -To read a string from keyboard, Files in C -File handling functions -Opening a File closing a file --example: fopen, fclose -Reading data from a File-Problem solving in C

**Total No of Periods: 30** 

- 1. www.spoken-tutorials.org
- 2. http://www.learn-c.org/

# **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.



CO3	Subject BEI1800			bject I STRU			LYTI(	CAL			TY / LB/	L	T / S.Lr	P/ R	C
L: Lecture T: Tutorial SUr: Supervised Learning P: Project R: Research C: Credits T/L/ETL: Theory/Lab/Embedded Theory and Lab  OBJECTIVE:  The capability to acquire knowledge on various techniques which occur in the various regions of the spectrum.  The capability to acquire knowledge on various methods of analysis which occur in the various regions of the spectrum.  To understand Industrial Gas Analyzers And Pollution Monitoring Instruments  To study important methods of analysis of industrial gases.  Understanding the important radio chemical methods of analysis.  COURSE OUTCOMES (COs): (3-5)  COI  The graduate gets knowledge on various methods of analysis which occur in the various regions of the spectrum  CO2  The graduate gets knowledge on various methods of analysis which occur in the various region of the spectrum  CO3  Understands Industrial Gas Analyzers And Pollution Monitoring Instruments  CO4  Students are capable of analysing important methods industrial gases analysis  CO5  Understands the important radio chemical methods of analysis.  Mapping of Course Outcomes with Program Outcomes (POs)  CO6  Understands the important radio chemical methods of analysis.  Mapping of Course Outcomes with Program Outcomes (POs)  CO7  CO8  PO1  PO2  PO3  PO4  PO5  PO6  PO8  PO9  PO10  PO11  PO11  PO11  CO2  H H H M M L H H H M M M H H L M M H H L M M M H H L M M CO4  H H M M M H H L M M H H L M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H L M M M H H H M M M H H M M M H H L M M M H H M M M H H M M M H H M M M H H M M M H H M M M M H H M M M M H H M			Pr	ereani	site: N	one						3	1/0	0/0	4
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BEI18001 ANALYTICAL INSTRUMENTS 3 1/0 0/0 4

#### UNIT I COLORIMETRY AND SPECTROPHOTOMETRY

12

Special methods of analysis – Beer-Lambert law – Colorimeters – UV-Vis – spectrophotometers – Single and double beam instruments – Sources and detectors – IR spectrophotometers – Types – Attenuated total reflectance flame – photometers – Atomic absorption spectrophotometers – Sources and detectors – FTIR spectrophotometers – Flame emission photometers.

# UNIT II CHROMATOGRAPHY

12

Different techniques – Gas chromatography – Detectors – Liquid chromatographs – Applications – High-pressure liquid chromatographs – Applications.

# UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS

12

Types of gas analyzers – Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

### UNIT IV PH METERS AND DISSOLVED COMPONENT ANALYZERS

12

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, biosensors, dissolved oxygen analyzer – Sodium analyzer – Silicon analyzer.

# UNIT V RADIO CHEMICAL AND MAGNETIC RESONANCE TECHNIQUES 12

 $Nuclear\ radiations-Detectors-GM\ counter-Proportional\ counter-Solid\ state\ detectors-Gamma\ cameras-X-ray\ spectroscopy-Detectors-Diffractometers-Absorption\ meters-Detectors.NMR-Basic\ principles-NMR\ spectrometer-Applications. Mass\ spectrometers-Different\ types-Applications$ 

**Total No of Periods: 60** 

### **TEXT BOOKS:**

- 1. R.S. Khandpur, 'Handbook of Analytical Instruments', Tata McGraw Hill publishing Co. Ltd., 2003.
- 2. H.H.Willard, L.L.Merritt, J.A.Dean, F.A.Settle, 'Instrumental methods of analysis', CBS publishing & distribution, 1995.

- 1. Robert D. Braun, 'Introduction to Instrumental Analysis', McGraw Hill, Singapore, 1987.
- 2. G.W.Ewing, 'Instrumental Methods of Analysis', McGraw Hill, 1992.
- 3. DA Skoog and D.M.West, 'Principles of Instrumental Analysis', Holt, Saunders Publishing, 1985.
- 4. C.K. Mann, T.J Vickers & W.H. Gullick, 'Instrumental Analysis', Harper and Row publishers, 1974



Subject Code: BEI18002	Subject Name: CIRCUIT THEORY	TY / LB/ ETL	L	T / S.Lr	P/ R	С
	Prerequisite: Basic Electrical and Electronics Engg	T	3	1/0	0/0	4

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

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

# **OBJECTIVE:**

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

COURSE OU	JTCOM	ES (	COs)	: (3-5)									
CO1	Unders	stands	basic	es of circ	uit ana	ılysis, 1	networl	k theor	ems, a	c circuits	and trans	sient ana	ılysis.
CO2	The gr	aduat	e will	be able	to anal	lysis co	mplex	circuit	s usin	g mesh cu	rrent and	d nodal	voltage
	method												
CO3	Ability	to ar	nalyze	comple	x circu	its usir	ng netw	ork the	eorem	S			
CO4	Unders	stands	the o	concept	of con	nplex f	requen	cy & f	ree an	nd forced 1	esponse	of RL,	RC &
	RLC c	ircuit	s.										
CO5									two n	etworks.			
Mapping of (							mes (P	POs)					_
COs/POs	PO1	PC		PO3	PO4	PO5	PO6	PO7	PO8		PO10	PO11	PO12
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CO2	M		H	H	L	M	M	H	H	L	L	H	M
CO3	M		I	H	L	M	M	H	H	L	M	H	M
CO4	H		I	M	M	H	H	L	H	H	M	L	L
CO5	H	I	I	M	M	H	H	M	H	L	M	H	L
COs / PSOs	PS	<b>SO1</b>		PSO	2	PS	O3	PS	SO4	PSO5			
CO1		H		L		I			L	M			
CO2		H		M		I	L	I	M	L			
CO3		H		M		N	<u>/I</u>		L	L			
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BEI18002 CIRCUIT THEORY 3 1/0 0/0 4

### UNIT I BASICS OF CIRCUIT ANALYSIS

12

Resistive elements - Ohm's Law Resistors in series and parallel circuits - Kirchhoff's laws - Mesh current and node voltage - methods of analysis.

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

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

# UNIT III TRANSIENT RESPONSE ANALYSIS

**12** 

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

### UNIT IV RESONANCE AND COUPLED CIRCUITS

12

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

# UNIT V THREE PHASE CIRCUIT

12

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

Total No of Periods: 60

# **TEXT BOOKS:**

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

- 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, New Delhi. 2017
- 4. M E Van Valkenburg, "Network Analysis, Prentice-Hall 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



TY/ L T/ P/ C

Subject Name : ELECTRICAL

**Subject Code:** 

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	Pr	erequi	site: N	one					T	3	0/0	0/0	3
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• Understanding the	cons	truction	n, wor	king, c	characte	eristics	and a	pplica	tions of	DC ge	eneratoi	rs &	DC
motors.													
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CO3	H	H	M	M	M	L	L	H	M	H	Н		L
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BEI18003 ELECTRICAL MACHINES 3 0/0 0/0 3

### UNIT I D.C. MACHINES

Q

Constructional details-EMF and Torque-Circuit model-Methods of Excitation- Characteristics of Generators- Characteristics of motors-Starting and speed control Methods-Testing and Efficiency-Losses in D.C machines-Applications.

#### UNIT II TRANSFORMER

9

Constructional details-Principle of operation-EMF equation-Equivalent circuit-Losses and efficiency-Voltage regulation-Auto transformers-Three phase transformers-Constructional details-Types of connections.

### UNIT III INDUCTION MOTORS

9

Constructional details-types-Principle of operation-Torque equation-Equivalent circuit-Characteristics-Performance calculations-Starting methods-Speed control methods.

# UNIT IV SYNCHRONOUS MACHINES

9

Construction of synchronous machines-Classification-Induced EMF equation-Voltage regulation-EMF method-Parallel operation-Synchronous motor-Principle of operation-Methods of starting-Hunting-Effect of change of excitation of a synchronous motor.

# UNIT V SINGLE PHASE INDUCTION MOTORS & MACHINES

9

Single phase induction motors-Construction & Principle of working-Types-Universal motor-Reluctance motor-Stepper motor-Two phase servo motor-Tachogenerator-Linear induction motor (Qualitative Treatment

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Mulukutla.S.Sarma, "Electric Machines, Stead state theory and dynamic Performance", 2nd Edition Thomson Learning 1997
- 2. S.K Bhattacharya, "Electrical Machines", 3rd Edition Tata McGraw Hill Publications 2008.

- 1. I.J. Nagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill Publications, Second Edition 1997.
- 2. Nasar S.A, "Electrical Machines & Power Systems", TMH Publications
- 3. Ian McKenzie Smith, "Hughes Electrical Technology", Revised Low price Edition, Pearson Education, Seventh edition.
- 4. Irving I.Kosow, "Electric Machinery and Transformers", PHI, Second Edition, 2001.



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CO3		M	Н		L	M	Н	M	H	L	Н	M	Н		L
CO4		M	M		Н	M	Н	M	H	L	L	M	M		H
CO5		L	L		Н	M	Н	M	Н	L	L	Н	M		H
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEI18004 INDUSTRIAL INSTRUMENTATION – I 3 0/0 0/0

3

# UNIT I MEASUREMENT OF FORCE, TORQUE AND VELOCITY

9

Electric balance – Different types of load cells – Magnets – Elastic load cells - Strain gauge load cell – Different methods of torque measurement – Strain gauge, relative regular twist – Speed measurement – Revolution counter – Capacitive tacho-drag cup type tacho – D.C and A.C tacho generators – Stroboscope.

# UNIT II MEASUREMENT OF ACCELERATION, VIBRATION, DENSITY AND VISCOSITY

)

Accelerometers – LVDT, piezoelectric, strain gauge and variable reluctance type accelerometers – Mechanical type vibration instruments – Seismic instrument as an accelerometer and vibrometer – Calibration of vibration pick-ups – Units of density, specific gravity and viscosity used in industries – Baume scale, API scale – Pressure head type densitometer – Float type densitometer – Ultrasonic densitometer – Bridge type gas densitometer – Viscosity terms – Saybolt viscometer – Rotameter type.

#### UNIT III PRESSURE MEASUREMENT

Q

Units of pressure - Manometers - Different types - Elastic type pressure gauges - Bourdon type bellows - Diaphragms - Electrical methods - Elastic elements with LVDT and strain gauges - Capacitive type pressure gauge - Piezo resistive pressure sensor - Resonator pressure sensor - Measurement of vacuum - McLeod gauge - Thermal conductivity gauges - Ionization gauge, cold cathode and hot cathode types - Testing and calibration of pressure gauges - Dead weight tester.

### UNIT IV TEMPERATURE MEASUREMENT

q

Definitions and standards – Primary and secondary fixed points – Calibration of thermometer, different types of filled in system thermometer – Sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement – Signal conditioning of industrial RTDs and their characteristics – Three lead and four lead RTDs.

# UNIT V THERMOCOUPLES AND PYROMETERS

9

Thermocouples – Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning of thermocouples output – Thermal block reference functions – Commercial circuits for cold junction compensation – Response of thermocouple – Special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement – Radiation fundamentals – Total radiation & selective radiation pyrometers – Optical pyrometer – Two colour radiation pyrometers.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. E.O. Doebelin, 'Measurement Systems Application and Design', Tata McGraw Hill publishing company, 2003.
- 2. R.K. Jain, 'Mechanical and Industrial Measurements', Khanna Publishers, New Delhi, 1999.

- 1. D. Patranabis, 'Principles of Industrial Instrumentation', Tata McGraw Hill Publishing Company Ltd, 1996.
- 2. A.K. Sawhney and P. Sawhney, 'A Course on Mechanical Measurements, Instrumentation and Control', DhanpathRai and Co, 2004.
- 3. B.C. Nakra & K.K.Chaudary, 'Instrumentation Measurement & Analysis', Tata McGraw Hill Publishing Ltd, 2004.
- 4. S.K. Singh, 'Industrial Instrumentation and Control', Tata McGraw Hill, 2003.
- 5. D.P. Eckman', Industrial Instrumentation', Wiley Eastern Ltd



Subject	Subject Name :	TY/	L	T /	P/R	C
Code: BME18I03	THERMODYNAMICS AND FLUID MECHANICS	LB/ ETL		S.Lr		
	Prerequisite: None	T	3	0/0	0/0	3

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

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

# **OBJECTIVE:**

- To understand the basic Laws of Thermodynamics and the working principle of IC Engines.
- To understand the design of Turbines and boilers.
- To understand the properties of Fluids and implementation of Hydraulic machinery & Pumps.
- To know the importance, application and inter relationship of various properties of fluid
- To study about various types of pumps and turbines

# **COURSE OUTCOMES (COs): (3-5)**

knowledge on the basic Laws of Thermodynamics and the working principle of IC Engines
Capable of selecting the suitable turbines and boilers depending upon the applications
Incorporating the knowledge gained in operating the Hydraulic machinery & Pumps
knowledge on properties of different fluids and its applications
Develop knowledge on the working of different types of pumps and turbines

# **Mapping of Course Outcomes with Program Outcomes (POs)**

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	Н	Н	Н	H	Н	H	L	M	Н	M	Н	Н
CO2	Н	Н	H	H	H	H	Н	H	Н	M	Н	M
CO3	H	H	H	H	H	H	L	H	Н	M	H	L
CO4	Н	H	H	H	H	H	L	L	Н	M	Н	L
CO5	Н	H	H	H	H	H	H	L	Н	H	Н	M
COs / PSOs	F	PSO1		PSO2	PS(	)3	PSO	4	PSO5			
CO1		M		M	H		M		H			
CO2		M		H	H	[	Н		Н			
CO3		M		M	M	[	M		M			
CO4		M		M	M	[	M		M			
CO5		H		H	Н		H		H			
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# H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skil	Soft Skills		
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BME18I03 THERMODYNAMICS AND FLUID MECHANICS 3 0/0 0/0 3

# UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS

Thermodynamics systems, Concepts of continuum, Thermodynamics properties, Equilibrium, Process, Cycle, Work, Heat, Temperature, Zeroth law of thermodynamics. First law of thermodynamics – Applications to closed and open systems – Steady flow Energy Equations – Simple Problems

# UNIT II SECOND LAW OF THERMODYNAMICS

Q

Statements, Reversibility, Causes of irreversibility, Carnot Cycle, Reversed Carnot Cycle, Heat Engines, Refrigerators, Heat Pumps - Clausius Inequality - Entropy - Principles of increase of entropy - Carnot theorem

# UNIT III POWER CYCLES

9

Air cycles – Assumptions - Otto, Diesel, Dual and Brayton cycle – Air standard efficiency – Mean effective pressure – Working of two stroke and Four Stroke Petrol and Diesel Engines

# UNIT IV FLUID MECHANICS

9

Fluid properties; fluid statics, manometer, control-volume analysis of mass, momentum and energy; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc

### UNIT V FLUID MACHINERY

Q

Introduction, types of pumps – reciprocating pump – centrifugal pump - construction details – working principles, Pelton wheel, Francis and Kaplan turbines – construction and working principles

**Total No of Periods: 45Hrs** 

### **TEXT BOOKS:**

- 1. Nag, P.K. Engineering Thermodynamics, 2<sup>nd</sup> Edn, Tata McGraw Hill Publishing Company Ltd.
- 2. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S.Chand and Co., India

- 1. Holman, J.P. (1995) Thermodynamics, McGraw Hill.
- 2. Yunus A. Cengel, Thermodynamics-An Engineering Approach. ,Tata McGraw Hill.
- 3. Bansal R.K., A Text Book of Fluid Mechanics and Hydraulic Machines, S.Chand and Co., India



<b>Subject Code:</b>	Subject Name : ELECTRICAL	TY/	L	T /	<b>P</b> /	C
BEI18L01	TECHNOLOGY LAB	LB/		S.Lr	R	
		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

# **OBJECTIVE:**

- Providing fair knowledge on the working of various electrical machines
- Understanding the construction, working, characteristics and applications of DC generators & DC
- The graduate will learn the construction, working, characteristics and testing of single phase transformers.
- Enabling the students to understand the principle of operation, construction and characteristics of 3 phase induction motor.
- To understand the construction and characteristics of single phase induction motor and some

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gen	erators	& DC											
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mot	or.												
Unc	lerstand	ds the	const	tructio	n and c	haracte	ristics	of singl	e phas	e inductio	n		
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Understands the construction and constrains of Course Outcomes with Program PO1 PO2 PO3 PO4 M H M L M H M L H M L H M L H M L H M L H M M L H M M L H M M M L H M M M M	Acquires fair knowledge on the working of The graduate understands the construction generators & DC motors.  The graduate will learn the construction transformers.  Understands the principle of operation, of motor.  Understands the construction and character of Course Outcomes with Program Outcomes with Program Outcomes with Program Outcomes M H M L H M H M L H M H M L H M M L H M M L H M M L H M M L H M M M L H M M M M	Acquires fair knowledge on the working of vario The graduate understands the construction, work generators & DC motors.  The graduate will learn the construction, work transformers.  Understands the principle of operation, constru- motor.  Understands the construction and characteristics of the construction and characteristi	Acquires fair knowledge on the working of various elector. The graduate understands the construction, working, generators & DC motors.  The graduate will learn the construction, working, characteristics of single transformers.  Understands the principle of operation, construction a motor.  Understands the construction and characteristics of single of Course Outcomes with Program Outcomes (POs)  PO1 PO2 PO3 PO4 PO5 PO6 PO7  M H M L H H H  M H M L H H L  H M M L H H H L  H M M L H H H L  H M M L H H H L  H M M L H H H L  H M M L H H H L  H M M L H H H L  OS PSO1 PSO2 PSO3 PSO3  H M M H H H H  M H H H H  M H H H H  M H H H H	E OUTCOMES (COs): (3-5)  Acquires fair knowledge on the working of various electrical in The graduate understands the construction, working, character generators & DC motors.  The graduate will learn the construction, working, character transformers.  Understands the principle of operation, construction and characteristics of single phases of Course Outcomes with Program Outcomes (POs)  PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8  M H M H M L H H H M  M H M L H H H L M  H H M L H H L M  H M L H H H L M  H M L H H H L M  OS PSO1 PSO2 PSO3 PSO4  H M M H M H H L  M H M H H H L  OS PSO1 PSO2 PSO3 PSO4  H M M H M H H L  M H M H H H M  M H H H M H H L  M H H M H H H M  M H H H M H H H M  M H H H M H H H M  M H H H M H H H M  M H H H H	Acquires fair knowledge on the working of various electrical machines The graduate understands the construction, working, characteristics a generators & DC motors.  The graduate will learn the construction, working, characteristics and transformers.  Understands the principle of operation, construction and characteristic motor.  Understands the construction and characteristics of single phase inductions; of Course Outcomes with Program Outcomes (POs)  PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 M H M L H H H M M M H H L H M M H H H H	Acquires fair knowledge on the working of various electrical machines  The graduate understands the construction, working, characteristics and appligenerators & DC motors.  The graduate will learn the construction, working, characteristics and testing transformers.  Understands the principle of operation, construction and characteristics of 3 pmotor.  Understands the construction and characteristics of single phase induction of Course Outcomes with Program Outcomes (POs)  PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10  M H M L H H H M M L  M H M L H H L M H M M L  H H M L H H L M H M M  H M L H H H L M H M  H M L H H H L M H M  H M L H H H M L H M H M  H M M L H H H L M H M  H M M L H H H L M H M  H M M L H H H L M H L  OS PSO1 PSO2 PSO3 PSO4 PSO5  H M M H M H H L L  M H M H H M M H H L  M H M H H M M H H L  M H M H H M M H H L  M H M H H M M H H L  M H M H H M M H H H M M M  L H H M M H H H M M M  H M H H M M H H H M M M  L H H M M H H H M M M  H M H H H M M H H H M M L  M H H M H H M M H H H M M L  M H H H M H H M M L  M H H H M M H H H M M L  M H H H M M H H H M M L  M H H H M M H H H M M L  M H H H M M H H H M M L  M H H H M M H H H M M L  M H H H M M H H H M M L  M H H H M M H H H M M L  M H H H H M M L  M H H H M M H H H M M L  M H H H H M M L  M H H H M M H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H M M L  M H H H H H H M M L  M H H H H H H M M L  M H H H H H H M M L  M H H H H H H M M L  M H H H H H H M M L  M H H H H H H H H M M L  M H H H H H H H H H M M L  M H H H H H H H H H H H H H H H H H H	Acquires fair knowledge on the working of various electrical machines  The graduate understands the construction, working, characteristics and applications generators & DC motors.  The graduate will learn the construction, working, characteristics and testing of single transformers.  Understands the principle of operation, construction and characteristics of 3 phase in motor.  Understands the construction and characteristics of single phase induction  (of Course Outcomes with Program Outcomes (POs)  PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11  M H M H M L H H H M M L H M H M L H H H M M L H M H M L H H L M H M L H H M M L H H H L M H M L H M M L H H H L M H M L H M M L H H H L M H M L H M M L H H H L M H M L H M M L H H H M L M H L H M M M L H H H L M H L M  OS PSO1 PSO2 PSO3 PSO4 PSO5  H M M H M H H M M L M H M H H M M L M H M H H M M L M H M H H M M L M H H M M H H H M M L M H H M M H H H M M L M H H M H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H M M H H H M M L M H H H H M M L M H H H M M H H H M M L M H H H H M M L M H H H M M H H H M M L M H H H M M M M M M M M M M M M M M M M

# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEI18L01 ELECTRICAL TECHNOLOGY LAB 0 0/0 3/0 1

### LIST OF EXPERIMENTS:

- 1. Verification of network theorems.
- 2. Determination of coupling coefficient.
- 3. Series and parallel resonance.
- 4. Power measurement in single phase
- 5. Power measurement in three phase circuits.
- 6. Open circuit characteristics of DC generators.
- 7. Load characteristic of DC motors.
- 8. Speed control of DC motors
- 9. Brake test of DC motors.
- 10. Regulation of three-phase alternator.
- 11. Open circuit and short circuits of transformer.
- 12. Brake test of induction motors.
- 13. V-curve of synchronous motor.

**Total No of Periods: 45** 



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

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

# **OBJECTIVE:**

- 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.

	_	oth digital techniques.  ign and implement the hardware of a voltage Regulator for AC inputs in hardware and												
									for AC i	nputs in	hardwar	e and		
De	esign a fil	ter circu	iit for A	ctive a	nd pass	sive cor	nponen	ts.						
COURSE														
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	using bo													
CO4				o Desig	gn and i	implem	ent the	hardwa	are of a vo	oltage Re	egulator	for AC		
CO5									d passive	compon	ents.			
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CO2	H	H M H M H M L H H L M H												
CO3	M	H	H	H	M	H	M	L	H	H	M	L		
CO4	M	H	H	M	L	H	M	L	H	H	M	M		
CO5	H	Н	M	M	M	L	M	M	H	H	M	L		
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PSOs		· •		-					-					
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CO4		<u>L</u>	I			<u>/I</u>		H	M					
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BEI18L02 ELECTRIC CIRCUITS LAB 0 0/0 3/0 1

### 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, Norton, 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.
- 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

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**Total No of Periods: 45** 



Subject Code: BME18IL2		F	ubject I LUID I AB		ANICS	S AND	IC E	NGINE	,	TY / LB/ ETL		T / S.Lr	P/ R	C	
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T/L/ETL: The	ory/Lab/E	Embedo	ded The	ory and	Lab										
<b>OBJECTIVE</b>	:														
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CC												instrume s pumps	ziits.		
		Gain knowledge on the concepts of timing diagrams for IC Engines													
	CO3 Gain knowledge on the concepts of timing diagrams for IC Engines  CO4 analyze the performance and testing of IC engines														
CC	)5			•				ng of R			and bo	oilers.			
Mapping of C	ourse Ou	tcome													
COs/POs		PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO	9 P	O10	PO11	PO1	2	
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CO3	H	H	H	M	M	H	M	L	H		M	H	L		
CO4	H	H	H	H	H	H	H	M	H		M	H	M		
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BME18IL2 FLUID MECHANICS AND IC ENGINE LABORATORY 0 0/0 3/0 1

# LIST OF EXPERIMENTS

### **FLUID MECHANICS**

- 1. Measurement of flow using Orificemeter.
- 2. Measurement of flow using Venturimeter.
- 3. Measurement of flow using flow through pipes.
- 4. Measurement of flow using Flow meter.
- 5. Performance test on Reciprocating pump.
- 6. Performance test on Centrifugal pump.

### **IC ENGINES**

- 7. Valve timing and port timing diagrams for IC Engines.
- 8. Performance test on a Petrol Engine.
- 9. Performance test on a Diesel Engine.
- 10. Heat Balance test on an IC Engine.
- 11. Boiler performance and Heat Balance Test.
- 12. Performance test on a Refrigerator (Determination of COP)

Total No of Periods: 45



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING | Subject Name: NUMERICAL METHODS FOR | TY / L | T /

Code:   BMA18011   Prerequisite: None	Subject		ubject Na	MT OF I						TY/	L	T/	<b>P</b> /	С
Prerequisite: None														
L : Lecture T : Tutorial   SLr : Supervised Learning P : Project R : Research C : Credits	BMA18011									ETL				
### Time												1/0	0/0	4
OBJECTIVE :  • To develop the ability in Numerical Skills  COURSE OUTCOMES (COs) : (3 - 5)  CO1							P: Pro	oject R	: Resea	arch C: Cr	edits			
• To develop the ability in Numerical Skills  COURSE OUTCOMES (COs) : (3-5)  CO1	T/L/ETL : Th	eory/	Lab/Emb	edded Th	eory an	d Lab								
• To develop the ability in Numerical Skills  COURSE OUTCOMES (COs) : (3-5)  CO1	ORIECTIVI	r •												
To understand the Basic concepts in Numerical Analysis			the abili	ty in Nun	nerical	Skills								
To understand the Basic concepts in System of Linear Equations	COURSE O	UTC	OMES (C	COs): (3	- 5)									
To understand the Basic concepts in Non Linear Equations	CO1													
To understand the Basic concepts in Interpolation	CO2		To under	stand the	Basic	concept	s in Sys	tem of	Linear	Equations	}			
To understand the Basic concepts in Numerical Differentiation and Integration	CO3		To under	stand the	Basic	concept	s in No	n Linea	r Equat	ions				
Mapping of Course Outcomes with Program Outcomes (POS)	CO4		To under	stand the	Basic	concept	s in Inte	erpolatio	on					
COs/POs	CO5		To under	stand the	Basic	concept	s in Nu	merical	Differe	entiation a	nd Integ	gration		
CO1		Cour	se Outcor			ım Out	comes	(POs)						
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CO3 M M L L L L CO5 M M L L L L H/M/L indicates Strength of Correlation  CO5 Strength of Correlation  R-High, M- Medium, L-Low														
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# BMA18011 NUMERICAL METHODS FOR ELECTRICAL 3 1/0 0/0 4 ENGINEERS

### UNIT I BASICS OF NUMERICAL METHODS

12

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

# UNIT II SYSTEM OF LINEAR EQUATIONS

12

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

### UNIT III NON LINEAR EQUATIONS

12

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

### UNIT IV INTERPOLATION

12

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

### UNIT V NUMERICAL DIFFERENTIATION AND INTEGRATION

12

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

**Total No of Periods: 60** 

### **TEXT BOOKS:**

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

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



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CO5			ads the operation, characteristics, applications of various types of transducers and the advantages and disadvantages of various types of transducers												
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CO3		Н	Н	Н	M	L	Н	M	L	Н	Н	M	_	H	
CO4		M	Н	Н	M	L	Н	M	L	Н	M	Н	]	L	
CO5		Н	Н	Н	M	L	Н	M	Н	M	L	Н	N	М	
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BEI18005 TRANSDUCER ENGINEERING 3 1/0 0/0 4

### UNIT I SCIENCE OF MEASUREMENT

12

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

### UNIT II CHARACTERISTICS OF TRANSDUCERS

12

Static characteristics – accuracy, precision, sensitivity, linearity etc. – mathematical model of transducers – zero, first-order and second-order transducers – response to Standard test signals

### UNIT III VARIABLE RESISTANCE TRANSDUCERS

12

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

# UNIT IV VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 12

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

# UNIT V OTHER TRANSDUCERS

12

 $\label{eq:piezoelectric} Piezoelectric \ transducer - magnetostrictive \ transducer - IC \ sensor - digital \ transducers - smart \ sensor - fiber \ optic \ transducers.$ 

**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

- 1. Doebelin, E.O., Measurement Systems, McGraw-Hill Book Co., 1998.
- 2. Neubert, H.K.P. Instrument Transducers, Clarenden Press, Oxford, 1988.
- 3. Patranabis, D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
- 4. Murthy, D.V.s., Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
- 5. Renganathan, S., Transducer Engineering, Allied Publishers, Chennai, 1999.



Subject Code:	Subject Name : DIGITAL ELECTRONICS	TY / LB/	L	T / S.Lr	P/ R	C
BEI18006	Prerequisite: Basics of Electrical and Electronics Engg.	T T	3	0/0	0/0	3

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

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

# **OBJECTIVE:**

- Understanding logic and analyzing the logical processes
- Familiarity to common forms of number representation in digital electronic circuits and to be able to convert between different representations
- Understanding the logical operation of simple arithmetic and other MSI circuits (Medium Scale Integrated Circuits)

U	npart the	,	ots of s	seauen	itial cii	rcuits e	enabling	them	to anal	lyze sequ	ential sy	stems ir	terms
	te machi	_		- 1				,		7			
COURSE OU	JTCOM	IES (CO	<b>Os</b> ):(	3- 5)									
CO1	The gr	aduate c	an tel	l the h	istory	and de	evelopm	ent of	digital	electronic	cs.		
CO2	Studer	nts can	descr	ibe aı	nd der	nonstr	ate the	use o	ligital	test equ	ipment	and its	operati
		teristics											
CO3		ne purp											
CO4							ogic fan	nilies li	ike RT	L, DTL,	TTL, EC	CL.	
CO5	Identif	y and de	escrib	e flip-f	flop cir	rcuits.							
Mapping of (	Course (	Outcom	es wit	h Pro	gram	Outco	mes (P	Os)					
COs/POs	PO1	PO2	PO			PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	L	N		H	L	H	L	M	M	H	M	L
CO2	M	Н	L		H	H	M	M	L	H	M	H	M
CO3	M												
CO4	H												
CO5	M	M H M H H H M H M H L											
COs / PSOs	P	SO1		PSO	2	PS	SO3	PS	O4	PSO5			
CO1		H		M			M		L	H			
CO2		H		M			M	N	M	Н			
CO3		H		M		]	H	N	М	Н			
CO4		H		Н		N	М	N	M	L			
CO5		M		L			H		М	M			
H/M/L indica	ates Str	ength of	Corr	elatio	n H-	High,	, M- M	edium,		w	1	1	
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108		Basic Sciences	gin	Humanities and Sciences	Program Core	Program Electives	Open Electives	Practical / Project	ern	Soft Skills			
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BEI18006 DIGITAL ELECTRONICS 3 0/0 0/0 3

#### UNIT I NUMBER SYSTEMS

9

Review of binary, octal and hexadecimal number systems – Conversions; Binary Arithmetic – signed magnitude form – 1's, 2's Complement representation. Codes: - BCD, Excess-3, Grey codes, ASCII Codes, Error detecting codes (Hamming code)-Applications of Error Detecting Codes.

### UNIT II BOOLEAN ALGEBRA

9

Boolean algebra – De Morgan's law - Simplifications of Boolean expression – Sum of products and product of sums – KarnaughMap(upto 5 variables) – Quince McClusky method of simplification (Including Don't care conditions)

### UNIT III COMBINATIONAL LOGIC

9

Logic gates – AND, OR, NOT, NOR, NAND and EX-OR – combinational logic- Arithmetic circuits – Half adder – Full adder, Half Subtractor - Decimal Adder – Excess 3 adder – Code converters – Multiplexer – Demultiplexer- Encoder – decoder – Design of general combinational logic circuit. PAL, PLA and FPGA.

# UNIT IV SEQUENTIAL LOGIC DESIGN

9

Building blocks of sequential logic-RS, JK, Master-Slave, D and T flip-flop, Asynchronous and synchronous counters - Binary and BCD counters - Shift registers –Basic models of sequential machines – concept of state diagram - State table – State reduction - Design and implementation of synchronous sequential circuits

# UNIT V LOGIC FAMILIES

9

Characteristics of RTL, DTL, TTL, families – Schottky, clamped TTL, ECL, IIL – MOS Inverters – complementary MOS inverters .IC based Full adder ,IC based Magnitude Comparator.

**Total No of Periods: 45** 

### **TEXT BOOKS:**

- 1. Charles H. Roth, "Fundamentals of Logic Design", Thompson Learning ,5th Edition.
- 2. John. M. Yarbrough, "Digital Logic: Application and design", Thomson Learning

- 1. FLOYD:" Digital Fundamentals",10th Edition Universal Book Stall, New Delhi.1993.
- 2. Morris Mano, "Digital Electronics and Design", Prentice Hall of India, 2000.
- 3. Albert Paul, Malvino and Donald P Leach: "Digital Principles and Applications" Tata McGraw Hill publications.



Subject Code:	Subject Name : INTRODUCTION TO OOPS WITH C++ AND JAVA	TY / LB/	L	T / S.Lr	P/ R	С
DCC10106		ETL				
BCS18I06	Prerequisite: None	T	3	0/0	0/0	3

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

# **OBJECTIVE:**

- To be able to distinguish OOPS features with procedural Oriented and
- To Analyze OOPS features to a real world object,
- To analyze generic data type for the data type independent programming which relate it to reusability.
- To understand the concepts of Java programs
- To develop basic networking programs using Java.

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COURSE OU	JTCOM	IES (C	Os):(	3-5)										
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	these f												-	
CO2	Analyz	ze OO	PS feat	ures to	a real	world	object,							
CO3	Unders	stands	the ana	alysis c	of gene	eric dat	a type	for the	data	type inde	pendent	prograi	mming	
	which	relate i	t to reu	ısabilit	y.									
CO4	Unders	stands 1	the con	cepts o	of Java	progra	ıms							
CO5	Develo	ps bas	ic netw	orking	gprogra	ams us	ing Jav	'a						
Mapping of (	Course (													
COs/POs		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	
CO1		H	M	H	L	M	H	H	L	H	H	M	H H	
CO2		L         M         H         M         H         L         L         M         H           M         H         H         M         L         H         M         H         L         H         L												
CO3													H	
													M	
COS		L	H	H	M	H	M	H	L	H	M	H	M	
COs / PSOs		DC	<u> </u>	PC	<b>O2</b>	PS	O3	PS	O4	PSO5				
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CO1 CO2 CO3 CO4 CO5		I I N H	H M H	N H I H	M H L H M	I N I	H M H M	N N N	M M M M	L H H L M				
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# BCS18I06 DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING INTRODUCTION TO OOPS WITH C++ AND 3 0/0 0/0 3 JAVA

### UNIT I BASICS OF OOPS

9

Programming methodologies -Object Oriented concepts-Definition-Data members-Function members-Access specifiers-Constructors-Default constructors-Copy constructors-Destructors-Static members-Control statements, Basics of C++environment.

### UNIT II INHERITANCE AND POLYMORPHISM

9

Overloading operators-Functions-Friends-Class derivation-Virtual functions-Abstract base classes-Multiple inheritance.

# UNIT III TEMPLATES

9

Class templates-Function templates-Exception handling-Streams.

### UNIT IV JAVA PROGRAMMING

0

Java environment-Classes-Definition-Fields-Methods-Object creation-Constructors-Overloading methods-Static members-This keyword-Nested classes-Extending classes.

# UNIT V INHERITANCE AND EXCEPTION

9

Inheritance-member accessibility-Overriding methods-Abstract classes-Interfaces. Exceptions And Threads: Exception and errors -Exception classes - Runtime Exception - Uncompact Exception - Finally block - User defined Exceptions. Creating Threads -Controlling Threads

**Total No of Periods: 45** 

### **TEXT BOOKS:**

- 1. Stanley B.Lippman, "The C++ Primer" Addison Wesley, 5/e, 2012.
- 2. H.Schildt, Java 2: The Complete Reference, 6/e, Tata McGraw Hill-2008

- 1. Deitel and Deitel, "C++ How to Program" Prentice Hall, 8/e, 2011
- 2. Programming in java –E.Balagurusamy-Tata McGraw Hill, 4/e, 2009
- 3. Ken Arnold and James Gosling, "The Java Programming Language", Pearson Education, 3/e, Reprint 2009.
- 4. B.Stroustrup,"The C++ Programming Language", 3/e, Pearson Education, 2004.
- 5. E.Balagurusamy "Object Oriented Programming with C++"- 4/e. "Tata Mcgraw Hill", 2008.



Subject Code:			Subject 1		CONST	TITUTIO	ON	Ty/ Lb/		T/ S.Lr	P/R	C		
BHS18NC1								ETI						
			Prerequi	site: NI	L			Ty	2	0/0	0/0	NC		
L : Lecture T	: Tutor	ial S.I	r : Super	vised L	earning	P : Proje	ect R : R	esear	ch C:	Credits				
T/L/ETL: Th	neory/La	ab/Emb	edded Th	eory an	d Lab									
OBJECTIVI	ES:													
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CO1	To pro	vide an	overview	of the	history	of the ma	aking of	India	ın Con	stitutio	1			
CO2	To und	erstand	the prear	nble an	d the ba	sic struc	tures of	the C	onstitu	ution.				
CO3	To Kno	ow the f	fundamen	tal righ	ts. dutie	s and the	directiv	e pri	nciple	s of stat	e policy			
		now the fundamental rights, duties and the directive principles of state policy  The Outcomes with Program Outcomes (POs)												
Mapping of	Course	Outco	omes with Program Outcomes (POs)											
CO /DO	DO1	DO2	DO2	DO 4	DO 5	DO.	DO5	<b>D</b> O0	DOO	DO10	DO11	DO12		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1						Н	L	L	L	L				
CO2						H	L	L	L	L				
CO2						H	L	L	M	L				
COs / PSOs	PSO	11	PSO	<u> </u>	PSO		L	L	IVI	L				
COS/PSOS	PSU	1	PSU	<b>4</b>	PSU	3								
CO1	L		L		M									
CO2	L		L		M									
CO3	L		L		M									
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BHS18NC1 THE INDIAN CONSTITUTION Ty 2 0/0 0/0 NC

UNIT I 3Hrs

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

UNIT II 3Hrs

Fundamental Rights and Duties, Directive Principles of State Policy

UNIT III 3Hrs

Legislature, Executive and Judiciary

UNIT IV 3Hrs

**Emergency Powers** 

UNIT V 3Hrs

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

**Total Hours: 15** 

# **TEXT BOOKS:**

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

- 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: BHS18NC2		7	THE I	t Name : <b>NDIAN</b> VLEDG	TR	ADITIO	ONAL		Ty/ Lb/ ETL	L	T/ S.Lr	P/R	С
		F	Prerequ	uisite: NI	IL				Ty	2	0/0	0/0	NC
L : Lecture T : T/L/ETL : The							Project	tR:R	esearc	h C: C	Credits	I	
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COs/POs	PO1	PO2	PO3	PO4	ļ	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		Н	Н	L			M				M		L
CO2		Н	Н	L			M				M		L
CO2		Н	Н	L			M				M		L
COs / PSOs	PSO1			PSO2	2	PSO	3						
CO1	L			L		M							
CO2	L			L		M							
CO3	L			L		M							
H/M/L indica	tes Stren	gth o	f Cor	relation	H-	High, N	M- Med	dium,	L-Lov	w			
Category	Basic Sciences	Engg Sciences		Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			

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

UNIT I 3Hrs

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

Knowledge System

UNIT II 3Hrs

Traditional Medicine, Traditional Production and Construction Technology

UNIT III 3Hrs

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

UNIT IV 3Hrs

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

UNIT V 3Hrs

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

**Total Hours: 15** 

# **TEXT BOOKS:**

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



# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING de: Subject Name : MEASUREMENTS AND TV / I T

Subject Code: BEI18ET1			Name : IMENT			MENT	S ANI	)	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	Pr	erequi	isite: N	one					ETL	1	0/1	3/0	3
L : Lecture T : Tutoria	al SL	л : Sup	ervised	Learn		: Projec	et R:I	Resear	ch C: Cre	edits			
T/L/ETL : Theory/La	b/Emb	edded '	Theory	and La	ab								
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• Introducti					•		. 14		14		. 4	4.	
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CO2	Н	Н	M	Н	M	Н	Н	L	Н	M	Н	_	L
CO3	M	Н	L	M	Н	M	L	M	Н	M	Н	]	L
CO4	H	M	L	M	H	M	L	Н	Н	H	M	I	M
CO5	L	H	M	H	H	M	L	H	H	H	L	I	M
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Category	Basic Sciences	Engineering Sciences	Humanities and Social Scie	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
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BEI18ET1 MEASUREMENTS AND INSTRUMENTATION 1 0/1 3/0 3

### UNIT I INTRODUCTION

9

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

### UNIT II RESISTANCE. INDUCTANCE & CAPACITANCE MEASUREMENTS

9

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

# UNIT III WATT METER AND ENERGY METER CALIBRATION

9

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

#### UNIT IV ANALOG & DIGITAL INSTRUMENTS

Q

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

# UNIT V DIGITAL DISPLAY AND RECORDING DEVICES

9

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

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Rangan C.S. "Instrumentation Devices and Systems", Tata McGraw Hill, 1998.
- 2. Cooper, "Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 1988.
- 3. A. K. Shawney "Electronics and Electrical Instrumentation" Tata McGraw Hill, 1975.

- 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: BEI18L03			bject	Nam	e:TR	ANSD	UCER	LAB	3	TY / LB/ ETL	L	T / S.Lr	P/ R	C
	erequ	requisite: Transducer Engineering						L	0	0/0	3/0	1		
L: Lecture T						_	: Proje	ct R:	Resea	rch C: Cre	dits			
T/L/ETL : Th		o/Embed	lded T	Theory	and L	ab								
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	alibrate v													
COURSE O														
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			n mai	ocuro l	Docietiz	o Cor	aggitive	and Ir	ductiv	zo tronedu	ore			
CO5	The graduate can measure Resistive, Capacitive and Inductive transducers  Graduate can calibrate various transducers													
Mapping of								Og)						
COs/POs	PO1	PO2	PC		PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO1	1 P(	012
CO1	H	L		M I	H	Н	M	M	L	H	M		_	M
CO2	H	H		H	H	M	M	L	L	M	Н			L
CO3	H	M	_	vI	M	M	L	M	M	H	Н			L
CO4	M	Н		H	M	Н	M	Н	Н	Н	M			M
CO5	Н	Н	I	I	M	L	M	L	M	Н	Н	M		L
COs / PSOs	os PSO1			PSO2		PSO3		PSO4		PSO5				
CO1		M		M		Н		Н		L				
CO2	Н			H		Н		M		M				
CO3	M			Н			H		M	L				
CO4	Н			Н			M		H	L				
CO5		M		M		I	L	Н						
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Category		Basic Sciences	Engineering Sciences	Humanities and Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				

BEI18L03 TRANSDUCER LAB 0 0/0 3/0 1

### LIST OF EXPERIMENTS

- 1. Displacement versus output voltage characteristics of a Potentiometric transducer.
- 2. Strain gauge characteristics.
- 3. Load cell characteristics.
- 4. Photoelectric tachometer.
- 5. Hall Effect transducer.
- 6. Characteristics of LVDT.
- 7. Characteristic of LDR, Thermistor and thermocouple.
- 8. Ramp response characteristic of filled in system thermometer.
- 9. Step response characteristic of RTD and thermocouple.
- 10. Flapper nozzle system.
- 11. P/I and I/P converters.
- 12. Study of smart transducers

**Total No of Periods: 45** 



Subject Code: BEI18L04 Pro			Subject Name: DIGITAL DESIGN LAB									T / S.Lı	P/	R	C
		requisite:		L	0	0/0	3/0	)	1						
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COURS	SE OUT	COME	<b>S</b> ( <b>COs</b> ) :	(3-5)											
CO1	Un	derstand	the basic	concepts	of logic g	gates									
CO2		familiarization to the Design and implementation of Boolean Function													
CO3		Understand about Counters, Registers using flip-flops													
CO4		Understand the concepts in programming of verilog HDL													
CO5			understan					exers							
			tcomes w					_	-						
COs/P	PO1	PO2	PO3	PO4	PO5	PO	PO7	PO	<b>O8</b>	PO9	PO		PO1	PC	
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CO2	M	M	M	M	M	M	M	]		M	N		M	L	
CO3	Н	H	H	M	M	M	M	1		M	N		M	L	
CO4	H	Н	M	M	M	M	M	1		M	N		M	L	
CO5	M	M	M	M	M	M	M	I	Ĺ	M	N	1	M	L	,
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BEI18L04 DIGITAL DESIGN LAB 0 0/0 3/0 1

# LIST OF EXPERIMENTS

- 1. Study of Logic Gates & Digital Logic families
- 2. Implementation of Boolean functions
- 3. Adders & Subtractors
- 4. Multiplexers and De-multiplexers
- 5. Study of Flip-flops
- 6. Study of Registers
- 7. Study of Counters
- 8. Implementation of any general combinational / sequential logic circuits
- 9. Encoder and Decoder
- 10. 1's Complement and 2's Complement
- 11. Magnitude Comparator
- 12. Code Converter

**Total No of Periods: 45** 



Subject Code: BCS18IL6	Subject Name : OOPS LAB USING C++	TY / LB/ ETL	L	T / S.Lr	P/ R	С
	Prerequisite: None	L	0	0/0	3/0	1

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

#### **OBJECTIVE:**

- To be able to understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism
- To solve various computing problems using C++ language.

	<ul> <li>To solve various computing problems using C++ language.</li> <li>To be able to create a program that measures or simulates performance and use it</li> </ul>															
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•				iii abie to	learn	object-	oriented	ı progra	am desi	gn into th	ie class a	na tempi	ate			
COLIDGE		odel o		70 ) (/	2 5											
COURSE																
CO1										s like inh						
										problems	s using C	++ langu	iage.			
CO2	То	solve	various	comput	ing prol	blems u	ising C	++ lang	uage							
CO3	Stı	ıdents	will be	able to c	reate a	prograi	n that r	neasure	s or sir	nulates pe	erforman	ce and us	se it			
CO4	An	Analyze the behavior of the performance of the program  The graduates can map an object-oriented program design into the class and template model of														
CO5	The graduates can map an object-oriented program design into the class and template model of C++.															
		C++.														
Manning																
COs/POs																
CO1																
CO2		M         M         H         H         M         M         L         H         H         M         M           M         H         H         M         M         L         H         M         H         L         H         M														
CO3		H	H	H	M	M	L	M	H	M	L	H	M			
CO4		M	M	H	M	H	M	H	H	M	L	H	M			
CO5	+	H	M	H	L	L	M	H	M	L	H	M	H			
CO3		11	171	11	L	L	141	11	171	<u> </u>	11	171	11			
COs /		PS	Ω1	PSC	)2	PS	O3	PS	O4	PSO5						
PSOs		10	<b>01</b>	150	<i>_</i>		00			1500						
CO1		N	1	M	[	I	I	]	H	L						
CO2		F		Н			<u> </u>		M	L						
CO3		N		Н			I		M	M						
CO4		F		Н			<u>Л</u>		vI	M						
CO5		I		L			<u>Л</u>		L	Н						
H/M/L in	dica	tes St	rength	of Corre	elation	H- H	igh, M	- Medi	um, L-	Low	I.					
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BCS18IL6 OOPS LAB USING C++ 0 0/0 3/0 1

#### LIST OF EXPERIMENTS

- ➤ To implement the following list of programs.
- 1. Write a C++ program for Simple Interest and adding two numbers
- 2. Write a C++ program for Control Structure.
- 3. Write a C++ program for Inline Function.
- 4. Write a C++ program for Function Overloading.
- 5. Using Class concept write a C++ program for Constructor and Destructor.
- 6. Using Class concept write a C++ program for Overloading Unary Operator, Binary operator.
- 7. Using Class concept write a C++ program for Single Inheritance.
- 8. Using Class concept write a C++ program for Multiple Inheritance.
- 9. Using Class concept write a C++ program for Multilevel Inheritance.

#### **USING JAVA**

- 1. Write a JAVA program Find the length of array.
- 2. Write a JAVA program to Prime number checking and sum of digit
- 3. Write a program for example of try and catch block. In this check whether the given array size is negative or not.
- 4. Write the programs using the concept of Generic class, Inheritance, Interface and Package
- 5. Write a program to create a file and write data into it using the methods Output Stream class.
- 6. Write a program that uses the concept of Applet and Exception Handling
- 7. Write a program to give example for multiple inheritance in Java
- 8. Write an application to simulate traffic lights and calculator using GridbagLayout
- 9. Write the program which creates the Frame and implements MouseListener

Total No of Periods: 45



Subject Code BEI18TS1				lame :		TILL 1			TY LI ET	3/ L	L	T / S.L r	P/ R	C		
		Prer	equi	site:No	ne						L	, (	0	0/0	3/0	1
L : Lecture T :	Tutori	al S	Lr:	Supervi	ised Le	arning	P : Pro	ject R	Rese	arch	C: Cre	edits				
T/L/ETL: The	eory/La	b/Em	bedd	ed The	ory and	l Lab										
OBJECTIVE	: The	objec	tive	is to de	velop t	he techr	nical sk	ill of th	e stud	ents.	•					
COURSE OU	TCOM	IES (	COs	):(3-	5)											
CO1	Devel	op the	e tecl	nnical s	kills re	quired i	n the fi	eld of s	tudy							
CO2	Bridge	e the	gap b	etween	the sk	ill requi	emple	oyer	or ind	ustry	an	d the				
	compe	etency	of t	he stud	ents.											
CO3	Enhan	nce the employability of the students.														
Mapping of C	Course	Outco	omes	with I	Progra	m Outc	comes (	POs)								
COs/POs	PO1	PC	)2	PO3	PO4	PO5	PO	8	PO9	PO1	10	PO11	PC	)12		
CO1	Н	H H H H H M M						Н	M	Ī.	Н	I	М			
CO2	Н	]	H	M	Н	Н	Н	M	N	1	Н	Н	[	Н	]	H
CO3	Н	]	H	Н	Н	Н	Н	M	N	1	Н	Н	[	Н	]	H
COs / PSOs	P	SO1		PS	O2	PS	SO3	P	SO4		PSO5	5				
CO1		Н		I	H	]	H		Н		]	H				
CO2		Н		I	Ŧ	1	H		Н		]	H				
CO3		Н		I	Ŧ	J	H		H		]	H				
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<i>h</i>			Basic Sciences	Engineering Sciences	Humanities and Social	Aciences Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills					
Category			Bas	Eng	Hu	Pro	Pro	Op	Pra	✓ Inte	Sof					



Subject Code: BEN18SK1	Subject Name :SOFT SKILLS – I (Career and Confidence Building )	TY / LB/ ETL	L	T / S.Lr	P/ R	С
	Prerequisite: None	Ty	0	0/0	3/0	1
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 $L: Lecture \ T: Tutorial \quad SLr: Supervised \ Learning \ P: Project \ R: Research \ C: Credits$ 

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

# **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 st	udent how students in ock session	nprove		• •				_							
COURSE Students wil			(Os):	(3-5)												
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CO2		vare of var											and be			
~~		o prepare (														
CO3		re for diffe										terview	S.			
CO4	•	nprove their verbal, written and other skills by performing mock sessions.  Course Outcomes with Program Outcomes (POs)														
	ng of Course Outcomes with Program Outcomes (POs) POs PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12															
COs/POs	S															
CO1		L L L L M M H M H M H														
CO2		L L L L M M H M H														
CO3		L	L	L	L	L	M	M	H	M	H	M	H			
CO4		L	$\mathbf{L}$	L	L	$\mathbf{L}$	M	M	H	M	H	M	H			
COs / PSO	s	PSO1		PS	<b>O2</b>	PS	<b>O3</b>	PS	<b>O4</b>	PSO5						
CO1		L		I		H	I	]	L	L						
CO2		L		I	.1	F		]	L	L						
CO3		<u>L</u>		I		H			<u>L</u>	L						
CO4		L	0.0	I		I I		-	L	L						
H/M/L ind	licates	Strength (	of Cor	relatio	n H-	High,	M- M	edium,	L-Lo	W						
Categoir		Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills						

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**Total No of Periods: 30** 

3/0

1

**SOFT SKILLS – I (Career and Confidence Building)** 

BEN18SK1

UNIT I 6 Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness. **UNIT II** 6 Group discussions / Do's and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume. **UNIT III** 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** 6 Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews. **UNIT V** 6 Practical session on Group Discussion and written tests on vocabulary and reading comprehension



Subject C BEI18007			IN	DUS	t Name	L INS					TY / LB/ ETL	L	T / S.Lr	P/ R	C
					uisite:						<u>T</u>	3	1/0	0/0	4
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T/L/ETL : OBJECT		_	Embec	iaea	Theory	and La	ab								
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COURSE						opertie	5 01 11	scosity	, mann	idity d	ila Wolst	110 001	iterit.		
CO1				_		riable	w mete	rs, qu	antity met	ers.					
CO2	Stu	idents ca	an anal	vze a	bout air	r flow	meters	and ma	ass flov	w met	ers				
CO3		Students can analyze about air flow meters and mass flow meters  Students can analyze electrical type flow meters													
CO4		Students acquire knowledge on various level measurement techniques													
CO5		The graduate understands the properties of Viscosity, Humidity and Moisture content.													
		The graduate understands the properties of Viscosity, Humidity and Moisture content.  Course Outcomes with Program Outcomes (POs)													
COs/POs	01 0	PO1	PO2		PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO1	1 P	012
CO1		H	M		M	M	Н	L	L	Н	Н	M	L		H
CO2		M	Н		M	Н	M	Н	Н	M	L	Н	M		L
CO3		Н	M		M	M	H	H	M	L	Н	M	Н		H
CO4		M	Н		M	H	H	M	H	M	H	H	L		H
CO5		M	H		L	H	H	M	H	M	H	L	H	]	M
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CO2			M		H			<u></u>		H H	M				
CO3			H		H			<u>1</u>		H	L				
CO4			M		H		I			M	H				
CO5		]	M		Н		N	1	]	H	Н				
H/M/L inc	dicat	es Strei	ngth of	Cor	relatio	n H-	High,	M- M	edium,	L-Lo	w		•	•	
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ofocory	Category Basic Sciences			Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
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BEI18007 INDUSTRIAL INSTRUMENTATION-II 3 1/0 0/0 4

#### UNIT I MEASUREMENT OF HUMIDITY & MOISTURE

12

Humidity terms – Dry and wet bulb psychrometers – Hot wire electrode type hygrometer – Dew cell Electrolysis type hygrometer – Commercial type dew point meter – Moisture terms – Different methods of moisture measurement – Moisture measurement in granular materials, solid penetrable materials like wood, web type material.

#### UNIT II MECHANICAL TYPE FLOW METERS

12

Theory of fixed restriction valuable head type flow meters – Orifice plate – Venturi tube – Flow nozzle – Dall tube – installation of head flow meters – Piping arrangement for different fluids – Pivot tube.

# UNIT III QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS 12

Positive displacement flow meters – Constructional details and theory of operation of mutating disc, reciprocating piston, oval gear and helix type flow meters – Inferential meter – Turbine flow meter – Rotameter – Theory and installation – Angular momentum mass flow meter – Coriolis mass flow meters – Thermal mass flow meters – Volume flow meter plus density measurement – Calibration of flow meters – Dynamic weighing method.

#### UNIT IV ELECTRICAL TYPE FLOW METER

12

Principle and constructional details of electromagnetic flow meter – Different types of excitation schemes used – Different types of ultrasonic flow meters – Laser Doppler anemometer systems – Vortex shedding flow meter – Target flow meter – Solid flow rate measurement – Guidelines for selection of flow meter.

#### UNIT V LEVEL MEASUREMENT

12

Gauge glass techniques coupled with photoelectric readout system – Float type level indication – Different schemes – Level switches, level measurement using displacer and torque tube – Bubble system. Boiler drum level measurement – Differential pressure method – Hydra step systems – Electrical types of level gauges using resistance, capacitance, nuclear radiation and ultrasonic sensors.

Total No of Periods: 60

#### **TEXT BOOKS:**

- 1. D.Patranabis, Principles of Industrial Instrumentation Tata McGraw-Hill Publishing Co., New Delhi, 1999
- 2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi 1999.

- 1. Ernest O.Doebelin, Measurement systems application and design international student Edition, Tata McGraw Hill Publishing Co., New Delhi, 1999.
- 2. Patranabis, Principles of Industrial Instrumentation Tata McGraw-Hill Publishing Co., New Delhi, 1999
- 3. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, Delhi 1999.
- 4. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation Dhanpat Rai and Sons, New Delhi, 1999.
- 5. Eckman D.P.M Industrial Instrumentation Wiley Eastern Limited, 1990.
- 6. Liptak B.G. Instrument Engineers Handbook (Measurement), Chilton Book Co., 1994.



Subject Coo BEI18008	de:		ubject NGIN			TROI				TY / LB/ ETL	L	T / S.Lr	P/ R	С
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T/L/ETL: T		/Eml	bedded	Theor	y and I	Lab								
OBJECTIV														
								athemat	tics ne	ecessary to	formu	late, sol	ve an	ıd
	yse contro				_									
					_		_			eory, prob	-	theory,	etc	
_	_			-			-			application				
						mputati	latform	s and	software a	pplicat	ions rel	ated t	to	
	respective		_		_									
	provide an				rk in in	ter-dis	ry grou	ıps.						
COURSE C														
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	solve and													
CO2	Understan	ds an	ıd appli	ies diff	erentia	l equat	ion, int	egrals,	matri	x theory, p	robabi	lity the	ory, e	tc.
CO3	Gets good	knov	wledge	of inst	rument	tation s	vstems	and th	eir an	plications.				
												ıs relate	ed to t	the
		s necessary foundation on computational platforms and software applications related to the sective field of engineering												
CO5	Gets an op	porti	unity to	work	in inte	r-discip	olinary	groups	•					
Mapping of	Course C	Outco	omes w	ith Pro	ogram	Outco	mes (I	POs)						
CO TO						~								
COs/POs	PO1		O2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1	1 P	O12
COs/POs CO1	PO1 H								PO8	PO9	PO10	PO1 H	_	O12 M
	-		O2	PO3	PO4	PO5	PO6	PO7			<b>†</b>	_	]	
CO1	Н		O2 H	PO3 M	PO4 M	PO5 H	PO6 M	PO7 H	M M L	L	L	Н		M
CO1 CO2	H M		O2 H M	PO3 M H	PO4 M H	PO5 H H	PO6 M L	PO7 H L	M M	L H	L M	H H		M M
CO1 CO2 CO3	H M M		O2 H M H	PO3 M H M	PO4 M H L	PO5 H H H	PO6 M L M	PO7 H L L	M M L	L H H	L M H	H H M		M M H
CO1 CO2 CO3 CO4	H M M H H		O2 H M H M	PO3 M H L L	PO4 M H L M	PO5 H H H H	PO6 M L M M	PO7	M M L H	L H H M	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5	H M M H H	P	O2 H M H M	PO3 M H L L	PO4 M H L M M	PO5 H H H H	PO6 M L M H	PO7 H L L L M	M M L H H	L H H M M	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1	H M M H H	SO1	O2 H M H M	PO3 M H M L L PS	PO4 M H L M O2	POS H H H H H PS	PO6 M L M H	PO7 H L L L PS	M M L H H SO4	L H H M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2	H M M H H	SO1	O2 H M H M	PO3 M H M L L PS	PO4 M H L M O2	PO5 H H H H S S S S S S S S S S S S S S S	PO6 M L M H O3	PO7 H L L L PS	M M L H H SO4	H H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1	H M M H H	SO1	O2 H M H M	PO3 M H M L L PS	PO4 M H L M O2	POS H H H H H PS	PO6 M L M M H O3	PO7 H L L L M PS	M M L H H SO4	L H H M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4	H M M H H	SO1  M H L	O2 H M H M	PO3 M H M L L PS	PO4	H H H H H PS	PO6 M L M H O3	PO7 H L L L M PS	M M L H SO4	L H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5	H M M H H	SO1  M H L H	O2 H M H M L	PO3 M H M L L PS	PO4 M H L M O2	PO5 H H H H S S S S S S S S S S S S S S S	PO6 M L M H O3	PO7 H L L L M PS	M H H SO4	L H H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3	H M M H H	SO1  M H L H	O2 H M H M L	PO3 M H M L L PS	PO4 M H L M O2	PO5 H H H H S S S S S S S S S S S S S S S	PO6 M L M H O3	PO7 H L L L M PS	M H H SO4	L H H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5	H M M H H	SO1  M H L H	O2 H M H M L	PO3 M H M L L PS	PO4	PO5 H H H H S S S S S S S S S S S S S S S	PO6 M L M H O3	PO7 H L L L M PS	M H H SO4 M H H H L	L H H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5	H M M H H	SO1  M H L H	O2 H M H M L	PO3 M H M L L PS I I I I I I I I I I I I I I I I I I	PO4	PO5 H H H H S S S S S S S S S S S S S S S	PO6 M L M H O3	PO7 H L L L M PS	M H H SO4 M H H H L	L H H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5	H M M H H	SO1  M H L H	O2 H M H L	PO3 M H M L L PS I I I I I I I I I I I I I I I I I I	PO4	PO5 H H H H S S S S S S S S S S S S S S S	PO6 M L M H O3	PO7 H L L L M PS	M H H SO4 M H H H L	L H H M M PSO5	L M H L	H H M		M M H H
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CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5	H M M H H	SO1  M H L H H ngth	O2 H M H L	PO3 M H M L L PS II	PO4 M H L M O2 H M H L M H H H H H H H H H H H H H H H	POS H H H H H OS N I I H H H H H H H H H H H H H H H H H	PO6 M L M H O3	PO7 H L L M PS	M H H SO4 M H H H L	L H H M M PSO5	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5	H M M H H	SO1  M H L H H ngth	O2 H M H L	PO3 M H M L L PS II	PO4 M H L M O2 H M H L M H H H H H H H H H H H H H H H	POS H H H H H OS N I I H H H H H H H H H H H H H H H H H	PO6 M L M H O3	PO7 H L L M PS	M H H SO4 M H H H L	L H M M PSO5  L L H H M H OW	L M H L	H H M		M M H H
CO1 CO2 CO3 CO4 CO5 COs / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indi	H M M H H	SO1  M H L H H ngth	O2 H M H L	PO3 M H M L L PS II	PO4 M H L M O2 H M H L M H H H H H H H H H H H H H H H	POS H H H H H OS N I I H H H H H H H H H H H H H H H H H	PO6 M L M H O3	PO7 H L L M PS	M H H SO4 M H H H L	L H M M PSO5  L L H H M H OW	L M H L	H H M		M M H H
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEI18008 CONTROL ENGINEERING 3 0/0 0/0

#### UNIT I SYSTEMS AND THEIR REPRESENTATION

0

3

Basic elements in control systems-open and closed loop systems – Mathematical modeling of Mechanical Translational system and Rotational system - Electrical analogy of physical systems – transfer function – AC and DC servomotors – block diagram reduction techniques – signal flow graph.

#### UNIT II TIME RESPONSE

9

Time response – time domain specifications – types of test inputs – I and II order system response – error coefficients – generalised error series – steady state error – PID controller response with and without I order system.

#### UNIT III FREQUENCY RESPONSE

9

Frequency response – definition – Bode plot – polar plot – constant M and N circles – Nichols chart – determinate of closed loop response from open loop response..

#### UNIT IV STABILITY OF CONTROL SYSTEM

9

Characteristic equation – location of roots in s-plane for stability – Routh Hurwitz criterion – root locus techniques – construction – gain margin and phase margin – Nyquist stability criterion.

#### UNIT V CONTROL SYSTEM DESIGN

(

Performance criteria – selection of controller modes – lag, lead, and lag-lead networks – compensator design for desired response. PI, PD and PID Controllers – Feedback compensation.

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. Ogata K., Modern Control Engineering, Prentice Hall of India Ltd., New Delhi, 1995.
- 2. I.Gopal, and M.Nagrath, Control Systems, Wiley Eastern, Ltd., New Delhi, 1985
- 3. A. NagoorKani, control systems, R.B.A publications, Chennai

- 1. Kuo B.C., Automatic Control Systems, Prentice Hall of India Ltd., New Delhi, 1995.
- 2. M.Gopal, Control Systems, Principles and Design, Tata McGraw-Hill Publishing Co., New Delhi, 1997.



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Subject Code:	<b>Subject Name: POWER ELECTRONICS</b>	TY/	L	T /	<b>P</b> /	C						
BEI18ET2		LB/		S.Lr	R							
		ETL										
	Prerequisite: None	ETL	1	0/1	3/0	3						
L : Lecture T : Tutorial	: Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits											
T/L/ETL : Theory/Lab/E	Embedded Theory and Lab											

# **OBJECTIVE:**

- The purpose of this course is to develop basic understanding of power semi conductor devices its construction, V-I and switching characteristic and implementation in various power converter applications.
- Detailed overview about operation of power semi conductor devices.
- The purpose to design protection circuits for power semiconductor devices used in power converters.
- Overview about the basics of industrial drives.

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CO5	Foster ability to understand the use of power converters in commercial and industrial applications.														
	ng of Course Outcomes with Program Outcomes (POs)														
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BEI18ET2 POWER ELECTRONICS 1 0/1 3/0 3

# UNIT I POWER SEMICONDUCTOR DEVICES

9

Power diodes – power transistor – characteristics of SCR, Triac, power MOSFET – IGBT – MCT – LASCR – SCR turn on, turn off characteristics – thyristor specifications – thyristor protection circuits.

#### UNIT II COMMUTATION CIRCUITS

9

Thyristor trigger circuits – R, RL, RC triggering – Single pulse and train of pulses – triggering with microprocessor – forced commutation – different techniques – series and parallel operation of SCRs.

#### UNIT III CONVERTERS

9

Natural commutation – single phase – three phase – half controlled and fully controlled rectifiers – effect of source and load inductance – dual converters – cyclo converter.

#### UNIT IV INVERTERS AND CHOPPERS

9

Voltage source inverters – series, parallel and bridge inverters – current source inverters – PWM inverters – DC chopper – step up and step down chopper – AC chopper.

#### UNIT V TYPICAL APPLICATION

9

Control of DC and AC drives – stepper and switched reluctance motor drive – AC voltage regulators – SMPS – uninterrupted power supply – induction heating.

**Total No of Periods: 45** 

### **TEXT BOOKS:**

- 1. P.S.Bimbhra, 'Power Electronics', Khanna Publishers, New Delhi, 2002
- 2. G.K.Dubey, Doradia, S.R. Joshi and R.M.Sinha, Thyristorised Power Controllers, New Age International Publishers, New Delhi, 1996.

- 1. M.H.Rashid, Power Electronics circuits, devices and applications, PHI, New Delhi, 1995.
- 2. Joseph Vithyathi, Power Electronics, McGraw-Hill, USA, 1995.
- 3. Mohan, Undeland and Robbins, Power Electronics, John Wiley and Sons, New York, 1995.
- 4. P.C.Sen, Modern Power Electronics, Wheeler Publishers, New Delhi, 1998.



TY / L T / P/ C

Subject Name: MICROPROCESSOR,

**Subject Code:** 

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BEI18L05 MICROPROCESSOR, MICROCONTROLLER AND ITS 0 0/0 3/0 1 APPLICATIONS LAB

#### **LIST OF EXPERIMENTS:**

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

**Total No of Periods: 45** 



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<b>OBJECTIV</b>	/E:			-										
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• The	graduate c	an und	lerstand	d calibr	ation a	nd mea	asurem	ent.						
<ul> <li>Over</li> </ul>	view abo	ut the p	oractica	l know	ledge a	about tl	ne spec	tropho	tomete	er				
COURSE (	OUTCOM	IES (C	COs):	(3-5)										
CO1	Enable	the stu	idents t	o unde	rstand	the fun	damen	tals of	orifice	plate.				
CO2	The gra	aduate	duate can understand calibration and measurement.  ands the Overview about the practical knowledge about the spectrophotometer											
CO3	Unders	tands t	he Ove	erview a	about t	lge abo	out the sp	ectrop	hotomet	er				
Mapping of	f Course	Outcor	mes wi	th Pro	gram (	Outcon	nes (Po	Os)						
COs/POs		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO1	1 P(	<b>D12</b>
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CO2		L	H	M	M	L	H	L	M	H	L	M		H
CO3		H	H	H	M	M	M	L	L	L	H	M	<u> </u>	M
COs / PSOs		DC	SO1	PS	02	DC	03	DC	O4	DCO5				
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# BEI18L06 INDUSTRIAL INSTRUMENTATION 0 0/0 3/0 1 LABORATORY

#### LIST OF EXPERIMENTS:

- 1. Discharge coefficient of orifice plate
- 2. Measurement of Force using Proving Ring Calibration of pressure gauge
- 3. Calibration of Thermocouple
- 4. Measurement of Flow using Wheel Flow Meter
- 5. Measurement of Viscosity
- 6. Vacuum Pressure Measurement
- 7. Level measurement using d/p transmitter
- 8. UV Visible spectrophotometer
- 9. Calibration of Pressure Gauge using Dead Weight Tester
- 10. pH Meter standardization and Measurement of pH values of solutions
- 11. Conductivity meter calibration and measurements of conductivity of test solutions.
- 12. Measurement of Temperature using Radiation Pyrometer.
- 13. Capacitance measurement using Capacitive Pickup.

**Total No of Periods: 45 Hrs** 



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Subject Code:	Subject Name: MICROGRID LAB	TY / LB/	L	<b>T</b> /	<b>P</b> /	C
		ETL		S.Lr	R	
BEE18L10						
	Prerequisite: None	Ty	0	0/0	3/0	1
L : Lecture T : Tutorial	SLr: Supervised Learning P: Project R: Resea	rch C: Cred	lits	•	1	
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T/L/ETL: Theory/Lab/Embedded Theory and Lab

#### **OBJECTIVE:**

- Students can obtain knowledge about specific wind power, calculate the wind frequency, turbines characteristics, time period and frequency of the rotating turbine at different speeds.
- To understand the concept of semiconductors and p-n junction energy band, Illumination effect on PV Modules, effect of Temperature, Effect of Shading on PV Modules and Effect of Angle of Inclination of Solar Modules.
- To understand the Characteristics of Solar Modules when connected in series and parallel
- To help the students to understand the modelling, simulation, implementation and performance

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	o help the st				simula	te the p	erform	ance ch	aracteri	istics of	a Micro	o-grid		
COURSI	E OUTCOM													
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CO2	Illuminatio						_	ature, I	Effect of	f Shadii	ng on P	√ Modu	les,	
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003	in series an	d paral	llel											
CO4	Students will be able to model, simulate, implement and perform the characteristics of solar photovoltaic and wind turbine.													
CO4	photovoltaic and wind turbine.													
CO5	Students will be able to design and simulate the performance characteristics of a Micro-grid													
Mapping	of Course (	Outcor	nes wi	ith Prog	ram O	utcom	es (PO	s)						
COs/POs	ng of Course Outcomes with Program Outcomes (POs)   PO1													
CO1	9													
CO2	Н		H	H	H	H	H	H	M	H	M	H	L	
CO3	M		M	H	H	H	H	H	M	H	M	H	L	
CO4	H		H	<u>H</u>	H	H	H	H	H	H	H	H	H	
CO5	Н		H	H	H	H	H	H	L	H	H	H	L	
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CO1	H			Н			I	F		Н				
CO2	N			H			H	F		H				
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Category		Basic Sciences	Engineering Sciences	Humanities and Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
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BEE18L10 MICROGRID LAB 0 0/0 3/0 1

#### LIST OF EXPERIMENTS

- 1. Characteristics of PV Modules
- 2. Characteristics of Series connection PV Modules
- 3. Characteristics of Parallel Connection PV Modules
- 4. Effect of Shading in the PV Characteristics
- 5. Effect of Tilting in PV Characteristics
- 6. Evaluation of cut-in and start up speed of Wind Turbine
- 7. Evaluation of efficiency of charge controller
- 8. Evaluation of Tip Speed Ratio (TSR) of Wind Turbine
- 9. Evaluation of co-efficient of performance of Wind Turbine
- 10. Evaluation of Turbine Power and Wind Speed
- 11. Evaluation of TSR and Co-efficient of Power
- 12. Simulation of Characteristics of PV Module.
- 13. Simulation of Characteristics of Wind Turbine
- 14. Simulation of Characteristics of PV Modules Connected in Parallel
- 15. Simulation of Characteristics of PV Modules Connected in Series
- 16. Design of a Micro-grid using Matlab/PSCAD/ETAP

**Total No of Periods: 45** 



Subject Co BEI18TS2		Subj	ject Naı	ne: T	ECHN	ICAL	SKIL	L 2			TY / LB/ ETL	L	T / S.Lr	P/ R	С
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T/L/ETL:	Theor	y/Lab/	/Embed	ded The	ory and	l Lab									
OBJECTI	VE:	The ol	bjective	is to de	velop t	he tech	nical	skill	of the	studer	nts.				
COURSE	OUT	COMI	ES (CO	s):(3-	5)										
CO1	Deve	elop th	ne techn	ical skil	ls requi	red in	the fie	ld o	f study						
CO2	Brid	ge the	gap bet	ween th	e skill	require	ments	of t	he emp	loyer	or indus	try and	the con	peter	ıcy
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CO3	Enha	ance th	ne empl	oyability	y of the	studen	its.								
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CO2		Н		I	I		Н		]	H	Н				
CO3		Н		I	H		Н		]	H	Н				
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CO3	The stu	dent w	ill be a	able to	know a	about v	arious	data ne	twork	S.					
CO4	Enable	Enable the student to get familiarized with different protocols and network components.													
CO5		The graduate understands the application of DCS in industrial													
	Ŭ	The graduate understands the application of DCS in industrial fourse Outcomes with Program Outcomes (POs)													
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING COMPUTER NETWORK AND DISTRIBUTED 3 1/0 0/0 4 BEI18009 CONTROL SYSTEM

#### UNIT I DATA NETWORK FUNDAMENTALS

12

Network hierarchy and switching – open system interconnection model of ISO – Data link control protocol – BISYNC – SLDC – HLDC – media access protocol – Command – response – Token passing – CSMA/CD, TCIP/IP.

#### UNIT II INTER NETWORKING

12

Bridges – Routers – Gateways – open system with bridge configuration – open system with gateway configuration – Standard ETHERNET and ARCNET configuration – Special requirement for networks used for control.

#### UNIT III DISTRIBUTED CONTROL SYSTEMS

12

Evolution – Different architecture – local control unit – Operator interface – Displays – Engineering interface.

#### UNIT IV APPLICATIONS OF DCS

12

DCS applications in Power plants, Iron and Steel plants, Chemical plants, Cement plants and Pulp and Paper plants.

#### UNIT V HART AND FIELD BUS

12

Introduction – Evolution of signal standards – HART communication protocol – communication modes – HART networks – Control system interface – HART commands – HART field controller implementation – HART and OSI model – Field bus – Introduction – General field bus architecture – basic requirements of field bus standard – field bus topology – interoperability – interchangeability

**Total No of Periods: 60** 

#### **TEXT BOOKS:**

- 1. A.S. Tanenbaum, Computer Networks, Third Edition, Prentice Hall of India, 1996
- 2. Michal P.Lucas, Distributed control systems, Van nostrand Reinhold Co., 1986

- 1. Romily Bowden, HART application guide and the OSI communication foundation., 1999
- 2. G.K.McMillan, Process/ Industrial instrument and handnook, McGraw-Hill, New york, 1999.
- 3. Popovic D. and Bhatkar V.P., Distributed Computer Control for industrial automation, Marcel Dekkar Inc., 1990 (for Unit 4)
- 4. Buchanan W., Computer Busses, Arnold Publishers, London, 2000.



Subject 6 BEI1801			S	Subject	t Name	e: PRC	CESS	CON	TROI		TY / LB/	L	T / S.Lr	P/ R	С
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CO4	_	Students learn different control actions and controllers like ON-OFF, P,P+I+D and also about tuning methods for setting optimum value and various multi-loop controlling methods.													
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CO5		H		M	Н	M	Н	Н	L	M	M	Н	L	1	M
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BEI18010 PROCESS CONTROL 3 1/0 0/0 4

#### UNIT I INTRODUCTION

12

Need for process control – mathematical model of first – order level, pressure and thermal processes – higher order process – interacting and non-interacting systems – continuous and batch process – self-regulation – servo and regulator operation-Heat Exchanger-CSTR.

#### UNIT II CONTROL ACTIONS AND CONTROLLERS

12

Basic control actions – characteristics of on-off, proportional, single-speed floating, integral and derivative control modes – P+I, P+D and P+I+D control modes – pneumatic and electronic controllers –Practical form of PID Controller.

#### UNIT III OPTIMUM CONTROLLER SETTINGS

12

Evaluation criteria – IAE, ISE, ITAE and ¼ decay ratio – determination of optimum settings for mathematically described processes using time response and frequency response – tuning – process reaction curve method – Ziegler Nichols method – damped oscillation method..

#### UNIT IV MULTILOOP CONTROL

12

Feed forward control – ratio control- cascade control – inferential control – split range control – introduction to multivariable control – Model Predictive control-Plant wide control-Adaptive control-examples from distillation column and boiler systems.

#### UNIT V FINAL CONTROL ELEMENT

12

I/P converter – pneumatic and electric actuators – valve positioner – control values – characteristics of control valves – inherent and installed characteristics – valve body – commercial valve bodies – control valve sizing – cavitation and flashing – selection criteria.

**Total No of Periods: 60** 

#### **TEXT BOOKS:**

- 1. Stephanopoulis, G, Chemical Process Control, Prentice Hall of India, New Delhi, 1990.
- 2. Eckman. D.P., Automatic Process Control, Wiley Eastern Ltd., New Delhi, 1993.

- 1. Pollard A.Process Control, Heinemann educational books, London, 1971.
- 2. Harriott. P., Process Control, Tata McGraw-Hill Publishing Co., New Delhi, 1991.
- 3. Curtis.D.Johnson, Process control Instrumentation Technology, PHI Learning, 2009



Subject Cod BEI18ET3			Name: VI		L				TY / LB/	L	T / S.Lr	P/ R	C	
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CO4	The gra	aduate o	can provi	de grap	phical p	rogram	ming er	nvironn	nent in vii	rtual ins	trumenta	ation.		
CO5	The student will get capability to analyse tools and simple applications used in virtua													
	instrumentation.													
Mapping of	instrumentation.  Course Outcomes with Program Outcomes (POs)													
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12	
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BEI18ET3 VIRTUAL INSTRUMENTATION 1 0/1 3/0 3

#### UNIT I REVIEW OF DIGITAL INSTRUMENTATION

O

Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

#### UNIT II FUNDAMENTALS OF VIRTUAL INSTRUMENTATION

9

Concept of virtual instrumentation – PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency - Multiplexing of analog inputs – Single-ended and differential inputs – Different strategies for sampling of multi-channel analog inputs. Concept of universal DAQ card - Use of timer-counter and analog outputs on the universal DAQ card.

#### UNIT III CLUSTER OF INSTRUMENTS IN VI SYSTEM

9

Interfacing of external instruments to a PC - RS232, RS 422, RS 485 and USB standards - IEEE 488 standard – ISO-OSI model for serial bus – Introduction to bus protocols of MOD bus and CAN bus..

#### UNIT IV GRAPHICAL PROGRAMMING ENVIRONMENT IN VI

9

Concepts of graphical programming – Lab-view software – Concept of VIs and sub VI - Display types – Digital – Analog – Chart – Oscilloscopic types – Loops – Case and sequence structures - Types of data – Arrays – Formulae nodes –Local and global variables – String and file I/O.

#### UNIT V ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI

9

Fourier transform - Power spectrum - Correlation - Windowing and filtering tools - Simple temperature indicator - ON/OFF controller - P-I-D controller - CRO emulation - Simulation of a simple second order system - Generation of HTML page.

**Total No of Periods: 45** 

#### **TEXTBOOKS:**

- 1. S. Gupta and J.P Gupta, 'PC Interfacing for Data Acquisition and Process Control', Instrument society of America, 1994.
- 2. Peter W. Gofton, 'Understanding Serial Communications', Sybex International.
- 3. Robert H. Bishop, 'Learning with Lab-view', Prentice Hall, 2003.

- 1. Kevin James, 'PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control', Newness, 2000.
- **2.** Gary W. Johnson, Richard Jennings, 'Lab-view Graphical Programming', McGraw Hill Professional Publishing, 2001.



Subject Code: BEI18L07		Su	bject l	Name:	PROC	CESS (	CONT	ROL I	AB	TY / LB/ ETL	L	T / S.Lr	P/ R	C
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T/L/ETL : The							3							
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characte	ristics	of diffe	erent ty	pes of	contro	llers fo	r contr	olling	a proc	ess and pi	ocess	automa	tion.	
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CO3	Under	rstands	Auton	nation	of proc	ess								
CO4	The g	raduate	e will b	e able	to Des	sign an	d Tune	contro	llers					
CO5	Under	rstands	the Co	ontrol c	of a pro	cess us	sing pe	rsonal	comp	ıter.				
Mapping of Co	ourse (	Outcon	nes wit	th Prog	gram (	Outcon	nes (Po	Os)						
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CO1	H		M	H	H	L	M	H	M	H	M	H		M
CO2	N		H	M	H	L	H	M	L	M	H	H		M
CO3	I		L	H	M	H	H	L	H	H	L	M		<u>M</u>
CO4	<u>F</u>		M	H	M	L	H	M	H	L	M	H		H
CO5	N	1	H	L	M	H	H	L	H	M	H	L		M
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BEI18L07 PROCESS CONTROL LABORATORY 0 0/0 3/0 1

#### LIST OF EXPERIMENTS:

- 1. Operation of Interacting and Non-Interacting systems
- 2. Responses of different order processes with and without transportation lag
- 3. Response of ON-OFF controller
- 4. Response of PID controller
- 5. Characteristics of Equal Percentage Control Viscosity Valve
- 6. Characteristics of Control Valve with Positioner.
- 7. Operation of ON-OFF controller Using Simple Thermal System.
- 8. Closed loop response of Flow Control Loop
- 9. Closed loop response of Level Control Loop
- 10. Closed loop response of Temperature Control Loop
- 11. Closed loop response of pressure control loop
- 12. Tuning of Controllers
- 13. Study of complex control system (ratio / cascade / feed forward)
- 14. Analysis of Non-Linear Systems(Conical Tanks)

**Total No of Periods: 45** 



DEPARTMI	ENT OF ELECTRICAL AND ELECTRONIC	CS ENGIN	EER	ING		
Subject Code:	Subject Name :DIGITAL CONTROL	TY/	L	T /	<b>P</b> /	C
BEI18L08	LAB	LB/		S.Lr	R	
		ETL				
	Prerequisite: Control Engineering	L	0	0/0	3/0	1
L : Lecture T : Tutorial	SLr : Supervised Learning P : Project R : Resea	rch C: Cre	dits			
T/L/ETL: Theory/Lab/En	nbedded Theory and Lab					
<b>OBJECTIVE:</b>						
To study various signs	als.					
To enable the students	s to understand the various response of the system	n.				
To Study about the va	rious types of sequential circuits					
• To study the PLC & a	pplication of PLC.					
To Design and verify	compensator using bode plot.					

Conductor should study various signals	
CO1 Graduates should study various signals.	
CO2 Students can understand the various responses of the system	
CO3 The various types of sequential circuits can be analyzed	
CO4 The graduate becomes familiar with the PLC & application of PLC.	
CO5 The students will be able to Design and verify compensator using bode plot	

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CO2	M	H	Н	M	L	H	M	H	M	H	L	L
CO3	L	M	M	L	H	M	Н	L	Н	M	L	Н
CO4	Н	Н	M	L	H	Н	M	L	Н	M	Н	L
CO5	Н	M	Н	M	L	Н	M	L	L	Н	M	L
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H/M/L indicates Str	ength of (	Correlation	n H-	High,	M- Mo	edium,		OW		
Category	Basic Sciences	Engineering Sciences Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		

BEI18L08 DIGITAL CONTROL LABORATORY 0 0/0 3/0 1

#### LIST OF EXPERIMENTS:

- 1. Standard test signal
- 2. Response for the first order system
- 3. Response for the second order system
- 4. Bode plot for a given system
- 5. Root locus for the given system
- 6. Polar plot for the given system
- 7. Design of lead compensator using bode plot
- 8. Design of lag compensator using bode plot
- 9. Study of programmable logic controller (PLC)
- 10. Verification of logic gates using PLC
- 11. Application of PLC

**Total No of Periods: 45** 



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Subject Name: SOFT SKILL -II

**Subject Code:** 

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BEN18SK2		(	Qualit	auve a	ına Qu	iantita	tive Si	KIIIS)		ETL		S.Lr	R	
		]	Prereq	uisite:	BSK1	8ET1				ETL	0	0/0	3/0	1
L: Lecture T: T	Cutorial	SI	r : Sup	ervised	d Learr	ning P	: Proje	ect R:	Resea	rch C: Cre	dits			
T/L/ETL : Theo	ry/Lab/	Emb	edded	Theory	and L	ab								
<b>OBJECTIVE:</b>														
<ul> <li>To help</li> </ul>			•		_		_							
<ul> <li>To help</li> </ul>	student	ts to	improv	e their	arithm	etic rea	asoning	g.						
<ul> <li>To help</li> </ul>	student	ts im	prove t	heir da	ta inter	rpretati	on skil	ls						
COURSE OUT	COMI	ES (C	COs):	(3-5)										
CO1	Prepa	re stu	idents	for Log	gical re	asonin	g							
G0.							<del> </del>							
CO2	Prepa	re stu	idents	tor arit	hmetic	reason	ung							
CO3	Prepa	Prepare students for data interpretation skills												
	_													
		Outcomes with Program Outcomes (POs)												
COs/POs	PO1		PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		012
CO1	L		L	L	L	L	M	M	H	M	H	M		H
CO2	L		L	L	L	L	M	M	H	M	H	M		H
CO3	L		L	L	L	L	M	M	H	M	H	M	]	H
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CO1		L		I		I	H	]	L	L				
CO2		L		I		I	H	]	L	L				
CO3		L		I			I		L	L				
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Category		Basic Sciences	Engineering Sciences	Humanities and Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Inte	Soft Skills				
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEN18SK2 SOFT SKILLS – II 0 0/0 3/0

#### UNIT I LOGICAL REASONING I

6

1

Logical Statements – Arguments – Assumptions – Courses of Action.

#### UNIT II LOGICAL REASONING II

6

Logical conclusions – Deriving conclusions from passages – Theme detection.

#### UNIT III ARITHMETICAL REASONING I

6

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

#### UNIT IV ARITHMETICAL REASONING II

6

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

#### UNIT V DATA INTERPRETATION

6

Tabulation – Bar graphs – Pie graphs – Line graphs.

Total No. of Periods: 30

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



Subject Code	:		ubject N							TY/	L	<b>T</b> /	<b>P</b> /	C
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L: Lecture T:						g P	: Proje	ect R:	Resear	rch C: Cre	dits			
T/L/ETL: The														
<b>OBJECTIVE</b>	: The	main ol	bjective	of the I	nplant	train	ing is	to prov	ide a s	short-term	work	experie	nce ir	n an
Industry/ Com														
COURSE OU														
CO1	T	o get an	insight	of an ii	ndustry	/ org	ganiza	tion/co	mpany	pertainin	g to th	e doma	in of	
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CO2										into the c				
CO3									profess	sional netv	vork.			
Mapping of C	ourse													
COs/POs	PO1	PO2	PO3	PO4	PO		PO6	PO7	PO8	PO9	PO10	_		O12
CO1	M	L	L	L	I		H	H	H	H	H	H		H
CO2	H	M	H	H	N	1	H	H	H	H	H	Н		M
CO3	H	H	H	H	N		H	H	H	H	H	Н		M
COs / PSOs	P	SO1	P	SO2		PSC	)3	PS	SO4	PSO5				
CO1		H		H		H		]	H	H				
CO2		H		Н		Н		]	H	Н				
CO3		H		H		Н		]	H	Н				
H/M/L indica	tes Str	ength o	of Corre	lation	H- Hi	igh,	M- M	edium.	, L-Lo	w	I			
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<b>y</b> r		Basic Sciences	Engineering Sciences	Sciences	rrogram Core	riogiam Electives	Open Electives	Practical / Project	terr	Soft Skills				
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Category														
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Subject Code:	BEI18	TS3	Subje	ect Nan	ne:	TECH	NICAI	L <b>SKII</b>	LL - 3	TY / LB/ ETL	L	T / S.Lr	P/ R	С
			Prere	quisite	:					L	0	0/0	3/0	1
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C:										Credit	S	1		
T/L/ETL : Theor	ry/Lab/	Embed	ded The	eory an	d Lab									
OBJECTIVE:	The o	bjectiv	e is to d	evelop	the tec	hnical	skill of	the stu	dents.					
COURSE OUT	COME	ES (CO	s):(3-	- 5)										
CO1	Deve	Develop the technical skills required in the field of study												
CO2	_	Bridge the gap between the skill requirements of the employer or industry and the competency of the students.												
CO3	Enhance the employability of the students.													
Mapping of Cour	se Outo	comes v	vith Pro	gram C	Outcome	es (POs)	)							
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	10	PO11	PO	12
CO1	Н	Н	Н	Н	Н	Н	M	M	Н	N	1	Н	M	[
CO2	Н	Н	M	Н	Н	Н	M	M	Н	Н	I	Н	Н	[
CO3	Н	Н	Н	Н	Н	Н	M	M	Н	Н	I	Н	Н	[
COs / PSOs	PS	<b>O</b> 1	PSO2		PSO3		PSO4 PSO5		5					
CO1	I	I	Н		Н		н н		Н					
CO2	I	H	Н		Н		H H		Н					
CO3	I	I	I	н н н		Н								
H/M/L indicate	s Stren	gth of	Correl	ation	H- Hi	gh, M-	Mediu	m, L-I	ow				•	
şory		Basic Sciences	Engineering Sciences	Humanities and Social	Sciences Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
Category									<b>✓</b>					



	DEFINITION OF ELECTRICIES IN ID ELECTROSTIC	OD EI IGH	IDDICE	110							
<b>Subject Code:</b>	<b>Subject Name: INTRODUCTION TO BIOMEDICAL</b>	TY/	L	<b>T</b> /	P/R	C					
BEI18011	INSTRUMENTATION	LB/		S.Lr							
		ETL									
	Prerequisite: None	T	3	1/0	0/0	4					
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L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits

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

# **OBJECTIVE:**

Introduction to the Fundamentals of Biomedical Engineering

• Introduction to the Fundamentals of Biomedical Engineering														
The study of communication mechanics in a biomedical system with few examples														
<ul> <li>Understanding the basic principles in imaging techniques</li> <li>Acquiring basic knowledge in life assisting devices</li> </ul>														
•		_		_		_								
•	Acqı	uiring bas	ic knowle	dge in li	fe therap	peutic de	evices							
COURSE OU	TCON	MES (CO	(s): (3-5)	)										
CO1		Understands the Fundamentals of Biomedical Engineering												
CO2			the graduate will be able to study about communication mechanics in a biomedical system with											
		ew examples												
CO3		Ability to understand the basic principles in imaging techniques												
CO4		Acquires	basic kno	wledge	in life as	ssisting o	devices							
CO5		Gains bas	ic knowle	edge in l	ife thera	peutic d	evices							
Mapping of Course Outcomes with Program Outcomes (POs)														
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	Н	Н	M	L	Н	M	L	Н	M	L	Н	L		
CO2	M	M	L	Н	M	Н	M	L	Н	M	L	Н		
CO3	H							M	L	H	M	L		
CO4	H	M	L	M	L	H	M	M	L	M	H	M		
CO5	H	M	L	H	M	L	M	H	M	L	M	L		
COs / PSOs	P	SO1	PSC		PS	<b>SO3</b>	PSO4		PSO5					
CO1		H	N.		L		H		M					
CO2		M	Н		L		M		H					
CO3		H	N.		H		M		H					
CO4		L	N.			H M		L						
CO5		H	H			M		L	M					
H/M/L indica	tes Str	ength of	Correlati	ion H-	High, N	M- Med	ium, L-							
			ial					al Skill						
>-	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	kills					
Category	Basic	Engine	Humaniti Sciences	Progra	Progra	Open ]	Practic	Intern	Soft Skills					

# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEI18011 INTRODUCTION TO BIOMEDICAL 3 1/0 0/0 4 INSTRUMENTATION

#### UNIT I ANATOMY, PHYSIOLOGY AND TRANSDUCERS

12

Brief review of human physiology and anatomy – cell and their structures – electrical mechanical and chemical activities – action and resting potential – different types of electrodes – sensors used in biomedicine – selection criteria for transducers and electrodes – necessity for low noise pre- amplifiers – difference amplifiers – chopper amplifiers – electrical safety – grounding and isolation.

#### UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENT

12

ECG – EEG – EMG – ERG – lead system and recording methods – typical waveforms. Instruments for checking safety parameters of biomedical equipments.

#### UNIT III NON – ELECTRICAL PARAMETER MEASUREMENTS

12

Measurement of blood pressure – blood flow cardiac output – cardiac rate – heart sound – measurement of gas volume – flow rate of  $CO_2$  and  $O_2$  in exhaust air – pH of blood – ESR and GSR measurements.

#### UNIT IV MEDICAL IMAGING PARAMETER MEASUREMENTS

12

X- RAY machine – computer tomography – magnetic resonance imaging system – ultra sonography – endoscopy – different types of telemetry system – laser in biomedicine.

#### UNIT V ASSISTING AND THERAPETIC DEVICES

**12** 

Cardiac pacemakers – defibrillators ventilators –Nerve and muscle stimulators – diathermy – introduction to artificial kidney artificial heart – heart lung machine – Dialysers-limb prosthetics – orthotics – elements of audio and visual aids

Total No of Periods: 60

#### **TEXT BOOKS:**

- 1. Webster J.G., Medical Instrumentation: Application and Design, 3rd Edition, John Wiley and Son, 1999.
- 2. Khandpur R.S. Hand book of Biomedical Instrumentation and Measurements, Tata McGraw-Hill New Delhi 1987.

- Geddes and Baker, Principles of Applied Biomedical Instrumentation, John Wiley and Sons, USA, 1975
- 2. Well G, Biomedical Instrumentation and Measurements, Prentice Hall, New Jersey, 1980.
- 3. Koryla J., Medical and Biological Application of electro chemical devices John Wiley and Sons, Chichester, 1980.
- 4. Wise D. L., Applied Bio-sensors, Butterworth USA, 1989.



Subject Code:	Subject Name: MANAGEMENT	TY/	L	T	P	С
	CONCEPTS AND ORGANIZATION	LB/				
	BEHAVIOR	ETL				
BMG18002	Prerequisite: Basic Knowledge as	T	3	0/0	0/0	3
	Statistical Techniques and Probability					
	Theory					

L: Lecture T: Tutorial P: Project C: Credits

# **OBJECTIVE:**

- This course is aimed at addressing the contemporary issues, which fall under the broad title of management, and its functions.
- There will also be an attempt to analyze the behavior of individuals within an organization and the issues of working with other group or teams.

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COURSE OUTCOMES (COs):														
CO1														
CO2	CO2 Accommodating with co workers and at Work environment													
CO3 Enhanced leadership skills														
CO4 Understanding and implementing good policies for the welfare of management and workers														
Mapping of	Course	e Ou	tcome	es (COs)	with	Prog	gram	Outcor	nes (l	POs) &	Progra	ım Speci	fic Outo	omes
(PSOs)											C	-		
COs/POs	PO1	]	PO2	PO3	PO4	P	<b>O</b> 5	PO6	PO7	PO	PO9	PO10	PO11	PO12
CO1	H			M		I	M		L		M		L	
CO2	M		M					M		Н	M	M	L	H
CO3	L			H	H	I	M		M	Н	M	L	M	
CO4	M		L					M			M			M
H/M/L indi	cates St	reng	gth of	Correla	tion	H- ]	High	, M- M	ediun	ı, L-L	w			
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BMG18002 MANAGEMENT CONCEPTS AND 3 0/0 0/0 3
ORGANIZATION BEHAVIOR

#### UNIT I INTRODUCTION TO MANAGEMENT

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Definition of Management – Science or Art or Profession – Manager vs Entrepreneur vs Leader – Types of Managers – Managerial roles and skills – Evolution of Management – Scientific, Human relations and system approaches

#### UNIT II PLANNING AND ORGANIZING

9

Nature and purpose of planning – planning process – types of planning – planning premises – Nature and purpose of organizing – Formal and Informal organization – organization chart – organization structure – types - Line and staff authority

#### UNIT III DIRECTING AND CONTROLLING

9

Leadership – Types and theories of leadership – communication – process of communication – barriers in communication – System and process of controlling – Budgetary and non budgetary control techniques – Direct and preventive control – reporting

#### UNIT IV INDIVIDUAL BEHAVIOR

9

Diversity - Attitudes and Job satisfaction - Emotions and Moods - personality and values - perception - Decision making - Motivation concepts - Motivation Applications

#### UNIT V GROUP BEHAVIOR

0

Foundations of Group Behavior – Understanding Teams – power and politics – Conflict and Negotiation – Stress Management

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. Harold Koontz and Heinz Weihrich "Essentials of Management" Tata McGraw Hill Education 2015
- 2. Stephen. P. Robbins, Timothy A. Judge and Seema Sanghi "Essentials of Organizational Behavior" Pearson 10<sup>th</sup> Edition 2010

- 1. Tripathi PC & Reddy PN "Priciples of Management" Tata McGraw Hill 2012
- 2. Stephen P. Robbins, David A.De.Cenzo, Mary Coulter "Fundamentals of Management" Pearson Education 2016



Subject Code BEI18ET4			Subjec	t Name MATI	e: IND					TY / LB/	L	T / S.Lr	P/ R	C
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		]	Prerequ	iisite: I	ndustri	al Insti	ument	ation I,	II.	$\frac{1}{L}$	1	0/1	3/0	3
L : Lecture T	: Tutoria									arch C: Ci	redits			
T/L/ETL: Th	eory/Lab													
<b>OBJECTIVE</b>	E :													
<ul> <li>To stu</li> </ul>	udy Intro	ducti	ion to I	ndustri	al Auto	omatio	n, Plant	Wide	Contr	ol System	ns And	Automa	tion	
Strate	gy.													
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<ul> <li>To stu</li> </ul>	udy and a	naly	ze Dis	tribute	d Conti	rol Sys	tems E	Enginee	ring a	and Desig	n.			
COURSE OU	JTCOM	ES (	COs):	(3-5)										
CO1			n to In	dustrial	Auton	nation,	Plant V	Wide C	ontro	l Systems	and A	utomatio	n	
	Strateg	_												
CO2	Instrun	<u>nenta</u>	tion St	andard	Protoc	ols								
CO3	PLC C	onfig	guration	ı, Appl	ication	s and N	<b>Machin</b>	e Auto	matio	1				
CO4	Distrib													
CO5	Distrib						ng and	Design	1					
Mapping of (														
COs/POs	PO1		O2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	0 PO1	1 P	012
CO1	Н		M	Н	M	Н	M	L	L	Н	M	M	_	H
CO2	M		M	M	Н	M	Н	L	Н	M	Н	M		L
CO3	M		Н	M	L	Н	M	Н	M	Н	L	Н		M
CO4	Н		L	Н	M	L	Н	M	L	Н	M	L		Н
CO5	Н		Н	M	M	Н	M	Н	L	M	Н	M		L
COs / PSOs	P	SO1	_	PS	O2	PS	03	PS	SO4	PSO5				
CO1		M		I	I	N	Л		H	M				
CO2		Н		I	I	1	H	]	M	M				
CO3		Н		N	1	]	H		H	L				
CO4		L		N	1	1	H	]	M	L				
CO5		M		I	I	I	H	]	M	Н				
H/M/L indica	ates Stre		of Co	rrelatio	n H	- High	, M- M	ledium	, L-L	ow				
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Category		Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
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BEI18ET4 INDUSTRIAL AUTOMATION 1 0/1 3/0 3

# UNIT I INTRODUCTION TO INDUSTRIAL AUTOMATION, PLANT WIDE CONTROL SYSTEMS AND AUTOMATION STRATEGY

Introduction to Industrial Automation- Role of automation in industries- Introduction to the types of manufacturing industries- Introduction to type of automation system- Benefits of automation - Introduction to Automation pyramid - Introduction to automation tools like PAC, PLC, SCADA, DCS, Hybrid DCS with reference to automation pyramid.

#### UNIT II INSTRUMENTATION STANDARD PROTOCOLS

9

Definition of protocol - Introduction to Open System Interconnection (OSI) model - Communication standard (RS232, RS485) - Modbus (ASCII/RTU)- Introduction to third party interface - concept of OPC (Object linking and embedding for Process Control) - HART Protocol: Introduction - frame structure, programming - implementation examples - benefits, advantages and limitation.

# UNIT III PLC CONFIGURATION, APPLICATIONS AND MACHINE AUTOMATION 9

PLC programming methods as per IEC 61131 - Developing programs using Sequential Function Chart - Functional Block Diagram - Analog control using PLC (PID controller configuration) - Interfacing PLC to SCADA/DCS using communication link (RS232, RS485) - Protocols (Modbus ASCII/RTU) and OPC-Development stages involved for PLC based automation systems

#### UNIT IV DISTRIBUTED CONTROL SYSTEM BASICS

9

DCS introduction - Various function Blocks - DCS components/block diagram - DCS Architecture of different makes- comparison of these architectures with automation pyramid - DCS specification - latest trend and developments - DCS support to Enterprise Resources Planning (ERP) - performance criteria for DCS and other automation tool

#### UNIT V DISTRIBUTED CONTROL SYSTEM S ENGINEERING AND DESIGN 9

DCS detail Engineering - configuration and programming - functions including database management – reporting - alarm management – diagnosis -Historical database management - security and user access management –communication - third party interfaces – control - display etc - Enhanced functions like Advance process control - fuzzy logic - ANN.

**Total No of Periods: 45** 

- 1. The management of control system: Justification and Technical Auditing, N.E. Bhattiha, ISA
- 2. Computer aided process control, S.K.Singh, PHI.
- 3. Understanding Distributed Process Systems for Control, Samuel Herb, ISA.
- 4. Programmable Logic Controllers: Principles and Applications, Webb & Reis, PHI.
- 5. Introduction to Programmable Logic Controllers, Garry Dunning, Thomson Learning.
- 6. Distributed computer control for industrial automation, Ppovik Bhatkar, Dekkar Pub.
- 7. Computer Based Process control, Krishna Kant, PHI 8. Mechatronics ,HMT, TMH publication



Subject Code:	LIAKINI	Subjec							TY/	L	T /	<b>P</b> /	C
BBI18L03		BIOM			TRUN	MENT	ATIO	N	LB/		S.Lr	R	
		LAB							ETL				
		Prereq	uisite:						L	0	0/0	3/0	1
L : Lecture T :	Tutorial S	SLr : Sup	ervise	d Learn	ing P	: Proje	ct R:	Resea	rch C: Cre	edits			
T/L/ETL: The		bedded	Theory	and La	ab								
<b>OBJECTIVE</b>	:												
• Study	of Biologica	al Pream	plifiers										
	n Recordin	_	_		analysi	s.							
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	dy Recordin												
COURSE OU													
CO1	Understan												
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CO3	Capable o												
CO4	Capable o												
Mapping of C								1			_		
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8		PO10	_	_	012
CO1	H	M	M	H	M	L	M	M	L	H	M		L
CO2	H	M	L	M	H	L	M	H	L	M	H		L
CO3	M	M	M	L	H	M	L	H	M	L	M	_	H
CO4	L	M	H	M	L	M	H	L	M	H	H	]	M
GO / PGO	DCC	.1	TDC!	00	DC	02	DC	10.4	DCO.5				
COs / PSOs	PSC			<u>O2</u>		<u>O3</u>		O4	PSO5		-		
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CO2	M			<u> </u>		<u> </u>		M_	Н				
CO3	M M			<u>I</u>		<u>L</u> <b>/I</b>		<u>M</u> H	H L				
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BBI18L03 BIO-MEDICAL INSTRUMENTATION 0 0/0 3/0 1 LABORATORY

#### LIST OF EXPERIMENTS

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

**Total No of Periods:45** 



DE	PARTMENT OF ELECTRICAL AND ELECTRON	11C2 FIN	JUNEE	KING		
Subject Code:	Subject Name: EMBEDDED SYSTEM LAB	TY/	L	T /	P/	C
BEI18L10		LB/		S.Lr	R	
		ETL				
	Prerequisite: None	L	0	0/0	3/0	1
L: Lecture T: 7	Cutorial SLr: Supervised Learning P: Project R: Re	search C:	Credit	S		
T/L/ETL: Theo	ry/Lab/Embedded Theory and Lab					
<b>OBJECTIVE:</b>						
To desi	gn and simulate combinational circuits and sequential c	ircuits				
To design	n toggle, Bitwise, Arithmetic, Delay					

COURSE O		1										
CO1			will be	able t	o desig	gn and	simula	te com	binationa	ıl circuit	s and se	equential
		ircuits										
CO2									ic, Delay			
Mapping of												1
COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	L	L	H	M	M	H	M	L	H
CO2	M	H	M	H	L	H	M	H	M	H	L	M
Cos / PSOs	PS	<b>O</b> 1	PSC	02	PS	О3	PS	O4	PSO5			
CO1	J	H	N.	1	]	L	]	H	M			
CO2	N	M.	H	[	N	<b>I</b>	]	H	M			
H/M/L indica	ates Str	ength o	f Correla	tion I	I- High	, M- M	edium,	L-Low	7			
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BEI18L10 EMBEDDED SYSTEM LAB 0 0/0 3/0 1

# LIST OF EXPERIMENTS

Design and Simulate Using Keil Version

- 1. Design of Logic Gates
- 2. Design of Multiplexer and De-multiplexer
- 3. Design of Encoder and Decoders
- 4. Flip Flops
- 5. Counters
- 6. Toggle a port bit in Keil
- 7. Bitwise operators
- 8. Arithmetic Operators
- 9. Delay Operations
- 10. ADC Interfacing with ARM Processor

**Total No of Periods: 45** 



TY/ L T/ P/ C

PROJECT PHASE - 1

**Subject Code: Subject Name:** 

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	frien	dly and	l reacha	ble solut	ions									
CO3										mmunica				
CO4	To ta	ake on t	he chal	lenges of	f teamw	ork, pr	epare a	present	tation a	nd demoi	strate	the innate	e talen	ts.
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COs/P	Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO	12
CO1		Н	H	H	Н	M	Н	H	L	M	M	Н	I	H
CO2		H	H	H	H	H	H	H	M	M	M	Н	I	H
CO3		H	H	H	H	H	H	H	M	M	H	H		M
CO4		H	M	H	H	H	H	M	H	H	H	H	I	H
COs /		PS	<b>O1</b>	PSC	02	PS	<b>O3</b>	PS	<b>O</b> 4	PSO5				
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CO2			<u>1</u> 1	Н			<u>1</u> H		<u>1</u> H	H				
CO3			<u>1</u>	Н			<del>I</del>		H	H				
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CO2	Dev		n insi							process			e and	d cultur	e	
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COs/POs		PO1	P	02	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	10	PO11	PO	12
CO1		L		L	L	L	L	H	L	Н	M	F	I	Н	I	
CO2		M		L	L	L	L	Н	L	Н	Н	F	I	Н	I	
CO3		L		L	M	M	L	Н	M	Н	M	F	I	Н	I	
COs / PS	Os	I	PSO1		PS	O2	PS	О3	PS	SO4	PSO	5				
CO1			L		I		1	L		L	I	,				
CO2			L		I		1	Ĺ		L	L	,				
CO3			L		I		I	L		L	I	,				
H/M/L ir	ıdicat	tes Str	ength	of C	orrela	tion ]	H- Hig	h, M- I	Mediur	n, L-Lo	w					
ý				Basic Sciences	Engineering Sciences	Humanities and Social	Ociences Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills				
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COURSE OUT				isc stuc	1y 01 0	ottic II	inig pi	ant.					
CO1	Capability			crete d	ata svs	stems	samnlii	ng nro	cess and z	-transfe	orm		
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CO3	Understand									0 11 .	<u> </u>	1	
CO4	Understand	ds the (	Jvervie	ew of P	LC's a	irchited	etures,	progra	ms, logic	& their	tuncti	onal	
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CO5	Understand							udy of	bottle fill	ing pla	nt.		
Mapping of Co						nes (P PO6		DOG	DOO	DO10	DO1	1 D/	212
COs/POs CO1	PO1 H	PO2 M	PO3 M	PO4 H	PO5 M	H	PO7 L	PO8 M	PO9 H	PO10 M	PO1 H	_	<u>)12</u> L
CO2	M	H	H	M	H	M	H	M	L	L	H		M
CO3	M	H	M	H	L	M	Н	M	H	M	L		H
CO4									H			_	L
	l VI	l H	M	I,	Н	I VI	I II			M	- Н		
	M M	H	M L	L H	H M	M H	H M	L H		M H	H	_	
CO5	M M	H	M L	H	H M	H	M	H	L	H	M	_	H
CO5	M	Н	L	Н	M	Н	M	Н	L			_	
COs / PSOs	M PSO	Н	L PS	H O2	M PS	Н О3	M PS	H SO4	L PSO5			_	
COs / PSOs CO1	PSO1	Н	L PS	H O2 //	M PS	H O3 H	M PS	H SO4 L	PSO5 H			_	
COs / PSOs	M PSO	Н	L PS N	H O2	PS I	Н О3	M PS	H SO4	L PSO5			_	
COs / PSOs CO1 CO2 CO3	PSO:	Н	PS N	H O2 // H	M PS I	O3 H	PS	H 5O4 L M	PSO5 H H			_	
CO5 COs / PSOs CO1 CO2	PSO1 M M H	Н	PS N I	Н О2 И Н	PS H	O3 H	PS	H SO4 L M	PSO5 H H H				
COs / PSOs CO1 CO2 CO3 CO4	M PSO	H	PS N I	H O2 M H M M	PS I I I	O3 H L H H	PS	H SO4 L M M M	PSO5 H H H M				
COs / PSOs CO1 CO2 CO3 CO4 CO5	M PSO	H	PS N I	H O2 M H M M	PS I I I	O3 H L H H	PS	H SO4 L M M M H	PSO5 H H H M				
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COs / PSOs CO1 CO2 CO3 CO4 CO5	M PSO	H of Corr	PS N N N N N N N N N N N N N N N N N N N	H O2 M H M M	PS I I I	O3 H L H H	PS	H SO4 L M M M H	PSO5 H H H M				
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COs / PSOs CO1 CO2 CO3 CO4 CO5	PSOTE MEDICAL	H of Corr	PS N N N N N N N N N N N N N N N N N N N	H O2  1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	PS I I I H M	03 H L H H M- M	M PS	H SO4 L M M M H	PSO5 H H H M				
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COS / PSOs CO1 CO2 CO3 CO4 CO5 H/M/L indicate	PSOTE MEDICAL	H of Corr	L PS N N N N N N N N N N N N N N N N N N	H O2 M H M M H n H-	PS I I I H M	03 H L H H M- M	M PS	H SO4 L M M M H	PSO5 H H H M ow				
COs / PSOs CO1 CO2 CO3 CO4 CO5	M PSO	H	PS N I	H O2 M H M M H n H-	PS I I I	O3 H L H H	PS	H SO4 L M M M	PSO5 H H H M				

BEI18012 COMPUTER CONTROL PROCESS 3 1/0 0/0 4

#### UNIT I ANALYSIS OF DISCRETE DATA SYSTEM

12

Z-Transform- Selection of sampling process – Selection of Sampling period – pulse transfer function – modified Z-transform – Stability of Discrete Data System.

#### UNIT II DESIGN OF DIGITAL CONTROLLER

12

Digital PID – Dead beat – Dahlin algorithms – pole placement controller Design of feed forward controller – predictive controller.

# UNIT III COMPUTER AS A CONTROLLER

12

Basic building blocks of computer control system – SCADA – Direct Digital Control – AI and expert control systems – Case studies on computer control for Industrial process..

UNIT IV PLC 12

Evolution of PLC's – Sequential and programmable controllers – Architecture- Relay logic – Ladder logic – Programming Timers & Counters

#### UNIT V PROGRAMMING & APPLICATIONS OF PLC'S

12

Instructions in PLC-Program control instructions, math instructions, and sequencer instructions-use of PC as PLC-Application of PLC-Bottle filling system application.

**Total No of Periods: 60** 

## **TEXT BOOKS:**

- 1. Despande and R.H.Ash, Computer process control, ISA Publication, USA 1995.
- 2. Shanthisasidharan, Computer control of Process

- 1. Stephan opoulous, Chemical Process control, Prentice Hall of India, New Delhi.
- 2. Chidambaram, Computer control of Process



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OBJECTIV														
	• To pr	ovide	an ove	rview o	n pow	er gene	eration	throug	h vari	ous metho	ds.			
										and the m		ment d	evices	s.
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			owledg											
	<ul> <li>Study</li> </ul>	ing ab	out dif	ferent o	control	loops	used in	boiler	s.					
COURSE O	UTCOV	IES (C	COs) :	(3-5)										
CO1	Understa				ration t	hrough	ı vario	us metł	ods.					
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CO2						• •	_			the measu	ıremen	ı aevic	es	
CO3	Understa	ands th	e basic	and ac	ivance	d boile	ol techi	nıques	S					
CO4	Capable	to get	knowle	edge ab	plant									
CO5	Understa	Understands different control loops used in boilers. Course Outcomes with Program Outcomes (POs)												
COs/POs	P(		PO2	PO3	PO4	PO5	PO6	PO7	PO8		PO10	_	_	<b>D12</b>
CO1	I I		M	H	M	H	M	H	L	L	M	H		H
CO2	I		M	L	H	M	L	H	M	M	H	M	_	H
CO3	N		L	H	L	H	M	L	H	M	L	M	_	H
CO4	<u> </u>		H	H	H	L	M	M	L	M	H	H		<u>M</u>
CO5	N	1	H	L	M	H	L	H	M	L	H	M		L
COs / PSOs	3	PSO1	-	PS			03		<u>604</u>	PSO5				
CO1		M		N			H		H	L				
CO2		L		N			<u>H</u>		<u>M</u>	L				
CO3		H		I			M T		L	H				
CO4 CO5				N	<b>T</b>		<u>Н</u>	,	<u>L</u> L	H				
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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEI18013 POWER PLANT INSTRUMENTATION 3 0/0 0/0 3

#### UNIT I OVERVIEW OF POWER GENERATION

9

Brief survey of methods of power generation – hydro, thermal, nuclear, solar and wind power – importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

#### UNIT II MEASUREMENTS IN POWER PLANTS

9

Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor

#### UNIT III ANALYZERS IN POWER PLANTS

9

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments..

#### UNIT IV CONTROL LOOPS IN BOILER

q

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main stem and reheat steam temperature control – superheater control – attemperator – deaerator control – distributed control system in power plants – interlocks in boiler operation.

#### UNIT V TURBINE – MONITORING AND CONTROL

Q

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system

Total No of Periods: 45

#### **TEXT BOOKS:**

- 1. Sam G. Dukelow, The control of Boilers, instrument Society of America, 1991.
- 2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.

- 1. Elonka, S.M. and Kohal, A.L., Standard Boiler Operations, McGraw-Hill, New Delhi, 1994.
- 2. R.K.Jain, Mechanical and industrial Measurements, Khanna Publishers, Delhi ,1995.



Subject BEI18L		Su	ıbject N	lame :	PR	OJECT	PHA:	SE - II		TY / LB/	L	T / S.Lr	P/R	<b>C</b>
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L : Lectu	ıre T :	Tutorial				arning	P : Pro	iect R	: Resea	rch C: C				
		ory/Lab/I						3						
OBJEC	TIVE	The	objectiv	e of th	ne Main	n Projec	ct is to	culmir	nate the	academ	ic stu	ıdy and	provid	e an
opportun	ity to	explore a	probler	n or iss	ue, add	lress thi	rough f	ocused	and app	plied rese	earch	under th	he direc	tion
of a facu	ılty me	entor. The	e projec	t demo	nstrate	s the st	udent's	ability	to syn	thesize a	nd ap	ply the	knowle	edge
and skill	s acqu	ired to re	al-worl	d issue	s and p	problem	is. This	projec	ct affirn	ns the stu	udent	s to thir	nk critic	cally
and creat	tively,	find an o	ptimal s	olution	, make	ethical	decisio	ons and	to pres	ent effec	tivel	у.		
COURS	E OU	TCOME	S (COs	):(3-	5)									
CO1		ly the kno	wledge	and sk	ills acq	uired in	n the co	ourse of	study a	addressin	ig a s	pecific p	problem	or
	issue													
CO2		ncourage				cally ar	nd creat	ively a	bout so	cietal iss	ues a	nd deve	lop use	r
	frien	dly and r	eachable	e soluti	ons									
CO3	To r	efine rese	arch ski	lls and	demon	strate t	heir pro	oficienc	v in co	mmunica	ation	skills.		
CO4		ake on the											nate	
	talen			-6		, F	- F	F						
Mapping		ourse Ou	tcomes	with F	rograi	m Outc	omes (	POs)						
COs/POs		`PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	10 PO	11 PC	012
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BEI18E01 FIBER OPTICS AND LASER INSTRUMENTS 3 0/0 0/0 3

# UNIT I OPTICAL FIBERS AND THEIR PROPERTIES

Q

Principles of light propagation through a fiber – different types of fibers and their properties transmission characteristics of optical fiber – absorption losses – scattering losses – dispersion – optical fiber measurement – optical sources – optical detectors – LED – LD – PIN and APD

#### UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBERS

9

Fiber optic sensors – fiber optic instrumentation system – different types of modulators – detectors – application in instrumentation – interferometric method of measurement of length – moiré fringes – measurement of pressure, temperature, current, voltage liquid level and strain – fiber optic gyroscope – polarization maintaining fibers.

#### UNIT III LASER FUNDAMENTALS

9

Fundamental characteristics of lasers – three level and four level lasers – properties of laser – laser modes – resonator configuration – Q-switching and mode locking – cavity dumping – types of lasers: gas lasers, solid lasers, liquid lasers and semi conductor lasers

#### UNIT IV INDUSTRIAL APPLICATION OF LASERS

9

Laser for measurement of distance, length velocity, acceleration, current, voltage and atmospheric effect – material processing – laser heating, welding melting and trimming of materials – removal and vaporization

# UNIT V HOLOGRAM AND MEDICAL APPLICATION

9

Holography – basic principle; methods; holographic interferometry and applications, holography for non – destructive testing – holographic components – medical applications of lasers; laser and tissue interaction – laser instruments for surgery, removal of tumors of vocal cords, brain surgery, plastic surgery, gynecology and oncology

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. John and Harry, Industrial lasers and their applications, McGraw-ill, 1974
- 2. Senior J.M., Optical Fiber Communication Principles and Practice, Prentice Hall, 1985

- 1. John F Read, Industrial applications of lasers, Academic Press, 1978
- 2. MonteRoss, Laser applications, McGraw-Hill, 1968
- 3. Keiser G., Optical Fiber Communication, McGraw-Hill, 1991
- 4. Jasprit Singh, Semi conductor optoelectronics, McGraw-Hill, 1995



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BEI18E02 PC BASED INSTRUMENTATION 3 0/0 0/0 3

#### UNIT I INTRODUCTION

9

Review of microprocessors, microcomputers, micro processing systems - Input-output structures - Measurement of digital computer power and performance.

#### UNIT II INTERFACING

9

Analogue signal conversion – Interface components and techniques - Signal processing - Interface systems and standards – Communications.

#### UNIT III SOFTWARE

9

Real time languages – Programming real time systems - Discrete PID algorithms -Real time operating systems - Case studies in instrumentation..

#### UNIT IV MEASUREMENT AND CONTROL

9

PC based data - Acquisition systems – Data Acquisition- Data Gathering

#### UNIT V APPLICATION EXAMPLES

Q

Industrial process measurements, like flow temperature, pressure, and level PC based instruments development system.

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

1. Krishna Khan, "Computer based industrial control", Prentice Hall, 1997.

- 1. Ahson, S.I., "Microprocessors with applications in process control", Tata McGraw-Hill Publishing Company Limited, New Delhi, 1984.
- 2. George Barney C., "Intelligent Instrumentation", Prentice Hall of India Pvt. Ltd., New Delhi, 1998.



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BEI18E03 CONTROL SYSTEM DESIGN 3 0/0 0/0 3

UNIT I INTRODUCTION TO DESIGN

9

Systems performance and specifications - Compensators - Methodologies and assessment

UNIT II CLASSICAL CONTROLLERS DESIGN

Q

Proportional (P) - Integral (I) - derivatives (D) - PI - PD - PID controllers - Characteristics - Design - Tuning - Manual and automatic.

UNIT III FREQUENCY DOMAIN DESIGN

9

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – MIMO design.

#### UNIT IV STATE VARIABLE DESIGN

9

Design by state feedback – Output feedback – Pole assignment technique – Design of state and output regulators – Design of reduced and full order observers – Introduction to robust control – H $\infty$  control – Parameter optimisation.

#### UNIT V CASE STUDIES

9

Radar tracking – Control of robot arm – Satellite altitude control – Temperature control

Total No of Periods: 45

#### **TEXT BOOKS:**

- 1. S.Thompson, 'Control Systems Engineering and Design', Longman group, U.K.Ltd., 1989.
- 2. E.O.Doebelin, 'Control Systems Principles and Design', John Wiley 1990.

- 1. I.J.Nagrath and M.Gopal, 'Control Systems Engineering', Wiley eastern Ltd., 1982.
- 2. M.Gopal, 'Modern Control Systems Theory', Wiley Eastern Ltd, 1993.



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# DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING BEI18E04 NANO TECHNOLOGY 3 0/0 0/0 3

#### UNIT I INTRODUCTION

9

Preliminary definitions, need for Nanotechnology, benefits of Nanotechnology a note on measures, elements of electricity, optics and electronics.

#### UNIT II FUNDAMENTALS

9

Electrons, atoms, ions, molecules, various metals, biosystems, molecular recognition, ohm's law, elements of quantum mechanics and magnetism.

UNIT III TOOLS 9

Tools for measuring nanostructures, scanning probe instruments, spectroscopy, electrochemistry and electron microscopy, tools for making nano structures, smart materials, nano scale biostructures , Energy capture, transformation and storage.

#### UNIT IV SENSORS & SELF HEALING STRUCTURES

9

Self healing structures, recognition, separation, catalysis, heterogeneous nano structures and composites encapsulation, consumer goods, natural sensors, electromagnetic sensors, biosensors.

#### UNIT V BIO MEDICAL APPLICATIONS

9

Drugs, drug delivery, photodynamic therapy, molecular motors, neuro- electronics interfaces, protein engineering, nanobusiness, nanoethics.

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. Mark Ratner and Daniel Ratner, Nanotechnology Pearson Educational.
- 2. M.H. Fulekar, Nanotechnology: Importance and Applications, I. K. International Pvt Ltd 2010.

#### **REFERENCE BOOKS:**

 Marc J. Madou, Fundamentals of Microfabrication and Nanotechnology, Third Edition, Three-Volume Set: Manufacturing Techniques for Microfabrication and Nanotechnology of Microfabrication and Nanotechnology) Hardcover –15 Jul 2011



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BEI18E05 EMBEDDED SYSTEM 3 0/0 0/0 3

#### UNIT I INTRODUCTION TO EMBEDDED SYSTEMS

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Brief overview of real time systems and embedded systems - Classification of embedded systems - Embedded system definitions - Functional and non-functional requirements - Architectures and standards - Typical applications.

#### UNIT II EMBEDDED SYSTEM COMPONENTS AND INTERFACE

9

Device choices - Selection criteria and characteristics of Processors and memory systems for embedded applications - Interface and Peripherals - Power sources and management.

#### UNIT III EMBEDDED SYSTEM DESIGN AND DEVELOPMENT

9

Design methods and techniques - Classification of need - Need analysis -Requirement and specification - Conceptual design - Models and languages - State machine model - State machine tables - Verification - Validation - Simulation and emulation.

#### UNIT IV REAL TIME SYSTEMS AND MODELS

9

Characteristics and classification of real time systems - Real time specifications and Design techniques - Event based - Process based and graph based models - Real time kernel - Hierarchy services and design strategy - Real time system performance and analysis - Typical real time systems - Their languages and features.

UNIT V CASE STUDIES

Case studies of safety-critical and 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.

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



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BEI18E06 SYSTEMS THEORY 3 0/0 0/0 3

#### UNIT I FREQUENCY DOMAIN DESCRIPTIONS

9

Properties of transfer functions – Impulse response matrices – Poles and zeros of transfer function matrices – Critical frequencies – Resonance – Steady state and dynamic response – Bandwidth.

#### UNIT II STATE SPACE DESCRIPTION

Q

Review of state model for systems – State transition matrix and its properties - Free and forced responses – Controllability and observability – Kalman decomposition – Minimal realisation – Balanced realisation

#### UNIT III DESIGN IN STATE SPACE SYSTEMS

9

State feedback – Output feedback – Design methods – Pole assignment – Full order and reduced order observers – Deadbeat control – Deadbeat observers – Introduction to optimal control..

#### UNIT IV NON-LINEAR SYSTEMS

9

Types of non-linearity – Typical examples – Phase plane analysis – Limit cycles -Equivalent linearization – Describing functions – Chaotic behaviour. Need for model reduction – Aggregation techniques – Dominant pole concept – Model reduction via partial realisation – Time moment matching and pade approximation – Hankel norm model reduction – Comparative merits of various methods.

#### UNIT V STABILITY

q

Stability concepts – Equilibrium points – BIBO and asymptotic stability – Direct method of Lyapunov – Application to non-linear problems – Frequency domain stability criteria – Popov's method and its extensions.

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. M.Gopal, "Modern Control Engineering", Wiley, 1996.
- 2. Theodore E. Djaferis, Irvin c.schick, System Theory: Modeling, Analysis and Control, springer science, 2000.

- 1. Ogatta, "Modern Control Engineering", PHI, 3rd Edition, 1997.
- 2. G.J.Thaler, "Automatic control systems", Jaico publishers, Chennai, 1993.



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BEI18E07 SYSTEM IDENTIFICATION AND ADAPTIVE 3 0/0 0/0 3 CONTROL

#### UNIT I NON PARAMETRIC METHODS

9

Non parametric methods: Transient analysis – frequency analysis – correlation analysis spectral analysis

#### UNIT II PARAMETRIC METHODS

9

Linear Regression: The least square estimate – best linear unbiased estimation under linear constraints – updating the parameter estimates for linear regression models – prediction error methods: description of prediction error methods – optimal prediction – relationships between prediction error methods and other identification methods – theoretical analysis.

Instrumental variable methods: Description of instrumental variable methods – theortical analysis – covariance matrix of IV estimates – comparison of optimal IV and prediction error estimates.

#### UNIT III RECURSIVE IDENTIFICATION METHODS

9

The recursive least squares method – the recursive instrumental variable method – the recursive prediction error method – model validation and model structure determination. Identification of systems operating in closed loop: identifiability considerations – direct identification – indirect identification – joint input – output identification.

#### UNIT IV ADAPTIVE CONTROL SCHEMES

9

Introduction – uses – definitions – auto tuning – types of adaptive control – gain scheduling controller – model reference adaptive control schemes –self-tuning controller.

## UNIT V MRAC AND STC

9

Approaches – the gradient approach –liapunov functions – passivity theory – pole placement method – minimum variance control – predictive control-Stability – convergence – robustness – application of adaptive control.

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. Soderstorm, T. and PetreStoica, System Identification, Prentice Hall International (UK)Ltd., 1989.
- 2. Sastry S. and Bodson M., Adaptive control stability, convergence and Robustness, Prentice Hall inc., New Jersey, 1989.

# **REFERENCE BOOKS:**

1. Ljung L, system identification: Theory for the user, Prentice Hall, Englewood Cliffs, 1987



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BEI18E08 NEURAL AND FUZZY LOGIC CONTROL 3 0/0 0/0 3

#### UNIT I INTRODUCTION AND DIFFERENT ARCHITECTURES OF NEURAL NETWORKS 9

Artificial neuron – MLP – Back propagation – Hope field networks – Kohonenself- organising maps – adaptive resonance theory.

#### UNIT II NEURAL NETWORKS FOR CONTROL

Q

Schemes of neuro-control – identification and control of dynamical systems – adaptive neuro controller – case study.

#### UNIT III INTRODUCTION TO FUZZY LOGIC

9

Fuzzy sets – fuzzy relations – fuzzy conditional statements – fuzzy rules – fuzzy algorithm. Fuzzy logic controller – fuzzification interface – knowledge base –

#### UNIT IV FUZZY LOGIC

9

decision making logic – defuzzification interface – design of fuzzy logic controller – case study.

#### UNIT V NEURO-FUZZY LOGIC CONTROL

9

Optimisation of membership function and rules base of fuzzy logic controller using neural networks – genetic algorithm – fuzzy neuron – adaptive fuzzy systems – case study.

**Total No of Periods: 45** 

#### **TEXT BOOKS:**

- 1. LauranceFausett, Fundamentals of Neural Networks, Prentice Hall, Englewood cliffs, N.J, 1992.
- 2. Zimmermann H.J., Fuzzy set theory and its applications, Allied Publication Ltd., 1996.

- 1. Tsoukalas L.H, and Robert E.Uhrig, Fuzzy and Neural approach in Engineerin, John Wiley and Sons, 1997.
- 2. JacekM.Zurada, Introduction to artificial Neural Systems, Jaico Publishing House Mumbai, 1997.
- 3. KlirG.J.and Yuan B.B, Fuzzy sets and fuzzy logic, Prentice Hall of India, New Delhi, 1997.
- 4. Driankov D., Hellendron. H. Reinfrank M., An Introduction to Fuzzy control, Narosa publishing House, New Delhi, 1996.
- 5. Millon W.T., Sutton R.S. and Webrose P.J., Neural Networks for control, MIT Press, 1992.



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BEI18E09 INSTRUMENTATION IN PETRO CHEMICAL 3 0/0 0/0 3 INDUSTRY

#### UNIT I PETROLEUM PROCESSING

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Petroleum exploration – recovery techniques – oil – gas separation processing wet gases – refining of crude oil.

#### UNIT II OPERATIONS IN PETROLEUM INDUSTRY

9

Thermal cracking – catalytic cracking – catalytic reforming – polymerization – alkylation – isomerization – production of ethylene, acetylene and propylene from petroleum

#### UNIT III CHEMICALS FROM PETROLEUM PRODUCTS

9

Chemical from petroleum – methane derivatives – acetylene derivatives – ethylene derivatives – propylene derivatives – other products.

#### UNIT IV MEASUREMENT IN PETROCHEMICAL INDUSTRY

9

Parameters to be measured in refinery and petrochemical industry – selection and maintenance of measuring instruments – intrinsic safety of instruments

#### UNIT V CONTROL LOOPS IN PETROCHEMICAL INDUSTRY

9

Process control in refinery and petrochemical industry-control of distillation column control of catalytic crackers and pyrolysis unit-automatic control of polyethylene production-control of vinyl chloride and PVC production

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Waddams A.L, Chemical from petroleum, Butter and Janner Ltd., 1968
- 2. Balchan.J.G. and Mumme K.I., Process Control Structures and Applications, Van Nostrand Reinhold Company, New York, 1988.

- 1. Austin G.T.Shreeves, Chemical Process Industries, McGraw-Hill International student edition, Singapore, 1985
- 2. Liptak B.G. Instrumentation in Process Industries, Chilton Book Company, 1994.



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BEI18E10 INTELLIGENT CONTROLLERS 3 0/0 0/0 3

# UNIT I INTRODUCTION

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Definition – architecture – difference between conventional and expert system.

#### UNIT II KNOWLEDGE ACQUISITION

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Knowledge representation and formal logic-knowledge engineer – knowledge acquisition techniques – concept formalisation – knowledge representation development – knowledge acquisition for core problem knowledge acquisition without knowledge engineers.

#### UNIT III EXPERT SYSTEM TOOLS

9

Problem solving start engines - languages for expert system development - expert system shells - LISP machines - PC-based expert system tools.

#### UNIT IV FUZZY MODELLING AND CONTROL

9

Fuzzy sets – Fuzzy set operators – Fuzzy Reasoning – Fuzzy propositions – Linguistic variable – Decomposition and Defuzzification – Fuzzy systems- Case studies

#### UNIT V NEURAL CONTROLLERS

Q

Introduction: Neural networks – supervised and unsupervised learning – neural network models – single and multilayers – back propagation – learning and training. Neural controllers case studies

**Total No of Periods: 45** 

#### **TEXT BOOKS**

- 1. Rolston, D.W., 'Principles of Artificial and Expert Systems Development', McGrawHill Book Company, International Edition, 1998.
- 2. Kosko, B, 'Neural Networks and Fuzzy Systems', Prentice Hall of India Pvt. Ltd., 1994.

- 1. Klir, G.J. and Folger, T.A., 'Fuzzy Sets, and Information', Prentice Hall, 1994.
- 2. James A. Freeman, David M. Skapura, 'Neural Networks Algorithms', Applications and programming Techniques', Addison Wesley Publishing company 1992.



Subject Code: BEI18E11	Subject Name : ADVANCED PROCESS CONTROL	TY / LB/ ETL	L	T / S.Lr	P/ R	С
	Prerequisite: Process Control	T	3	0/0	0/0	3

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

#### **OBJECTIVE:**

- Introducing some of the techniques of nonlinear control.
- Developing an in-depth understanding of generalized predictive control [GPC] as a vehicle for explaining the principles of modern predictive control [MPC].
- To become familiar with the minimum variance methods as a basis for studying the techniques of self-tuning and adaptive control.
- Providing a basis for applying these techniques in an industrial context.

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BEI18E11 ADVANCED PROCESS CONTROL 3 0/0 0/0 3

#### UNIT I MULTIVARIABLE SYSTEMS

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Multivariable Systems – Transfer Matrix Representation – State Space Representation – Poles and Zeros of MIMO System - Multivariable frequency response analysis - Directions in multivariable systems - Singular value decomposition.

#### UNIT II MULTI-LOOP REGULATORY CONTROL

9

Multi-loop Control - Introduction - Process Interaction - Pairing of Inputs and Outputs -The Relative Gain Array (RGA) - Properties and Application of RGA - Multi-loop PID Controller - Biggest Log Modulus Tuning Method - Decoupling Control - LQG Control - RGA for Non-square Plant

#### UNIT III MULTIVARIABLE REGULATORY CONTROL

9

Introduction to Multivariable control –Multivariable PID Controller -Multivariable IMC– Multivariable Dynamic Matrix Controller -Multivariable Model Predictive Control –Generalized Predictive Controller – Multiple Model based Predictive Controller – Constrained Model Predictive Controller - Implementation Issues.

#### UNIT IV CONTROL OF TIME-VARYING AND NONLINEAR SYSTEMS

9

Models for Time-varying and Nonlinear systems – Input signal design for Identification –Real-time parameter estimation - Types of Adaptive Control - Gain scheduling - Adaptive Control - Deterministic Self-tuning Controller and Model Reference Adaptive Controller – Nonlinear PID Controller - Control of Hammerstein and Wiener Systems

#### UNIT V CASE STUDIES

9

Control Schemes for Distillation Column, CSTR, Bioreactor, Three-tank hybrid system, Four-tank system, pH, and polymerization reactor

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2004.
- 2. Stephanopoulos, G., "Chemical Process Control An Introduction to Theory and Practice", Prentice Hall of India, 2005.
- 3. Seborg, D.E., Edgar, T.F. and Mellichamp, D.A., "Process Dynamics and Control", Wiley John and Sons, 2nd Edition, 2003.
- 4. Coughanowr, D.R., "Process Systems Analysis and Control", McGraw -Hill International Edition, 2004.

- 1. E. Ikonen and K. Najim, "Advanced Process Identification and Control", Marcel Dekker, Inc. Newyork, 2002
- 2. P. Albertos and S. Antonio, "Multivariable Control Systems An Engineering Approach", Springer Verlag, 2004
- 3. Sigurd Skogestad, Ian Postlethwaite, "Multivariable Feedback Control: Aalysis and Design", John Wiley and Sons, 2004



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# BEI18E12 DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING ARTIFICIAL INTELLIGENCE AND EXPERT 3 0/0 0/0 3 SYSTEMS

# UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

9

Overview of Al-general concepts-problem spaces and search –search techniques – BFS, DFS-Heuristic search techniques.

#### UNIT II KNOWLEDGE REPRESENTATION

9

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

# UNIT III KNOWLEDGE ORGANISATION AND MANIPULATION

9

Procedural Vs declaration knowledge – forward Vs backward reasoning – matching techniques – control knowledge/strategies – symbol reasoning under uncertainty – introduction to non – monotonic reasoning – logic for monotonic reasoning.

# UNIT IV ERCEPTION – COMMUNICATION AND EXPERT SYSTEMS

9

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

# UNIT V KNOWLEDGE ACQUISITION

9

Knowledge acquisition – general concepts – learning – learning by induction – explanation based learning

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Elaine Rich and Kelvin Knight, Artificial Intelligence, Tata McGraw-Hill, New Delhi, 1991.
- 2. Stuart Russell and Peter Norvig, Artificial Intelligence: A modern approach Prentice Hal, 1995

- 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.



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BEI18E13 DIGITAL IMAGE PROCESSING 3 0/0 0/0 3

#### UNIT I FUNDAMENTALS OF IMAGE PROCESSING

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Introduction – Steps in image processing systems – Image acquisition – Sampling and Quantization – Pixel relationships – Color fundamentals and models, File formats, Image operations – Arithmetic, Geometric and Morphological.

#### UNIT II IMAGE ENHANCEMENT

9

Spatial Domain: Gray level Transformations – Histogram processing – Spatial filtering smoothing and sharpening. Frequency Domain: Filtering in frequency domain – DFT, FFT, DCT – Smoothing and sharpening filters – Homomorphic Filtering.

# UNIT III IMAGE SEGMENTATION AND FEATURE ANALYSIS

9

Detection of Discontinuities – Edge operators – Edge linking and Boundary Detection – Thresholding – Region based segmentation – Morphological Watersheds – Motion Segmentation, Feature Analysis and Extraction.

#### UNIT IV MULTI RESOLUTION ANALYSIS AND COMPRESSIONS

9

Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms, Image compression: Fundamentals – Models – Elements of Information Theory – Error free compression – Lossy Compression – Compression Standards.

### UNIT V APPLICATION OF IMAGE PROCESSING

9

Image classification – Image recognition – Image understanding – Video motion analysis – Image fusion – Steganography – Digital compositing Mosaics – Colour Image Processing.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

1. Anil K.Jain, "Fundamentals of Digital Image Processing". Pearson Education, 2003

- 1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 2ndEdition, Pearson Education, 2003.
- 2. Milan Sonka, ValclavHalavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", 2nd Edition, Thomson Learning, 2001.



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Subject Name :DIGITAL

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BEI18E14 DIGITAL INSTRUMENTATION 3 0/0 0/0 3

#### UNIT I INTRODUCTION

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 $\begin{array}{l} \mbox{Digital codes} - \mbox{Memory devices} - \mbox{Basic building blocks} - \mbox{Gates, FF and counters} - \mbox{Discrete data handling} \\ - \mbox{Sampling} - \mbox{Sampling} - \mbox{Sampling theorem} - \mbox{Aliasing errors} - \mbox{Reconstruction} - \mbox{Extrapolation} - \mbox{Synchronous and} \\ \mbox{asynchronous sampling}. \end{array}$ 

#### UNIT II DIGITAL METHODS OF MEASUREMENTS

9

Review of A/D, D/A techniques – F/V and V/F conversion techniques – Digital voltmeters and multimeters – Automation and accuracy of digital voltmeters and multimeters – Digital phase meters – Digital tachometers – Digital frequency, period and time measurements – Low frequency measurements – Automatic time and frequency scaling – Sources of error – Noise – Inherent error in digital meters, hidden errors in conventional ac measurements – RMS detector in digital multimeters – Mathematical aspects of RMS.

#### UNIT III DIGITAL DISPLAY & RECORDING DEVICES

9

Digital storage oscilloscopes – Digital printers and plotters – CDROMS – Digital magnetic tapes, dot matrix and LCD display CROs, colour monitor, digital signal analyser and digital data acquisition..

#### UNIT IV SIGNAL ANALYSIS

0

Amplifiers, filters, transmitter, receiver, wireless base and mobile station test sets, noise figures meters, RF network analyser and high frequency signal sources

#### UNIT V CURRENT TRENDS IN DIGITAL INSTRUMENTATION

9

Introduction to special function add on cards – Resistance card – Input and output cards – Counter, test and time of card and digital equipment construction with modular designing; interfacing to microprocessor, micro controllers and computers - Computer aided software engineering tools (CASE) – Use of CASE tools in design and development of automated measuring systems – Interfacing IEEE cards – Intelligent and programmable instruments using computers.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

1. Doebelin, 'Measurement System, Application & Design', IV Ed, McGraw-Hill, 1990

- 1. Bouwens, A.J., "Digital Instrumentation", McGraw Hill, 1984.
- 2. John Lenk, D., "Handbook of Micro computer based Instrumentation and Control", PHI, 1984.



TY / L T / P/ C

**Subject Name : DIGITAL CONTROL** 

**Subject Code:** 

Prerequisite: Control Engineering	BEI18E15		YSTEN	Asine :	DIGI	IAL	ONII	KOL		LB/ ETL	L	S.Lr	R	
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The graduate is Equipped with the basic knowledge of D/A conversion.	CO2	A	Able to	know tl	ne stab	ility an	alysis	of digit	tal con	trol syste	m.			
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Mapping of Course Outcomes with Program Outcomes (POs)	CO4	7	The grad	duate is	Equip	ped wi	th the l	oasic k	nowled	dge of D/	A conv	ersion.		
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BEI18E15 DIGITAL CONTROL SYSTEMS 3 0/0 0/0 3

# UNIT I INTRODUCTION

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 $\label{eq:convergence} \begin{tabular}{ll} Digitisation-Effect of sampling-Linear difference equation-Review of -Z transforms-solution of difference equation-convergence. \end{tabular}$ 

#### UNIT II DISCRETE SYSTEM ANALYSIS

9

The transfer function – State Variable description – Relation of transfer function to pulse response – external stability state space form – solution of state equation – Numerical consideration – dynamic response – controllability and observability effect of sampling.

#### UNIT III SAMPLED DATA SYSTEMS

9

Sample and hold – spectrum of a sampled signal – extrapolation – response between samples – Hold equivalents.

#### UNIT IV DESIGN OF DIGITAL CONTROLLER

9

Pole placement – estimation design – regulation design – Integral control and disturbance estimation – design by emulation – root locus design – direct design method – frequency response methods.

UNIT V PLC 9

Evolution of PLC's – Sequential and programmable controllers – Architecture- Programming of PLC – Relay logic – Ladder logic – Functional blocks.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Franklin G.F, J.David Powell, Michael Worleman, "Digital Control of dynamic Systems"3rd Edition, Addison Wesley, 2000
- 2. Petrezeulla, Programmable Controllers, McGraw-Hill, 1989

- 1. M.Gopal, 'State variables and Digital control methods', Tata McGraw-Hill, 1997.
- 2. Ogatta.K. 'Modern Control Engineering', Prentice hall of India, II edition, 1997.
- 3. Kuo, "Digital control systems", Second Edition, Oxford University press, 1992.



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BEI18E16 PRINCIPLES OF ROBOTICS 3 0/0 0/0 3

# UNIT I BASIC CONCEPTS

9

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

#### UNIT II POWER SOURCES AND SENSORS

9

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

# UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

9

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

# UNIT IV KINEMATICS AND PATH PLANNING

9

Solution of inverse kinematics problem – multiple solution Jacobian work envelop – hill climbing techniques – robot programming languages.

# UNIT V CASE STUDIES

q

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, 1996
- **2.** Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

- 1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
- 2. Asfahl C.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.



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BEI18E17 MODERN CONTROL SYSTEMS 3 0/0 0/0 3

# UNIT I STATE VARIABLE ANALYSIS AND DESIGN

9

State models – solution of state equations – controllability and observability- pole assignment by state feedback – full and reduced order observers.

#### UNIT II NONLINEAR SYSTEMS

9

Common types of non-linear phenomena – Linearisation – singular points – phase plane method – construction of phase trajectories – system analysis by phase plane method – describing function method – describing function of non-linear elements

#### UNIT III STABILITY ANALYSIS OF NON LINEAR SYSTEM

9

Stability analysis by describing function method – jump resonance – Liapunov's and Popv's stability criteria.

# UNIT IV OPTIMAL CONTROL

Q

Problem formulation – necessary conditions of optimality – state regulator problem – Matrix Riccati equation – infinite time regulator problem – output regulator and tracking problems – Pontryagin's minimum principles – time - optimal control problem.

# UNIT V ADAPTIVE CONTROL

9

Classification – MRAC systems – Different configuration, classification, mathematical description – direct and indirect MRAC – self tuning regulator – different approach to self tuning, recursive parameter estimation, implicit and explicit STR.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Nagrath I.J., and Gopal, M., Control system Engineering Wiley Eastern Reprint 1995.
- 2. Kirk D.E., "Optimal control theory-an introduction", Prentice Hall, N.J. 1970.

- 1. Chalam V.V., Adaptive control systems Marcel Dekker, INC New York and Bassel, 1987
- 2. Stanley M.Shinners, Modern Control System Theory and Design, John Wiley and Sons, 1998.



Subject Code: BEE18E03	Subject Name : MECHATRONICS	TY / LB/ ETL	L	T / S.Lr	P/ R	С
	Prerequisite: Nil	T	3	0/0	0/0	3

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

# **OBJECTIVE:**

- Introduction to mechatronics and mechatronics approaches to modem engineering design.

Ability to	understa	nd vario	us sens	ors and	l transc	ducers	for sign	nal pro	cessing a	nd data	display.		
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BEE18E03 MECHATRONICS 3 0/0 0/0 3

# UNIT I INTRODUCTION

9

Mechatronics – definition and key issues – evolution – elements – mechatronics approach to modern engineering design.

# UNIT II SENSORS AND TRANSDUCERS

9

Types – displacement, position, proximity and velocity sensors – signal processing – data display.

# UNIT III ACTUATION SYSTEMS

9

Mechanical types – applications – electrical types – applications – pneumatic and hydraulic systems – applications – selection of actuators.

# UNIT IV CONTROL SYSTEMS

9

Types of controllers – programmable logic controllers – applications – ladder diagrams – microprocessor applications in mechatronics – programming interfacing – computer applications

#### UNIT V RECENT ADVANCES

9

Manufacturing mechatronics – automobile mechatronics – medical mechatronics – office automation – case studies.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

- 1. Bulton, N., Mechatronics: Electronic Control system for Mechanical and Electrical Engineering, Longman, 1995.
- 2. Dradly, D.A. Dawson., D, Burd, N.C., and Loader, A.J., Mechatronics: Electronics in products and processes, Chapman & Hall, 1993.

- 1. HMT Mechatronics, Tata McGraw-Hill, New Delhi, 1968
- 2. GalipUlsoy, A., and Devires, W.R. microcomputer Applications in manufacturing John wiley, USA 1989.
- 3. James Harter, Electromechanics: Principles, concepts and devices Prentice Hall New Jersey 1995



Subject Code: BEI18E19		Subject Name : INSTRUMENTATION IN TY / L T / P/ C PAPER AND PULP INDUSTRY LB/ S.Lr R ETL											С
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# BEI18E19 INSTRUMENTATION IN PAPER AND PULP 3 0/0 0/0 3 INDUSTRY

#### UNIT 1 AN OVERVIEW OF PAPER MAKING PROCESS

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Paper making process — Raw materials — Pulp separation — screening — Bleaching — Cooking — Chemical reaction — chippers — types of digesters — H factor and Kappa factors- Stock preparation — Instrumentation needs — Energy conservation and paper quality control.

# UNIT II PAPER PROPERTIES AND ITS MEASUREMENT

9

Physical, electrical, optical and chemical properties of paper — Basic weight, thickness, density, porosity, smoothness, softness, hardness and compressibility — stress-strain relationship — Tensile strength, bursting strength, tearing resistance, folding endurance, stuffiness and impact strength — Dielectric constant, dielectric strength, dielectric loss and Properties of electrical insulating paper — Brightness, colour, gloss and capacity — Starch constant acidity and pH - Measurement techniques.

#### UNIT III CONSISTENCY MEASUREMENT

9

Definition of consistency — Techniques for head box consistency measurement — Stock consistency measurement and control.

#### UNIT IV PAPER MAKING MACHINE

9

Functioning of Paper making machine — Quality parameters — moisture, basic weight, caliper, brightness, colour, ash content, strength, gloss and tensile strength - parameters monitoring Instrumentation.

#### UNIT V CONTROL ASPECTS

9

Machine and cross direction control technique — consistency, moisture and basic weight control — dryer control — computer based control systems - mill wide control.

**Total No of Periods: 45** 

# **REFERENCES:**

- 1. Sankaranarayanan, P.E., Pulp and Paper Industries Technology and Instrumentation Kotharis Desk book series, 1995.
- 2. Handbook of Pulp and Paper technology, Britt K.W.Van Nostrand Reinbold Company, 1970.
- 3. James P.Casey, Pulp and Paper chemistry and chemical Technology, John Wiley and sons, 1981.
- 4. Austin G.T., Shrencs Chemical Process Industries, McGraw Hill International Student Edition, Singapore, 1985.



BEÍ18E20  IRÓN AND STEEL INDUSTRY  Prerequisite: Industrial Instrumentation I,II T 3 0/0 0/0 0/0 3  L: Lecture T: Tutorial SLr: Supervised Learning P: Project R: Research C: Credits  T/L/ETL: Theory/Lab/Embedded Theory and Lab  OBJECTIVE:  Introduction to furnaces.  Introduction to furnaces.  Interstudy of Casting and Rolling  Understanding the measurement in Iron and Steel industries  Gaining familiarity in Evolution in computer Application  COURSE OUTCOMES (COs): (3-5)  CO1 Introduction to furnaces  CO2 The study of Casting and Rolling  CO3 Understanding the measurement in Iron and Steel industries  CO4 Gaining familiarity in control Application  CO5 Gaining familiarity in Evolution in computer Application  CO5 Gaining familiarity in Evolution in computer Application  CO6 Gaining familiarity in Evolution in computer Application  CO7 Defense Outcomes with Program Outcomes (POs)  CO8/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12  CO2 M H L M H L M H L H M L H M L H M L M L		JEPA	KIML	I Or	ELEC.	IKIC	AL AN	D ELI	LCIKU	DINIC	5 ENGIN	CCK	TING		
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Mapping of Course Outcomes with Program Outcomes (POs)   COs/POs	CO5	Gai	ining fami	iliarity	in Evol	lution i	n comp	outer A	pplicat	tion					
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# BEI18E20 INSTRUMENTATION IN IRON AND STEEL 3 0/0 0/0 3 INDUSTRY

#### UNIT-I INTRODUCTION TO FURNACES

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Process description in diagrammatic and functional block details – raw materials preparation – operation of blast furnace (BF) and auxiliary units including stoves – basic oxygen furnace (BoF) – electric furnace (EF) – open hearth furnace (OHF) – relative merits of various steel making furnaces.

#### UNIT II CASTING AND ROLLING

9

Quality of steel – impurities present and allowed limits for usable steel – waste recycling. Continuous casting and batch casting of steel – primary and secondary rolling – features of cold rolling – steel finishing operations.

# UNIT III MEASUREMENTS IN IRON AND STEEL INDUSTRIES

9

Identification of various process parameters in the industry – selection of suitable measurement hardware for temperature, pressure, level, flow, weighing and proportioning – special gauges for measurement of thickness and shape – Control room layout for mill operations – graphic displays – alarm management.

#### UNIT IV CONTROL APPLICATION

9

Special applications for controls – Blast Furnace (BF) Stove combustion control system – gas and water control system in Basic Oxygen Furnace (BoF) – Mould Level control system in Strand Casting operations.

# UNIT V EVOLUTION OF COMPUTER APPLICATIONS

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Evolution of computer applications in the industry – Review of data logging, SCADA, DDC and DCS. Practices for model calculating and data logging – steel rolling mill control – annealing process control – utilities management with computer system.

**Total No of Periods: 45** 

# **TEXT BOOKS:**

1. Liptak, Bela G, Instrumentation in the Processing Industries, Chilton Publishers, 1973.

- 1. Considine D. M., Process/Industrial Instruments and control Handbook, McGraw Hill, 4th edition 1993. 2. Serope Kalpakjian, Manufacturing Engineering and Technology, Addison Wesley Publishing Company, Massachusetts, 3rd edition, 1995.
- 2. Robert H. Perry, D.W. Green and J.O. Maloney, Perry's Chemical Engineers, Handbook, McGraw Hill Inc, New York, 7th ed, 1998.