Department of Electronics and Communication Engineering

SEMESTER – I

Course Code	Course Title	C	L	T/SLr	P/R	Ty/Lb/ETL
BEN17001	TECHNICAL ENGLISH –I	2	1	0/0	2/0	Ty
BMA17001 BMA17002	MATHEMATICS – I/ BIO MATHEMATICS (FOR BIOTECH)	4	3	1/0	0/0	Ty
BPH17001	ENGINEERING PHYSICS	3	2	0/1	0/0	Ty
BCH17001	ENGINEERING CHEMISTRY –I	3	2	0/1	0/0	Ty
BES17001	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	2	0/1	0/0	Ty
BES17002	BASIC MECHANICAL & CIVIL ENGINEERING	3	2	0/1	0/0	Ty
ANNUAL PATTERN (PRACTICALS)*						
BES17ET1	BASIC ENGINEERING GRAPHICS	2	1	0/0	2/0	ETL
BPH17L01	ENGINEERING PHYSICS LAB	1	0	0/0	2/0	Lb
BCH17L01	ENGINEERING CHEMISTRY LAB	1	0	0/0	2/0	Lb
BES17L01	BASIC ENGINEERING WORSHOP	1	0	0/0	2/0	Lb
BES17ET2	C PROGRAMMING AND LAB	2	1	0/0	2/0	ETL
BES17ET3	ENTREPRENEURIAL SKILL DEVELOPMENT & PROJECT LAB	1	0	0/0	2/0	ETL

Credits Sub Total:26

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

SEMESTER – II

Course Code	Course Title	C	L	T/SLr	P/R	Ty/Lb/ETL
BEN17002	TECHNICAL ENGLISH – II	2	1	0/0	2/0	Ty
BMA17003 BMA17004	MATHEMATICS – II / BIO STATISTICS (FOR BIOTECH)	4	3	1/0	0/0	Ty
BPH17002	MATERIAL SCIENCE	3	2	0/1	0/0	Ty
BCH17002	ENGINEERING CHEMISTRY – II	3	2	0/1	0/0	Ty
BES17003	ENVIRONMENTAL SCIENCE	3	3	0	0/0	Ty

Credits SubTotal:15

SEMESTER – III

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BMA17007	PROBABILITY AND RANDOM PROCESS	4	3	1/0	0/0	Ty
BEC17001	CIRCUIT THEORY	4	3	1/0	0/0	Ty
BEC17002	DIGITAL ELECTRONICS	4	3	1/0	0/0	Ty
BEC17003	SOLID STATE DEVICES	3	3	0/0	0/0	Ty
BCS17I01	C++ AND DATA STRUCTURES (INTER DISCIPLINARY THEORY 1)	3	3	0/0	0/0	Ty

Practical:

BEC17ET1	ELECTRICAL MACHINES AND PCB DESIGN	3	2	0/0	2/0	ETL
BEC17L01	CIRCUITS AND DEVICES LAB	1	0	0/0	3/0	Lb
BEC17L02	DIGITAL SYSTEM DESIGN LAB	1	0	0/0	3/0	Lb

BCS17IL1	C++ AND DATA STRUCTURES LAB(INTER DISCIPLINARY LAB 1)	1	0	0/0	3/0	Lb

Credits Sub Total: 24

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 (Departmental level Refer Annexure for evaluation methodology)**

SEMESTER – IV

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BMA17012	MATHEMATICS IV FOR ELECTRONICS ENGINEERS	4	3	1/0	0/0	Ty
BEC17004	CONTROL SYSTEMS FOR ELECTRONICS ENGINEERS	4	3	1/0	0/0	Ty
BEC17005	SIGNALS AND SYSTEMS	4	3	1/0	0/0	Ty
BEC17006	ELECTRONIC CIRCUITS	3	3	0/0	0/0	Ty
BCS17I02	COMPUTER NETWORKS (INTER DISCIPLINARY THEORY 2)	3	3	0/0	0/0	Ty

Practical:

BSK17ET1	SOFT SKILL 1 CAREER & CONFIDENCE BUILDING	2	1	0/1	0/0	ETL
BEC17ET2	ANALYSIS OF ELECTRO MAGNETIC FIELD THEORY	3	1	0/1	2/0	ETL
BEC17L03	ELECTRONIC CIRCUITS LAB	1	0	0/0	3/0	Lb
BEC17L04	DIGITAL SIMULATION LAB	1	0	0/0	3/0	Lb
BCS17IL2	COMPUTER NETWORKS LAB (INTER DISCIPLINARY LAB 2)	1	0	0/0	3/0	Lb
BEC17TS1	TECHNICAL SKILL I (CERTIFICATE COURSE)	1	0	0/0	3/0	Lb

Credits Sub Total: 27

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 (Departmental level Refer Annexure for evaluation methodology)**

SEMESTER – V

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BEC17007	TRANSMISSION LINES AND WAVE GUIDES	4	3	1/0	0/0	Ty
BEC17008	DIGITAL SIGNAL PROCESSING	4	3	1/0	0/0	Ty
BEC17009	MICROPROCESSOR AND MICROCONTROLLER	3	3	0/0	0/0	Ty
BEC17010	COMMUNICATION SYSTEMS	3	3	0/0	0/0	Ty
BEI17I01	MEASUREMENT AND INSTRUMENTATION (INTER DISCIPLINARY THEORY 3)	3	3	0/0	0/0	Ty

Practical:

BEC17ET3	DESIGN AND IMPLEMENTATION OF LINEAR INTEGRATED CIRCUITS	3	1	0/0	2/0	ETL
BEC17L05	COMMUNICATION LAB - I	1	0	0/0	3/0	Lb
BEC17L06	MICRO PROCESSOR AND MICROCONTROLLER LAB	1	0	0/0	3/0	Lb

BEE17IL1	SIMULATION OF ELECTRICAL AND ELECTRONICS CIRCUITS USING PSPICE(INTER DISCIPLINARY LAB 3)	1	0	0/0	3/0	Lb
BEC17TS2	TECHNICAL SKILL II (CERTIFICATE)	1	0	0/0	3/0	Lb
BEC17L07	INPLANT TRAINING	1	0	0/0	3/0	Lb

Credits Sub Total : 25

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 (Departmental level Refer Annexure for evaluation methodology)**

SEMESTER – VI

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BEC17011	DIGITAL COMMUNICATION	4	3	1/0	0/0	Ty
BEC17012	ANTENNA AND WAVE PROPAGATION	3	3	0/0	0/0	Ty
BEC17EXX	ELECTIVE I	3	3	0/0	0/0	Ty
BME17I04	BASICS OF ROBOTICS (INTER DISCIPLINARY THEORY 4)	3	3	0/0	0/0	Ty
BEC17OE1	OPEN ELECTIVE	3	3	0/0	0/0	Ty

Practical:

BSK17ET2	SOFT SKILL II QUALITATIVE AND QUANTITATIVE SKILLS	2	1	0/1	0/0	ETL
BEC17L08	COMMUNICATION LAB II	1	0	0/0	3/0	Lb
BEC17L09	ROBOTICS LAB	**1**	0	0/0	3/0	Lb
BEC17L10	OPEN CV - PYTHON FOR DIGITAL IMAGE PROCESSING LAB	1	0	0/0	3/0	Lb
BEC17L11	MINI PROJECT	1	0	0/0	3/0	Lb
BEC17TS3	TECHNICAL SKILL III	1	0	0/0	3/0	Lb

Credits Sub Total: 23

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 (Departmental level Refer Annexure for evaluation methodology)**

SEMESTER – VII

Theory:

Course Code	Course Title	C	L	T/SLr	P/R	Ty / Lb/ ETL
BEC17013	INTRODUCTION TO VLSI AND EMBEDDED SYSTEM DESIGN	4	3	1/0	0/0	Ty
BEC17014	OPTICAL COMMUNICATION AND NETWORKS	4	3	1/0	0/0	Ty
BEC17EXX	ELECTIVE II	3	3	0/0	0/0	Ty
BEC17EXX	ELECTIVE III	3	3	0/0	0/0	Ty
BMG17001	PRINCIPLES OF MANAGEMENT	3	3	0/0	0/0	Ty

Practical:

BEC17ET4	ELECTIVE (INTERNET OF THINGS)	3	1	0/0	2/2	ETL
BEC17L12	MICROWAVE AND OPTICAL COMMUNICATION LAB	1	0	0/0	3/0	Lb
BEC17L13	VLSI AND EMBEDDED SYSTEM DESIGN LAB	1	0	0/0	3/0	Lb
BEC17L14	PROJECT PHASE I	2	0	0/0	3/1	Lb
BFL17001	FOREIGN LANGUAGE (EVALUATION)	2	1	1		

Credits Sub Total: 26

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 (Departmental level Refer Annexure for evaluation methodology)**

SEMESTER – VIII

Theory:

Course Code	Course Title	C	L	T/S Lr	P/R	Ty / Lb/ ETL
BEC17EXX	ELECTIVE IV	3	3	0/0	0/0	Ty
BEC17EXX	ELECTIVE V	3	3	0/0	0/0	Ty
BMG17003	TOTAL QUALITY MANAGEMENT	3	3	0/0	0/0	Ty

Practical:

BEC17L15	PROJECT PHASE II	10	0	0/0	20/0	Lb

Credits Sub Total: 19

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 (Departmental level Refer Annexure for evaluation methodology)

4 Credit papers should compulsorily have either P/R component.

Credit Summary

Semester : 1 : 18
Semester : 2 : 23
Semester : 3 : 24
Semester : 4 : 27
Semester : 5 : 25
Semester : 6 : 23
Semester : 7 : 26
Semester : 8 : 19

Total Credits : 185

Department of Electronics and Communication Engineering

LIST OF ELECTIVES						
S.No	**Sub. Code**	**Title of the Subject**	**L**	**T**	**P**	**C**
1.	BEC17E01	Biomedical Instrumentation	3	0	0	3
2.	BEC17E02	Pattern Recognition	3	0	0	3
3.	BEC17E03	Device Modeling	3	0	0	3
4.	BEC17E04	Quantum computing	3	0	0	3
5.	BEC17E05	Microwave Engineering	3	0	0	3
6.	BEC17E06	Real Time Operating Systems	3	0	0	3
7.	BEC17E07	Power Electronics	3	0	0	3
8.	BEC17E08	Cryptography and -Network Security	3	0	0	3
9.	BEC17E10	Disaster Management	3	0	0	3
10.	BEC17E11	Television & Video Engineering	3	0	0	3
11.	BEC17E12	Operating Systems	3	0	0	3
12.	BEC17E13	Visual Programming	3	0	0	3
13.	BEC17E14	Bio-Signal Processing	3	0	0	3
14.	BEC17E15	Digital Image Processing	3	0	0	3
15.	BEC17E16	Neural networks and its Applications	3	0	0	3
16.	BEC17E17	Advanced Microprocessors	3	0	0	3
17.	BEC17E18	Database Management Systems	3	0	0	3
LIST OF OPEN ELECTIVES						
S.No	**Sub.Code**	**Title of the subject**	**L**	**T**	**P**	**C**
1.	BEC17OE1	Cellular mobile communication	3	0	0	3
2.	BEC17OE2	Satellite Communication	3	0	0	3
3.	BEC17OE3	Radar & Navigational Aids	3	0	0	3
4.	BEC17OE4	ADHOC and Sensor Network	3	0	0	3
5.	BEC17OE5	Multimedia compression techniques	3	0	0	3

Dr.M.G.R. Educational and Research Institute
(Deemed to be University U/S 3 of the UGC Act 1956)
An ISO 9001:2008 Certified Institution
Maduravoyal, Chennai - 95
Department of Electronics and Communication Engineering

SEMESTER - I

DEPARTMENT OF ENGLISH

Subject Code : **BEN17001**	Subject Name : **TECHNICAL ENGLISH - I**	C	L	T/SLr	P/R
	Prerequisite : None	**2**	**1**	**0/0**	**2/0**

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

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

OBJECTIVES :

1. Strengthen their vocabulary in both technical and business situations
2. Get practice in functional grammar
3. Learn the effective way of corresponding with officials
4. Learn to give instructions, suggestions, recommendations and comprehend and infer the information from the given passages.
5. Strain learners in organized academic and professional writing in LSRW skills

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Strengthen their active and technical vocabulary
CO2	Understand functional grammar and gain proficiency in technical writing
CO3	Learn the appropriate technique of writing formal and business letters and prepare oneself to read the advertisement and prepare the resume relevantly
CO4	Learn to give instructions, suggestions, recommendations and comprehend and infer the information from the given passages
CO5	Focus on academic and technical writing

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO 9	PO10	PO1 1	PO1 2
CO1				H						H		H
CO2				H						H		H
CO3				H		M			H	H		H
CO4				H					H	H		H
CO5				H					H	H		H

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

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

BEN17001 TECHNICAL ENGLISH I 2 1 0/0 2/0

1. Vocabulary, Grammar and Usage - I (6)

Meanings of words and phrases, synonyms and antonyms – affixes: prefixes and suffixes and word formation – nominal compounds, expanding using numbers and approximation – Verb: tense, auxiliary and modal –Voice: active, passive and impersonal passive

2. Vocabulary, Grammar and Usage – II (6)

Infinitives and Gerunds – preposition, prepositional phrases, preposition + relative pronoun-'If' clause, sentences expressing 'cause and effect', 'purpose',
Instructions, suggestions and recommendations

3. Reading (6)

Questions: Wh-pattern, Yes/no questions, tag questions
Comprehension: extracting relevant information from the text, by skimming and scanning and inferring, identifying lexical and contextual meaning for specific information, identifying the topic sentence and its role in each paragraph, comprehending the passage and answering questions - Précis writing

4. Writing (6)

Adjectives: degrees of comparison
Concord: subject-verb agreement
Interpretation of tables and flowcharts: writing a paragraph based on information provided in a table using comparison and contrast, classifying the data and flowchart, describing logical steps involved in specific

functions, note - making from a given passage- letter writing, formal: seeking permission to undergo practical training, letter to an editor of a newspaper complaining about civic problems and suggesting suitable solutions

5. Functional English and Practical Components (6)

Listening : Listening to stories, conversation, dialogue, speeches of famous people, and identifying the grammar components

Speaking : Scripting and enacting role plays/ narrating incidents

Reading : Review of books, articles, fiction- Extensive reading/ user manuals, pamphlets, brochures

Writing : paragraph and essay writing using academic vocabulary

Total No of Periods : 30

Text Book

1. Pushkala. R, PadmasaniKannan.S, Anuradha. V, Chandrasena Rajeswaran. M: **Quest:**A Textbook of Communication Skills, Vijay Nicole

References

1. Pushkala R, P.A.Sarada, El Dorado: A Textbook of Communication Skills, Orient Blackswan, 2014
2. PadmasaniKannan.S., Pushkala.R. : Functional English
3. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
4. McCarthy, Michael et.al,, English Vocabulary in Use, Advanced, Cambridge Univ. Press, 2011
5. Wren and Martin: Grammar and Composition, Chand & Co, 2006

Web Resources

1. https://learnenglish.britishcouncil.org
2. www.englishpage.com
3. www.writingcentre.uottawa.ca/hypergrammar/preposit.html
4. www.better-english.com/grammar/preposition.html
5. http://www.e-grammar.org/infinitive-gerund/
6. www.idiomsite.com/

DEPARTMENT OF MATHEMATICS

Subject Code : **BMA17001**	Subject Name : **MATHEMATICS – I**	C	L	T/SLr	P/R
	Prerequisite : None	**4**	**3**	**1/0**	**0/0**

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

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

OBJECTIVES :

1. Apply the Basic concepts in Algebra
2. Use the Basic concepts in Matrices
3. Identify and solve problems in Trigonometry
4. Understand the Basic concepts in Differentiation
5. Apply the Basic concepts in Functions of Several variables

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Find the summation of the given series of binomial, exponential & logarithmic
CO2	Transform a non – diagonal matrix into an equivalent diagonal matrix using orthogonal transformation.

CO3	Find expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts.
CO4	Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function.
CO5	Evaluate the partial / total differentiation and maxima / minima of a function of several variables.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Approval	

BMA17002 **MATHEMATICS – I** **4 3 1/0 0/0**

1. ALGEBRA (12)

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

2. 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.

3.TRIGONOMETRY (12)

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

4. DIFFERENTIATION (12)

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

5. 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).

References

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

DEPARTMENT OF MATHEMATICS

Subject Code : **BMA17002**	Subject Name :**BIO MATHEMATICS**	C	L	T/SLr	P/R
	Prerequisite : None	**4**	**3**	**1/0**	**0/0**
L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab					

Department of Electronics and Communication Engineering

OBJECTIVES :

1. Use the Basic concepts in Matrices
2. Understand the Basic concepts in Differentiation
3. Understand the Basic concepts in Integration
4. Apply the Basic concepts in Interpolation
5. Analyze the Basic concepts in Numerical Differentiation and Integration

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Find the sum, difference, product and inverse of matrixes
CO2	Find the derivative of the given function and to find the maxima / minima of the given function.
CO3	Integrate the given function by using the methods of integration and to find area under the given curve and the volume of the solid by revolution.
CO4	Evaluate the value of function at the given point and to find the polynomial expressions of the given function.
CO5	Find the differentiation of a function at the given point and to find the integration of the given function at the given point

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

			Sciences		es				
	√								
Approval									

BMA17002 BIO MATHEMATICS 4 3 1/0 0/0

1.MATRICES (12)

Elementary operations on Matrices – Inverse of a Matrix – Solving simultaneous equations (atmost three equations with three unknowns) using Cramer's rule.

2. DIFFERENTIATION (12)

Basic concepts of Differentiation – Elementary differentiation methods – Parametric functions – Implicit function – Maxima and Minima (simple problems).

3.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 using single integrals (simple problems).

4.INTERPOLATION (12)

Interpolation: Newton's forward, Newton's backward formulae – Newton's divided differences – Lagrange's polynomial (simple problems).

5. NUMERICAL DIFFERENTIATION AND INTEGRATION (12)

Numerical differentiation with interpolation polynomials (Newton's forward and backward only) – Numerical integration by Trapezoidal and Simpson's (both $1/3^{rd}$& $3/8^{th}$) rules (simple problems).

Total no. of periods: 60

Text Books

1. Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).
2. H.K.Das, Engineering Mathematics, S.Chand Publishers
3. Veerarajan T., *Numerical Methods*, Tata McGraw Hill Publishing Co., (2007).

References

1. Shanti Narayanan, *Differential Calculus*, S.Chand& Co., New Delhi, (2005).
2. Shanti Narayanan, *Integral Calculus*, S.Chand& Co., New Delhi, (2005).
3. John Bird, *Basic Engineering Mathematics (5th ed.)*, Elsevier Ltd, (2010).

DEPARTMENT OF PHYSICS

Subject Code : **BPH17001**	Subject Name : **ENGINEERING PHYSICS**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing this course were able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

CO3	H	H	H	M		M				M		L
CO4	H	H	M		M			M				M
CO5	H	M	L	H								
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												

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

BPH17001 ENGINEERING PHYSICS 3 2 0/1 0/0.

1. PROPERTIES OF MATTER & ACOUSTICS (9)

Elasticity – Twisting couple on a Wire (derivation) – Shafts – Comparison of Solid and Hollow Shaft – Bending moment – Depression of a Cantilever – Determination of Young's modulus by Depression of a Cantilever – Uniform and non uniform bending (Experiment) – I form of Girders.
Viscosity – Definitions – Lubrication – Properties & Types of Lubricant. Acoustics of Buildings – Reverberation – Reverberation time –Sabine`s formula for Reverberation Time – Absorption Coefficient and its Determination – Factors affecting Acoustics of Buildings and its Remedial Measures.

2. THERMAL PHYSICS (9)

Thermal conduction – Thermal Expansion – Expansion joints – Bimetallic strips – Thermal conductivity (k) – Lee's Disc method (theory and experiment) – Radial flow of heat –Thermal conductivity of Glass – Thermal conductivity of Rubber Tube – Flow of heat through Compound Media – Thermal Insulation of buildings – Thermal radiation – Concept of Black body radiation – Fundamentals of Low Temperature Physics.

3. ULTRASONICS AND ITS APPLICATIONS (9)

Properties & Production of Ultrosonics – Piezoelectric method – Magnetostriction method – Acoustic Grating – Industrial Applications – Ultrasonic flaw detection (Block Diagram) – Medical Application: Velocity Blood Flow Meter – PhonoCardiography – Ultrasound imaging – Hazards and safety of Ultrasound – NDT of Materials using Ultrasonics.

4. LASER & ITS APPLICATIONS (9)

Nature of Light – Laser Principle & Characteristics–Ruby laser – Nd- YAG Laser – He-Ne Laser – Co_2 Laser – Semiconductor laser – Homo junction & Hetero Junction Laser – Engineering applications – Holography, Surveying – Industrial applications – Cutting, Welding – Medical applications – Surgery

5. FIBER OPTIC COMMUNICATION (9)

Total Internal Reflection – Propagation of Light in Optical Fibres – Numerical aperture and Acceptance Angle – Types of Optical Fibres (material, refractive index, mode) – Fibre Optical Communication system (Block diagram) – Attenuation–Transmitter, Receiver, Dispersion, Modulation/Demodulation Advantages of Fibre Optical Communication System – IMT, PMT, Wavelength Modulated & Polarization Modulated Sensors – Endoscope Applications.

Total No. of Periods : 45

Text Books

1. M. Arumugam, "Engineering Physics", Anuradha Publication (2004)
2. Dr. Senthil Kumar "Engineering Physics I" VRB Publishers (2016)
3. N.S.Shubhashree&R.Murugesan., "Engineering Physics", Sreelakhsmi Publishers(2008)

References

4. K. Gaur & S.L. Gupta, "Engineering. Physics", Dhanpat Raj & Sons, VI Edition, (1988)
5. Palanisamy, P.K., "Engineering Physics", Scitech Publications (P) Ltd., (2006)

DEPARTMENT OF CHEMISTRY

Subject Code : **BCH17001**	Subject Name : **ENGINEERING CHEMISTRY – I**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

CO1	Gain a clear understanding of the basics of chemical thermodynamics which include concepts such as Enthalpy, Entropy and Free energy.
CO2	Obtain an overall idea of Water quality parameters, Boiler requirements, problems, Water softening and Domestic Water treatment.

CO3	Improving the basic knowledge in electrical conductance and emf and also understand the chemical principles of storage devices.
CO4	Observe the information about corrosion and understand the mechanisms of corrosion and the methods of corrosion control.
CO5	Articulate the science of polymers and composites**.**

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

BCH17001 ENGINEERING CHEMISTRY – I 3 2 0/1 0/0

1. 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.

2.TECHNOLOGYOF 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.

3. 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 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.

4. CORROSION AND PROTECTIVE COATING (9)

Introduction–Causes of Corrosion–Consequences- Factors affecting corrosion. Theories of corrosion-Chemical corrosion and Electrochemical corrosion. Methods ofcorrosion control – corrosion inhibitors, Sacrificial anode and Impressed current cathodic protection.
Protective coatings- Metallic coatings- Chemical conversion coatings-paints-Constituents and functions.

5.POLYMERS AND COMPOSITES (9)

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

Total number of periods : 45

Textbooks

1. S.Nanjundan & C.SreekuttanUnnithan, “Applied Chemistry”, Sreelakshmi Publications, (2007)
2. Dr.R.Sivakumar and Dr.N.Sivakumar” Engineering Chemistry” Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

References

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 & ELECTRONICS ENGINEERING

Subject Code : **BES17001**	Subject Name : **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

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

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

OBJECTIVES :

1. Understand the concepts of circuit elements, circuit laws and coupled circuits.
2. Acquire knowledge on conventional &non conventional energy production.
3. Gain information on measurement of electrical parameters.
4. Identify basic theoretical principles behind the working of modern electronic gadgets.
5. Demonstrate digital electronic circuits and assemble simple devices.

Department of Electronics and Communication Engineering

COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to	
CO1	Students understand Fundamental laws and theorems and their practical applications
CO2	Predict the behavior of different electric and magnetic Circuits.
CO3	Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution.
CO4	Identify & Apply schematic symbols and understand the working principles of electronic devices
CO5	Analyze basics of digital electronics and solving problems and design combinational circuits

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Approval	

BES17001 BASIC ELECTRICAL & ELECTRONICS ENGINEERING 3 2 0/1 0/0

1. ELECTRIC CIRCUITS (9)

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

2. 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.

3. 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.

4. ELECTRON DEVICES (9)

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

5. 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 Halkias1991, Electronic Devices and Circuits , Tata McGraw Hill,

References

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 : **BES17002**	Subject Name : **BASIC MECHANICAL & CIVIL ENGINEERING**	C	L	T/SLr	P/R

Department of Electronics and Communication Engineering

	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

Department of Electronics and Communication Engineering

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

BES17002 BASIC MECHANICAL & CIVIL ENGINEERING 3 2 0/1 0/0

UNIT- I : THERMAL ENGINEERING (9)

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

UNIT- II : MANUFACTURING PROCESS (13)

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing. Casting process – Patterns -Moulding tools - Types of moulding - Preparation of green sand mould -Operation of Cupola furnace.
Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature.

UNIT- III : MECHANICS (9)

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

UNIT- IV : BUILDING MATERIALS AND CONSTRUCTION (7)

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

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

UNIT- V : ROADS, RAILWAYS, BRIDGES & DAMS (7)

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

Total No. of Periods : 45

Text books

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

References

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

DEPARTMENT OF MECHANICAL ENGINEERING

Subject Code : **BES17ET1**	Subject Name : **BASIC ENGINEERING GRAPHICS**	C	L	T/SLr	P/R
	Prerequisite : None	**2**	**1**	**0/0**	**2/0**

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

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

OBJECTIVES :

1. Learn to know what kind of pencils to be used to sketch lines, numbers, Letters and Dimensioning in drawing sheet.
2. Draw Projection of points, line, planes and solids using Drafters
3. To identify the angle of projection and development of surfaces, isometric projection and Orthographic projection
4. Know the basics of elevation and plan of building.
5. 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.

Department of Electronics and Communication Engineering

Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO11	PO 12
CO1	H	H	H	M	M	M			H	H		H
CO2	H	H	H	M	M	M			H	H		H
CO3	H	H	H	L		M			M	M		M
CO4	H	H	M	M		H		M	H	H		H
CO5	H	H	H	M	H	L		M	H	H		H
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												

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

BES17ET1 BASIC ENGINEERING GRAPHICS 2 1 0/0 2/0

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 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.

References

1. Natarajan, K.V (2014) A Text Book of Engineering Graphics, DhanalakshmiPublisheres, Chennai
2. Venugopal, K and Prabhu Raja, V. (2010) Engineering Graphics, New Age International (P) Limited

Special Points applicable to University examinations on Engineering Graphics

1. There will be five questions, each of either or type covering all UNIT-s of the syllabus
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consists of drawing sheets of A2 size only. The students will be permitted to use appropriate scale to fit solution within A2 size.

Department of Electronics and Communication Engineering

DEPARTMENT OF PHYSICS

Subject Code : **BPH17L01**	Subject Name : **ENGINEERING PHYSICS LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

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

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

OBJECTIVES :

1. Demonstrate an ability to make physical measurements & understand the limits of precision in measurements.
2. Display the ability to measure properties of variety of electrical, mechanical, optical systems.

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Recognize the correctness and precision in the results of measurements.
CO2	Construct and compare the properties of variety of electrical, mechanical, electronic and optical systems.
CO3	Practice the handling of Electrical, Electronic, Optical & Mechanical Equipments
CO4	Identify and compare the theoretical and practical usage of various instruments

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

Department of Electronics and Communication Engineering

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

BPH17L01 ENGINEERING PHYSICS LAB 1 0 0/0 2/0

LIST OF EXPERIMENTS (Any Seven)

1. Torsional Pendulum Without Masses–Determination of Rigidity Modulus and Moment of Inertia
2. Torsional Pendulum With Masses–Determination of Rigidity Modulus and Moment of Inertia
3. Non Uniform Bending – Determination of Young`s Modulus
4. Uniform Bending – Determination of Young`s Modulus
5. Poiseuille`s Method - Determination of Coefficient of Viscosity of a given liquid
6. Lee's Disc – Determination of Thermal Conductivity of Bad Conductor
7. Spectrometer – Determination of Refractive Index of a Prism
8. Laser Grating – Determination of Wavelength of a given Source
9. Spectrometer –Determination of Wavelength of Mercury Spectrum using Grating
10. Transistor Characteristics.

DEPARTMENT OF CHEMISTRY

Subject Code : **BCH17L01**	Subject Name :**ENGINEERING CHEMISTRY LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

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

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

OBJECTIVES :

1. To familiarize the students in the determination of water quality parameters
2. To help learners measure conductivity and EMF using electrical equipment.
3. To create awareness about corrosion.
4. To determine the essential parameters of polymers

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Awareness of water quality parameters and its determination.
CO2	Familiarizing the conductometric titration method.
CO3	Ability to measure EMF and perform potentiometric titrations.
CO4	Measuring the Molecular weight of macromolecules
CO5	Gaining awareness about corrosion.

Mapping of Course Outcomes with Program Outcomes (POs)

Department of Electronics and Communication Engineering

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H	H	M	M							L
CO2	M	H		L	M				L			
CO3	L	M		L					L			
CO4	M	M		L					L			
CO5	L	M	L	L								M
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												

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

BCH17L01 ENGINEERING CHEMISTRY LAB 1 0 0/0 2/0

LIST OF EXPERIMENTS (Any Seven)

(1) Estimation of temporary, permanent and total hardness of water.

(2) Determination of type and extent of alkalinity in water.

(3) Estimation of dissolved oxygen in a water sample.

(4) Conductometric titration of strong acid vs. strong base

(5) Conductometric precipitation titration using barium chloride and sodium sulphate.

(6) Determination of Equivalent conductance of strong electrolyte at infinite dilution.

(7) Determination of single electrode potential.

(8) Estimation of Fe^{2+}ion by potentiometry.

(9) Determination of Molecular Weight and Degree of Polymerisation of Polymer by viscometry.

(10) Determination of rate of corrosion by weight loss method.

DEPARTMENT OF ENGINEERING SCIENCES

Subject Code : **BES17L01**	Subject Name : **BASIC ENGINEERING WORKSHOP**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

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

Department of Electronics and Communication Engineering

Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	H	H	H	M	M			L	M			L
CO2	H		H	L	M			L	L			
CO3	H		M	L				L	L			
CO4	H	H	M	L				L	L			M
CO5												
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												

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

BES17L01 BASIC ENGINEERING WORKSHOP 1 0 0/0 2/0.

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. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR
2. Soldering practice – Components Devices and Circuits – Using general purpose PCB
3. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
4. Fluorescent lamp wiring.
5. Stair case wiring

ELECTRONIC 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 an electrical equipment.

DEPARTMENT OF COMPUTER SCIENCE

Subject Code : **BES17ET2**	Subject Name : **C PROGRAMMING AND LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**2**	**1**	**0/0**	**2/0**

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

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

OBJECTIVES :

1. Outline the basics of C Language.
2. Apply fundamentals in C programming.
3. Produce and present activities associated with the course.

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Acquire knowledge how to write and execute c programs

CO2	Understand the fundamental expression and statements of C Language.
CO3	Work with arrays, functions, pointers, structures, Strings and Files in C.
CO4	Identify and provide solutions for engineering problems in C programming

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Approval	

BES17ET2 C PROGRAMMING AND LAB 2 1 0/0 2/0

1. INTRODUCTION (6)

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

2.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.

3.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, Write a Program in Recursive Function.

4. 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.

5. 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 :

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

DEPARTMENT OF ENGINEERING SCIENCES

Subject Code : **BES17ET3**	Subject Name : **ENTREPRENEURIAL SKILL DEVELOPMENT & PROJECT LAB**	C	L	T/SLr	P/R
	Prerequisite : None	**1**	**0**	**0/0**	**2/0**

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

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

Department of Electronics and Communication Engineering

OBJECTIVES :

1. Understand how entrepreneurship Education transforms individuals into successful leaders.
2. Identify individual potential &Shape career dreams
3. Understand difference between ideas & opportunities
4. Understand the "flow" & create Entrepreneurial CV.
5. Identify components & create action plan.
6. Use brainstorming in a group to generate ideas.

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

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	Apply an ethical understanding & perspective to change opportunities to business situations

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

							√		
Approval									

BES17ET3 ENTREPRENEURIAL SKILL DEVELOPMENT & PROJECT LAB 1 0 0/0 2/0

1. CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR

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

2. DESIGN THINKING & RISK MANAGEMENT

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 - 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 ?

3.IDEA GENERATION & EVALUATION

Introduction – Finding your flow – Entrepreneurial CV – your draft action plan - D.I.S.R.U.P.T - A model for ideation – Let's ID8 – Mind mapping for ideas – build your own idea bank – Concept of Decision matrix & paired comparison analysis – 5Q framework.

4. ENTREPRENEURIAL OUTLOOK & CUSTOMER DISCOVERY

Effectuation – Start with your means – Segmentation & targeting – Niche marketing – Find your Niche – Drawing & mapping the consumption chain - outcome driven innovation – This is my customer

5. VALUE PROPOSITION& CAP STONE PROJECT PRESENTATION

Introduction – Value proposition design – customer segment – validation exercise – value propositions & assessing fit – Refine your value proposition – Blue ocean strategy - What is prototyping – Design your experiment – Design your MVP – Learning cards & Capstone Presentation.

SEMESTER - II

DEPARTMENT OF ENGLISH

Subject Code : BEN17002	Subject Name : TECHNICAL ENGLISH - II	C	L	T/SLr	P/R
	Prerequisite : None	2	1	0/0	2/0

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

OBJECTIVES :

1. strengthen the academic and interpersonal advanced vocabulary
2. strengthen their writing skill such as summarizing, describing and report writing
3. learn to keep the simple conversations in day to day life
4. get to know certain life skills such as marketing, advertising and do presentation
5. improve the reading skill with comprehension

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	strengthen their active vocabulary and appropriate language usage through reading poems, stories, texts, newspapers, magazines and research articles
CO2	use appropriate technical vocabulary in interpreting data
CO3	engage effectively in role-play, dialogue, conversation and interviews
CO4	equip them for effective interaction with people in all situations both academic and professional
CO5	learn English language as a 'life skill' and prepare for placement interviews

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

Department of Electronics and Communication Engineering

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

BEN17002 TECHNICAL ENGLISH II 2 1 0/0 2/0

Unit I Vocabulary, Grammar and Usage – I (6)

Verbal analogy – picking out the odd one from a series –finding one word substitute – paragraph writing: using discourse markers, defining / describing an object / device / instrument / machine using topic sentence and its role, unity, coherence and use of cohesive expressionsEssay writing with due emphasis on features such as topical sentence, unity, coherence and cohesive devices

UnitII Vocabulary, Grammar and Usage – II (6)

Cloze – completion of sentences suitably, phrases and idioms, homophones – collocation -
Techniques of formatting and drafting reports: writing newspaper reports on accidents, thefts and festivals

Unit III Reading (6)

Correcting errors in sentencesEditing a passage (correcting the mistakes in grammar, spelling and punctuation) -interpreting pie and bar charts

Unit IV Writing (6)

Register: formal and informal – using ellipses in dialogues- framing dialogues-Email: Job Application, Resume

Unit V Functional English and Practical Components **(**6)

Listening: Media Advertisement

Speaking: oral practice- activities related to professional skills (e.g. Marketing, advertising etc.), role play activities using different speech functions (persuasion, negotiation, giving directions and guidance), conversational etiquette (politeness, strategies, turn-taking, body language).

Reading: reading newspaper/ magazine articles for gathering information

Writing: Note-making from newspaper and magazine articles- follow BEC method

Writing and speaking dialogue writing followed by role play in different situations such as asking permission, requesting and instructing, introducing oneself – activities based on BEC

Total No of Periods :30

Text Book

1. Pushkala. R, PadmasaniKannan.S ,Anuradha. V,ChandrasenaRajeswaran.M Quest : A Textbook of ommunication
   Skills, Vijay Nicole,

References

1. Pushkala R, P.A.Sarada, El Dorado: A Textbook of Communication Skills, Orient Blackswan, 2014
2. PadmasaniKannan.S., Pushkala.R. : Functional English
3. Hancock, Mark, English Pronunciation in Use; Cambridge Univ. Press, 2013
4. McCarthy, Michael et.al,, English Vocabulary in Use, Advanced, Cambridge Univ. Press, 2011
5. Wren and Martin: Grammar and Composition, Chand & Co, 2006

Web Sources

1. https://learnenglish.britishcouncil.org
2. www.englishpage.com
3. www.writingcentre.uottawa.ca/hypergrammar/preposit.html
4. www.better-english.com/grammar/preposition.html
5. http://www.e-grammar.org/infinitive-gerund/
6. www.idiomsite.com/

DEPARTMENT OF MATHEMATICS

Subject Code : BMA17003	Subject Name : MATHEMATICS – II	C	L	T/SLr	P/R
	Prerequisite : None	4	3	1/0	0/0

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

OBJECTIVES :

1. Understand the Basic concepts in Integration
2. Identify the Basic concepts in Multiple integrals
3. Use the Basic concepts in Ordinary Differential equations
4. Apply the Basic concepts of Analytical Geometry
5. Analyze the Basic concepts of Vector Calculus

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

CO1	Integrate given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation.
CO2	Evaluate the multiple integrals / area /volume and to change the order of integration.
CO3	Solve the ordinary differential equation and to solve Eulers differential equation.
CO4	Find the equation of planes, lines and sphere and to find the shortest distance between to skew lines.

CO5	Find the gradient, maximum directional derivative and work done by a force and to verify Green/ Stokes/ Gauss divergence theorem

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO 9	PO10	PO1 1	PO1 2
CO1	H	H			M	M			M	M		H
CO2	H	H			M	H			H	H		M
CO3	H	H			M	H			H	H		M
CO4	H	H			L	M			M	H		M
CO5	H	H			M	M			M	H		M

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

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

Approval	

BMA17003 **MATHEMATICS – II** **4 3 1/0 0/0**

1. 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).

2. 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).

3.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).

4.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.

5. VECTOR CALCULUS (12)

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

Total no. of periods : 60

Textbooks

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

References

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

DEPARTMENT OF MATHEMATICS

Subject Code : **BMA17004**	Subject Name : **BIO STATISTICS**	C	L	T/SLr	P/R
	Prerequisite : None	**4**	**3**	**1/0**	**0/0**

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

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

OBJECTIVES :

1. Understand the Basic concepts in Statistics
2. Use the Basic concepts in Correlation
3. Understand the Basic concepts in Probability theory

4. Apply the Basic concepts in Testing of Hypothesis

5. Analyze the Basic concepts in Design of Experiments

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	Find the measures of central tendency and to find the measures of dispersion.
CO2	Evaluate the moments measures of skewness and kurtorsls and to evaluate correlation and regression.
CO3	Apply knowledge and concepts in finding the probability of a random variable and use addition and multiplication laws of Probability
CO4	Have ability to test and to give conclusion in testing of hypothesis.
CO5	Analyze and interpret results through one way and two way ANOVA

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO 9	PO10	PO1 1	PO1 2
CO1	H	H				H			M		M	M
CO2	H	H				H			L			H
CO3	H	H	L		L	M			L		L	H
CO4	H	H	L		L	M			M			H
CO5	H	H	H	M					M			H

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

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

Approval	

BMA17004 **BIO STATISTICS** **4 3 1/0 0/0**

1. BASICS OF STATISTICS (12)

Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median –Mode – Quartiles – Measures of Dispersion – The Range – Quartile Deviation –Standard Deviation.

2. CORRELATION (12)

Measures of Skewness& Kurtosis – Bi-variate data – Correlation & Regression.

3. PROBABILITY AND RANDOM VARIABLE (12)

Definition of Random Experiment - Sample Space – Events: Mutually exclusive events - Exhaustive events - Dependent events and Independent events - Mathematical and Statistical definition of probability - Theorems of addition and multiplication laws of Probability (Without proof) - Conditional probability (Simple problems).

4. SAMPLING (12)

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F & Chi-square Tests – Independence of Attributes – Goodness of Fit.

5. DESIGN OF EXPERIMENTS (12)

Analysis of Variance: One Way & Two-Way Classification – Design of Experiments – Randomized Block Design – Completely Randomized Block Design – Latin Square Design.

Total no. of Periods : 60

Text books

1. Gupta S.C, Kapoor V.K, *Fundamentals of Mathematical Statistics*, S.Chand& Co, New Delhi (2003).

2. Veerarajan T., *Probability, Statistics and, Random Processes*, Tata McGraw Hill Publishing Co., (2008).

References

1. Gupta S.P, *Statistical Methods*, S.Chand& Co., New Delhi (2003).
2. Singaravelu, *Probability and Random Processes*, Meenakshi Agency, (2017).
3. Richard Johnson A., *Miller & Freund's Probability and statistics for Engineers (9th ed)*, Prentice Hall of India, (2016).

DEPARTMENT OF PHYSICS

Subject Code :	Subject Name : **MATERIAL SCIENCE**	C	L	T/SLr	P/R

Department of Electronics and Communication Engineering

BPH17002	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO 9	PO10	PO1 1	PO1 2
CO1	H	H	M	M	M	L				M		L
CO2	H	H		M	M							L
CO3	H	H	H	H	M					M		
CO4	H	H	H	H	M				H	M		L
CO5	H	M	M	M	M	L			M	M		L

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

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

	√								
Approval									

BPH17002 **MATERIAL SCIENCE** **3 2 0/1 0/0**

1. CRYSTAL PHYSICS (9)

Space Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Ceramic Materials & Graphite Structures – Crystal GrowthTechniques (Slow Evaporation Method & Melt Growth)

2. CONDUCTING & SUPERCONDUCTING MATERIALS (9)

Introduction - Classical Free electron theory of Metals – Derivation of Electrical conductivity – Thermal Conductivity – Deduction of Wiedemann Franz law – Fermi Energy &Fermi Function – Density of Energy States – Qualitative Analysis of Conductors, Semiconductors and Insulators – Some Examples of Important Electrical Materials

Superconducting Materials:Transition temperature – BCS Theory – Properties of Superconductors – Type I &Type II Superconductors – Superconducting materials - Low & High Temperatures Superconductors – AC& DC Josephson Effects – Applications of Superconductors – Basic Concepts of SQUID, Magnetic Levitation.

3. SEMICONDUCTING MATERIALS (9)

Bonds in Semiconductors – Types – Importance of Germanium & Silicon – Other Commonly Used Semiconducting materials - Carrier concentration in Intrinsic Semiconductors (Electron and Hole Density) – Band Gap Determination – Carrier Transport in Semiconductors – Drift, Mobility and Diffusion – Hall effect – Determination of Hall Coefficient and its Applications – Dilute Magnetic Semiconductors (DMS) & their Applications – Schottky diodes.

4.MAGNETIC& DIELECTRIC MATERIALS (9)

Magnetic Materials: Types – Comparison of Dia, Para and Ferro Magnetism – Heisenberg's interpretation –Domain theory – Hysteresis – Soft and Hard Magnetic Materials – Application of Magnetic Resonance Imaging – Important Magnetic, Insulating & Ferro electric materials.

Dielectric Materials: Electrical Susceptibility – Dielectric Constant – Concept of Polarization – Frequency and Temperature Dependence of Polarization – Dielectric loss – Dielectric breakdown – Commomly used Dielectric materials and their practical applications.

5.OPTICAL, OPTOELECTRONIC AND NEW MATERIALS (9)

Properties & Classification of Optical Materials – Absorption in Metals, Insulators & Semiconductors – Composite Materials – Nano Materials – Bio Materials – MEMS – NEMS – LED's – Organic LED's – LCD's – Laser diodes – Photodetectors – Tunneling – Resonant Tunneling Diodes (RTD's) – Carbon Nanotubes – Various Ttypes of Optical Materials with Properties.

Total No. of Periods : 45

Text Books

1. V. Rajendran&Mariakani "Materials Science", Tata McGraw Hill (2004).
2. P.K.Palanisamy," Materials science", Scitech Publication(2002).

Reference Books

1. Dr. SenthilKumar,"Engineering Physics II" VRB Publishers (2016).
2. V. Arumugam, Materials Science", Anuradha Agencies, (2003 Edition).
3. Pillai S.O., "Solid State Physics", New Age International, (2005).

DEPARTMENT OF CHEMISTRY

Subject Code : **BCH17002**	Subject Name :**ENGINEERING CHEMISTRY – II**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**2**	**0/1**	**0/0**

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

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

OBJECTIVES :

1. Imparting the basic concepts of phase rule and apply the same to one and two component systems.
2. Introducing the chemistry of engineering materials such as cement, lubricants, abrasives, refractories, alloys and nano materials.
3. To impart a sound knowledge on the principles of chemistry involving different application oriented topics
4. Introducing salient features of fuels and combustion.
5. To give an overview on modern analytical techniques

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	1. Understand the science of phase equilibria and apply the phase rule to different systems.
CO2	2. Gain an overview of Engineering Materials such as Lime, Cement, Lubricants, Abrasives, Refractories, Alloys and Nanomaterials.
CO3	3. Recognize the essential information about consumer products such as Soaps and Detergents, also gaining the basic knowledge about Explosives and Propellants.
CO4	4. Discover the fuel Chemistry and Combustion process.
CO5	5. Inferring few important Analytical Techniques and their applications.

Department of Electronics and Communication Engineering

Mapping of Course Outcomes with Program Outcomes (POs)												
COs/POs	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO1 2
CO1	L											L
CO2	M		L			L	M					L
CO3	M					L						L
CO4	M	M	L	L			M					M
CO5	M				M							H
H/M/L indicates strength of correlation H – High, M – Medium, L – Low												

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

BCH17002 ENGINEERING CHEMISTRY – II 3 2 0/1 0/0

1. PHASE EQUILIBRIA (8)

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

2. 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.

3. 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.

4. 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.

5. ANALYTICAL AND CHARACTERIZATION TECHNIQUES

Electron microscopes: Scanning electron microscope & Transmission electron microscope, instrumentation and applications Absorption and Emission Spectrum - Beer - Lambert's law. Visible and UV Spectroscopy – instrumentation – Block diagram - working. IR Spectroscopy – instrumentation - Block diagram – molecular vibrations – stretching and bending – H_2O, CO_2. –Characterization of some important organic functional groups. Chromatographic techniques – column, thin layer and paper.

Total number of periods : 45

Textbooks

1. C. S.Unnithan, T. Jayachandran& P. Udhayakala, "Industrial Chemistry", Sreelakshmi Publications (2009).
2. Dr.R.Sivakumar and Dr.N.Sivakumar" Engineering Chemistry" Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

References

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 ENGINEERING SCIENCES

Subject Code : **BES17003**	Subject Name : **ENVIRONMENTAL SCIENCE**	C	L	T/SLr	P/R
	Prerequisite : None	**3**	**3**	**0/0**	**0/0**

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

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

OBJECTIVES :

1. To acquire knowledge of the Environment and Ecosystem & Biodiversity
2. To acquire knowledge of the different types of Environmental pollution
3. To know more about Natural Resources
4. To gain understanding of social issues and the Environment
5. To attain familiarity of human population and Environment

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

CO1	To known about Environment and Ecosystem & Biodiversity
CO2	To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest, water, and food resources
CO3	To discover water conservation and watershed management
CO4	To identify its problems and concerns climate change, global warming, acid rain, ozone layer depletion etc.,
CO5	To explain family welfare programmes and role of information technology in human health and environment

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO1 2
CO1						M	H	M				M
CO2						M	H			M		M
CO3						M	H	M				M
CO4						M	H	M		M		M
CO5						M	H			M		M

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

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

Approval	

BES17003 ENVIRONMENTAL SCIENCE 3 3 0 0/0

Unit I Environment and Ecosystem (9)

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 (9)

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 (9)

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 (9)

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns 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 (9)

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

Total Number of Periods : 45

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).

References

1. Vairamani, S. and Dr. K. Sankaran. **Elements of Environmental and Health Science.**Karaikudi: KPSV Publications, 5th Edition, July, 2013.
2. Ifthikarudeen, Etal, **Environmental Studies**, Sooraj Publications,2005.

3. R.Murugesan, **Environmental Studies,** Millennium Publishers and Distributors, 2nd Edition, July, 2009.

Subject Code: BMA17007	Subject Name: PROBABILITY AND RANDOM PROCESS	T / L / ETL	L	T / S Lr	P/ R	C
	Prerequisite: Mathematics – I, Mathematics - II	Ty	3	1/0	0/0	4

SEMESTER - III

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To understand the basic concepts in probability and random process and its application in signal processing.

COURSE OUTCOMES (Cos) : (3- 5)

The student will be able to

CO1	Understand the Basic concepts in Probability
CO2	Understand the Basic concepts in Distribution
CO3	Understand the Basic concepts in Random process
CO4	Understand the Basic concepts in Correlation
CO5	Understand the Basic concepts in Spectral Density

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BMA17007 PROBABILITY AND RANDOM PROCESS 3 1/0 0/0 4

UNIT- I: RANDOM VARIABLES 12 Hrs

Baye's Theorem – Applications - Random Variables – Distribution functions – Moments – Moment Generating functions –Chebychev's Inequality (statement and application only) – Function of Random Variables.

UNIT – II: STANDARD DISTRIBUTIONS 12 Hrs

Marginal and Conditional Distributions – Applications of Discrete Distributions: Binomial – Poisson – Geometric – Applications of Continuous distributions: Uniform – Exponential– Normal distributions – Central Limit theorem (statement applications only).

UNIT- III: RANDOM PROCESS 12 Hrs

Stationary Process – Ergodic Process – Poisson Process –Applications: Birth and Death Process – Markov Process – Markov Chains.

UNIT- IV: CORRELATION 12 Hrs

Auto Correlation – Auto Covariance – Cross Correlation – Cross Covariance.

UNIT- V : LINEAR SYSTEMS-APPLICATIONS 12 Hrs

Spectral Density – Cross Spectral Density – Applications to Linear Systems with Random Inputs and Outputs.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Reference Books:

1) Veerarajan T., "*Probability, Statistics and, Random Processes"*, Tata McGraw Hill Publishing Co., (2008).

Subject Code:	Subject Name : CIRCUIT THEORY	T / L/ ETL	L	T / S/ Lr	P/ R	C

2) Singaravelu, "*Probability and Random Processes"*, Meenakshi Agency, (2017).
3) Gupta S.C., Kapoor V.K., "*Fundamentals of Mathematical Statistics"*, S.Chand & Co., (2007).
4) Richard Johnson A., "*Miller & Freund's Probability and statistics for Engineers"(9th ed)*, Prentice Hall of India, (2016).

Department of Electronics and Communication Engineering

BEC17001	Prerequisite: Mathematical Knowledge, Basic Electrical Concepts	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To understand the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction
- To solve the electrical network using mesh and nodal analysis by applying network theorems
- To learn methods of circuits analysis in time domain and frequency domain
- To understand the concept of resonance in Series and parallel circuits and to know the concepts of coupled circuits.
- Obtaining equations to solve circuits in steady state and transient state

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Understand the concept of circuits, network theorems and various circuit laws
CO2	Analyze and solve a given electrical networks using mesh and nodal analysis
CO3	Done their inferences to analyze circuits analysis in time domain and frequency domain
CO4	Demonstrate their skills in understanding the concept of various resonance and coupled circuits
CO5	Apply their understanding to derive the analyze the equations with respect to solving circuit transients.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	
CO3	H	H	M

CO4	H	H	L					
CO5			M					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

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

BEC17001 CIRCUIT THEORY 3 1/0 0/0 4

UNIT- I: BASIC CIRCUIT CONCEPTS 12 Hrs

V-I Relationships Of R, L And C – Independent Sources – Dependent Sources – Kirchhoff's Laws - Simple Resistive Circuits – Network Reduction – Voltage Division – Current Division – Source Transformation. Formation of Matrix Equations and Analysis Using Mesh-Current and Node-Voltage Methods.

UNIT-II: AC FUNDAMENTALS 12 Hrs

AC Quantity, Phasor Representation – Analysis Of Simple Series And Parallel Circuits – Power And Power Factor – Analysis Mesh Current And Node Voltage Methods – Series Resonance And Parallel Resonance

UNIT-III: NETWORK THEOREM AND DUALITY 12Hrs

Useful Circuit Analysis techniques - Linearity and superposition, Thevenin and Norton Equivalent Circuits, Maximum Power Transfer, Super position theorem –principle of duality.

UNIT- IV: TRANSIENT ANALYSIS 12 Hrs

Transient Concepts-Behavior Of Circuit Elements Under Switching Conditions and Their Representation-Forced and Free Response of RL, RC And RLC Circuits with D.C. And Sinusoidal Excitations Using Laplace Transform Method – Natural Frequency and Damping Factor

UNIT-V: COUPLED CIRCUITS 12 Hrs

Mutual Inductance – Coefficient Of Coupling – Ideal Transformer – Analysis Of Multi Winding Couple Circuits – Single & Double Tuned Circuits – Critical Coupling.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. A.Sudhakar & Shyanmugam S.Palli *"Circuits & Network Analysis & Synthesis*", 4th Edition, Tata McGraw Hill, 2010
2. Bruce Carlson, "*Circuits: Engineering Concepts and Analysis of Linear Electric Circuits*", Thomson Learning, 1st Edition, 2002
3. M.L Soni & J.C. Gupta, "*Electric Circuit Analysis"*, Dhanpat Rai & Sons , New Delhi, 1999.

Reference Books:

1. Hyatt, W.H. Jr and Kimmerly, J.E., "*Engineering Circuits Analysis*", McGraw Hill International Editions, 1993.
2. Edminister, J.A., "*Theory and Problems of Electric Circuits*", Schaum's Outline Series McGraw Hill Book Company, 2nd Edition, 1983.
3. Paranjothi S.R., "*Electric Circuit Analysis*", New Age International Ltd., Delhi, 2nd Edition, 2000.
4. Artice.M. Davis, "*Linear Circuits Analysis*", Thomson Learning 2002
5. Roy Choudhury, "*Networks and Systems*", New Age International Ltd, 1992

Subject Code :	Subject Name : DIGITAL ELECTRONICS	T / L/ ETL	L	T / S Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17002	Prerequisite: Basic electronics and computer concepts	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To give an conceptual understanding about Boolean algebra, demorgans theorem, simplification of Boolean expression, Karnaugh map and Quine Mcklusky methodology.
- To Design and implement logic gates, combinational logic circuits, PAL, PLA and FPGA.
- To Design and implement sequential logic circuits like Flip flops, counters and shift registers.
- To analyzer state diagram, state tables and its reduction and design and implement synchronous and asynchronous sequential circuits.
- To study different logic families and classify different types of memories.

COURSE OUTCOMES (COs) : (3- 5)

The Student will be able to

CO1	Analyze and understand Boolean algebra and demorgans theorem concepts and apply Karnaugh map and Quine mcklusky methodogy to design combinational logic circuits.
CO2	Demonstrate the ability to design and implement logic gates, PAL, PLA and FPGA in combinational logic circuits.
CO3	Demonstrate the ability to design and implement sequential logic circuits like flip flops, counters and shift registers.
CO4	Analyze state diagram , state tables and its reduction and design and implement synchronous and asynchronous sequential circuits
CO5	Study different logic families and will able to differentiate and categorize memory devices.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3				
CO1	H	H	M				

CO2	H	H						
CO3	H	H	M					
CO4	H	H	-					
CO5	-	-	M					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

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

BEC17002 DIGITAL ELECTRONICS 3 1/0 0/0 4

UNIT - I: BOOLEAN ALGEBRA 12 Hrs

Boolean Algebra – De Morgan's Law - Simplifications of Boolean Expression – Sum of Products and Product of Sums – Karnaugh Map(up to 5 variables) – Quine McClusky Method of Simplification (Including Don't care conditions)

UNIT - II: COMBINATIONAL LOGIC 12 Hrs

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- III: SEQUENTIAL LOGIC DESIGN 12 Hrs

Building Blocks Of Sequential Logic-Rs, JK, Master-Slave, D And T Flip-Flop, Design of Asynchronous and Synchronous Counters - Binary and BCD Counters - Shift Registers.

UNIT - IV: SEQUENTIAL MACHINES **12 Hrs**

Basic Models Of Sequential Machines – Concept Of State Diagram - State Table – State Reduction - Design and Implementation of Synchronous Sequential Circuits. Design and Implementation of Asynchronous Sequential Circuits.

UNIT- V: LOGIC FAMILIES AND MEMORY DEVICE **12 Hrs**

Characteristics of RTL, DTL, TTL, Families – Schottky, Clamped TTL, ECL, IIL –Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. Charles H. Roth, "*Fundamentals of Logic Design*", Thompson Learning, 5th Edition
2. FLOYD: "*Digital Fundamentals*", 10th Edition Universal Book Stall, New Delhi.1993
3. Morris Mano, "*Digital Electronics and Design*", Prentice Hall of India, 2000

Reference Books:

1. John F.Wakerly, "*Digital Design*", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "*Digital Logic Applications and Design*", Thomson Learning, 2006.
3. Charles H.Roth. "*Fundamentals of Logic Design*", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "*Digital Principles and Applications*", 6th Edition, TMH, 2006.
5. Donald D.Givone, "*Digital Principles and Design*", TMH, 2003

Subject Code:	Subject Name : SOLID STATE DEVICES	T / L/ ETL	L	T / S. Lr	P/ R	C
BEC17003	Prerequisite: Basics of Electrical and Electronics.	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand Fermi levels, movement of charge carriers, Diffusion current and Drift current.
- To study behavior of semiconductor junction under different biasing conditions and Power devices. Varactor diode, Zener diode, Schottky diode, etc.
- To study VI Characteristics of devices and limitations in factors like current, power frequency.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand crystal structures of elements used for fabrication of semiconductor devices.
CO2	Familiar with energy band structure of semiconductor devices.
CO3	Understand Fermi levels, movement of charge carriers, Diffusion current and Drift current.
CO4	Know about Power devices. Varactor diode, Zener diode, Schottky diode, etc.
CO5	Understand VI Characteristics of devices and limitations in factors like current, power frequency

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1	H	M						
CO2	H	M	M					
CO3	H	M						
CO4	H	M	M					
C05	H	H	M					

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

Department of Electronics and Communication Engineering

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

BEC17003 SOLID STATE DEVICES 3 0/ 0 0/0 3

UNIT- I: SEMICONDUCTOR DIODES

9 Hrs

Theory of PN Junction Diode – VI characteristics – Static and Dynamic Resistance – Effect of Temperature on Diodes – Space Charge and Diffusion Capacitance - Zener Diode – Avalanche and Zener Break Down Mechanisms – Zener Diode as a Voltage Regulator.

UNIT- II: BJT & BIASING

9 Hrs

Principles of Transistor Action – Current Components – Cut Off, Active & Saturation Region – I/P & O/P characteristics CE, CB and CC. Small Signal Large Signal 'β', Break Down & Switching Characteristics – Transistor Biasing – Bias Stabilization – Bias Compensation – Thermal Runaway – Design with Heat Sink.

UNIT- III: FET & MOSFET

9 Hrs

Construction Feature & Working Principles of JFET, MOSFET Depletion and Enhancement Mode, Biasing of FET, and MOSFETS, Transmission Gate using CMOS.

UNIT- IV: POWER DEVICES

9 Hrs

Charge Transfer Device, UJT, SCR, Diac, Triac, GTO, MCT and Introduction to Gallium Arsenide Devices, FinFET, LDR, Photo Voltaic cell, Varactor diode.

UNIT- V: SMALL SIGNAL MODEL

9 Hrs

Small Signal Model of Transistor- Analysis of Amplifiers using Small Signal Model. Common Emitter, Common Base, Common Collector, Common Source, Common Drain, Common Gate, Multistage Amplifiers.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Nandita Das Gupta, Amitava Das Gupta, "*Semiconductor Devices*", Prentice Hall of India, 2005
2. Sedra and Smith, "*Microelectronic Circuits*", Oxford University Press, 2004
3. Mohammed Gausi and Spencer, "*Introduction to Electronics Circuit Design*", Pearson Education, 2004

Reference Books:

1. Boylestad, Robert. L and Nashelsky Louis ," *Electronic Devices and Circuit theory*",Prentice Hall of India,6th Edition, 2001
2. William & Harris, "*Electronic Devices and Circuits*", Tata McGraw Hill International Editions, 2000
3. Millman Halkias, "*Electron Devices*", Tata McGraw Hill, 2000.
4. Donald Neamam, "Microelectronics", Tata McGraw Hill, 2007.
5. Sedra Smith, "Micro *Electronic Circuits*" Fifth edition, 2013.

Subject Code: BCS17I01	Subject Name: C++ AND DATA STRUCTURES	T / L / ETL	L	T / S L r	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Programming and Multimedia lab	Ty	3	0/0	0/0	3

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

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

OBJECTIVE :

- To learn different object oriented programming concepts
- To understand the different methods of organizing large amounts of data
- To efficiently implement the different data structures
- To learn the systematic way of solving problems
- To efficiently implement solutions for specific problems
- Get to know about the trending programming technologies.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Possess an insight into what is involved in the development of classes and how it can be implemented using C++
CO2	Attain the basic ability to analyze, test and organize huge data
CO3	Master a variety of data structures and their implementations.
CO4	Master different algorithm design techniques (brute-force, divide and conquer, greedy, etc.)
CO5	Apply and implement learned algorithm design techniques and data structures to solve problems.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H		
CO2	M	H	M
CO3	M	M	
CO4		M	

CO5	M								

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

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

BCS17I01 C++ AND DATA STRUCTURES 3 0/0 0/0 3

UNIT- I: INTRODUCTION TO OOPS 9 Hrs

Object Oriented Concepts – Basics of C++ Environment. Definition – Data Members – Function Members – Control Statements-Overloading Operators – Functions – Friends – Class derivation – Virtual Functions – Abstract Base Classes.

UNIT – II: CLASSES, INHERITANCE & TEMPLATES

10 Hrs

Constructor – Default constructors – Copy Constructors – Destructors – Static members –Constant Members – Free Store Operators- Multiple Inheritances- Exception Handling – Streams - Class Templates – Function Templates

UNIT - III: LINEAR DATA STRUCTURES 9 Hrs

Stacks, Queues & Lists Implementation and Application Singly linked list – Doubly linked lists

UNIT - IV: NON LINEAR DATA STRUCTURES 9 Hrs

Trees – Binary Trees – Binary Search Tree – Tree Traversals – AVL Trees

UNIT V: SEARCHING AND SORTING **8 Hrs**

Searching – Linear search-Binary Search. Sorting- Insertion sort, Bucket sort, Heap sort, Merge sort, Quick sort.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Balagurusamy.E, "*Object oriented programming with C++*", Tata McGraw-Hill publishing company limited, Addison Wesley
2. E.Horowitz, S.Sahani & S.Rajasekharan, "*Fundamentals of data structure in C++*", Computer science press.
3. Stanley B.Lippman, "*The C++ Primer*", Addison Wesley Publishers, 4th Edition, 2005.

Reference Books:

1. Weiss Mark Allen. "*Data Structures and Algorithms Analysis in C*", Pearson Education, 2/e, 1997
2. E.Horowitz, S.Sahani & S.Rajasekharan, "*Computer Algorithms*", Galgotia 1999.
3. Gary J. Bronson, "*Object Oriented Program Development using C++",* Thomson Learning, 4th Edition 2005.
4. Brett D. McLaughlin, Gary Pollice, David West Head "*First Object-Oriented Analysis & Design*", O'Reilly Media, 2007.
5. Gilberg & Forugan, "*Data Structures: A Pseudo Code Approach using C++* ", Thomson Learning 1st Edition, 2002.
6. Gary J. Bronson, "*Object oriented program development using Java"*, Thomson Learning, 2nd Revised Edition 2005.

Subject Code: BEC17ET1	Subject Name : ELECTRICAL MACHINES AND PCB DESIGN	T / L/ ETL	L	T / SLr	P/ R	C
	Prerequisite: Basic Electrical and Electronic Circuits	ETL	2	0/0	2/0	3

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

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

OBJECTIVE :

- To study the working principles of different types of AC machines.
- To understand and analyze the working of various special machines.
- To give an introduction to different types of electronic components and instruments.
- To give an understanding of different stages in PCB design process.
- To analyze how components are assembled and tested in PCB.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Analyze the working principles of different types of AC machines.
CO2	Analyze the working of various special machines
CO3	Identify different types of electronic components and instruments.
CO4	Analyze and design PCB's
CO5	Assemble and test different components in PCB's

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	-
CO2	H	H	M
CO3	H	H	M

CO4	H	H	-					
CO5	H	H	M					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

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

BEC17ET1 ELECTRICAL MACHINES AND PCB DESIGN 2 0/0 2/0 3

UNIT-I: AC MACHINES 9 Hrs

Transformers - Principle of Operation of single phase Transformer – EMF Equation- Auto Transformers – Three Phase Transformers – Constructional Details. Induction motors- Construction Details - Types – Principle of Operation – Torque Equation. Synchronous machines -Construction of Synchronous machines – Classification - Induced EMF Equation

UNIT-II: SPECIAL MACHINES 9 Hrs

Principle of operation-Universal Motor – Switched Reluctance Motor – Permanent magnet Stepper Motor and Variable Reluctance stepper motor – DC and AC Servo Motor – Tachogenerator - Linear Induction Motor.

UNIT III: INTRODUCTION TO BASICS OF ELECTRONIC COMPONENTS AND INSTRUMENTS 12 Hrs

Study of electronic components: passive: -R,L,C –Types of R,L,C-Analysis of Colour code in R,C :Active: –Diode, BJT, FET,MOSFET :Electronic Instruments: CRO : -Measurements of Voltage &

Frequency, Function generator:- Frequency Measurements in Various Range and Wave Form : Power Supply: -Fixed and Variable :Multi-meter:-Measurement of Voltage ,Current, Frequency, R,L,C : IC tester:-Linear ICs and Non Linear ICs: Solder practice.

UNIT IV: PCB DESIGN PROCESS **12 Hrs**

Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Netlist, Making Netlist Files, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout, DRC, Pattern Transfer.

UNIT V: ASSEMBLING AND TESTING **12 Hrs**

Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books :

1. S. K. Bhattacharya, "*Electrical Machines"*, TMH Publications N. Delhi.
2. Kothari.D.P and Nagrath.I.J., "*Electrical Machines*", Tata McGraw Hill Publishing Co.Ltd, New Delhi, 5th edition 2002.

References:

1. Orcad User manual.
2. Raghbir Singh Khandpur, "*Printed Circuit Boards: Design, Fabrication, and Assembly*", (McGraw-Hill Electronic Engineering-2006)
3. Dr. Murugesh Kumar.K. "*DC Machines & Transformers*", Vikas Publishing House Pvt Ltd.,2nd edition 2003.
4. Deshpande M. V., "*Electrical Machines*" PHI Learning Pvt. Ltd., New Delhi, 2011.
5. Department Laboratory Manual.

Subject Code: BEC17L01	Subject Name : CIRCUITS AND DEVICES LAB	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Circuit theory , Solid State Devices	Lb	0	0/0	3/0	1

Department of Electronics and Communication Engineering

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To verify the different networks theorems of circuit theory
- To understand the working principle of semiconductor devices and its operations.
- To study the characteristics of power electronic devices, like SCR and UJT.
- To study the characteristics of MOSFET's and resonant circuits.
- To implement a miniproject based on above concepts.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Demonstrate the practical implementation of network theorems.
CO2	Apply the concepts of junction diodes, BJT, JFET and biasing methods.
CO3	Analyze the behavior of various Amplifiers.
CO4	Demonstrate behavior of various power electronics devices.
CO5	Implementation a mini project based on these concepts.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	-
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M
CO5	H	H	-

Department of Electronics and Communication Engineering

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BEC17L01 CIRCUITS & DEVICES LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

1. VERIFICATION OF SUPERPOSITION THEOREM, MPT, THEVENIN,NORTON
2. VERIFICATION OF NODAL & MESH ANALYSIS
3. CHARACTERISTICS OF P-N JUNCTION & ZENER DIODE
4. I/P & O/P CHARACTERISTICS OF BJT
5. CHARACTERISTICS OF JFET; FINDING β OF THE TRANSISTOR AND FIXED BIASING
6. BIASING OF TRANSISTOR IN CE MODE; BJT AMPLIFIER DESIGN CE MODE
7. BJT AMPLIFIER CB MODE AND CC MODE; JFET C.S. AMPLIFIER
8. UJT CHARACTERISTICS; SCR CHARACTERISTICS
9. MOSFET CHARACTERISTICS; STUDY OF RESONANT CIRCUITS
10. MINI PROJECT

Subject Code: BEC17L02	Subject Name : DIGITAL SYSTEM DESIGN LAB	T / L / ETL	L	T / S L r	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Electronics	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To implement of various laws of Boolean algebra in SOP and POS forms.
- To implement various combinational logic and sequential logic circuits.
- To implement standard IC's in implementing digital circuits.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Practically implement of various laws of Boolean algebra in SOP and POS forms.
CO2	Implement various combinational logic circuits and code converters.
CO3	Design and implement different types of multiplexer and demultiplexers.
CO4	Design and implement various sequential circuits like flip-flops, counters and registers.
CO5	Use the standard IC's in implementing combinational and sequential logic circuits.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	M	M	-
CO2	M	M	M
CO3	M	M	M
CO4	M	M	-
CO5	M	M	M

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

Department of Electronics and Communication Engineering

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

BEC17L02 DIGITAL SYSTEM DESIGN LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS:

1. Implementation of BOOLEAN FUNCTIONS using logic gates –POS &SOP form.

2. Implementation of MULTIBIT ADDERS & SUBTRACTORS (2 & 3 BITS).

3. Design and implementation of code converters using logic gates

i) BCD to excess-3 code and vice versa
ii) Binary to gray and vice-versa

4. Design and implementation of Magnitude Comparator (2-Bit).

5. Multiplexer & De multiplexer logic circuit design

6. Design and implementation of FLIP FLOPS

7 .Implementation of STUDY OF REGISTERS

8. Construction and verification of COUNTERS.

9. Implementation of combinational logic functions using standard ICs

10. Implementation of sequential logic functions using standard ICs

References:

1. Lab manual, Department of ECE, DR.MGR UNIVERSITY.
2. Maheswari.L.K and Anand.M.M.S, "*Laboratory Manual for Introductory Electronic Experiments*", New Age,2010
3. Poornachandra Rao.S and Sasikala.B, "*Handbook of Experiments in Electronics and Communication*".

Subject Code: BCS17IL1	Subject Name : C++ AND DATA STRUCTURES LAB	T / L/	L	T / S.Lr	P/ R	C

		ETL				
	Prerequisite: Programming lab	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To implement different oops concepts practically.
- To implement stacks and queues programmatically.
- To implement different types of linked lists.
- To implement different tree concepts.
- To perform sorting using various types of algorithms.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Implement and demonstrate different object oriented programming concepts.
CO2	Implement stacks and queues programmatically.
CO3	Implement and demonstrate different types of linked lists.
CO4	Perform programmatically different operations involving trees.
CO5	Perform sorting using various types of algorithms.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	-
CO2	H	H	M
CO3	H	H	M

CO4	H	H	-								
CO5	H	H	M								
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✓					
Approval												

BCS17IL1	**C++ and Data structures lab**	**0**	**0/0**	**3/0**	**1**

LIST OF EXPERIMENTS

1. Implementation of control statements
2. Implementation of arrays (single and multi-dimensional)
3. Implementation of constructor and destructor
4. Implementation of overloading functions.
5. Concept of inheritance
6. Implementation of stack (using arrays and pointers)
7. Implementation of queue (using arrays and pointers)
8. Single linked list
9. Doubly linked list
10. Binary tree traversals
11. Binary search tree
12. Quick sort

Subject Code:	Subject Name: MATHEMATICS IV FOR ELECTRONICS ENGINEERS	T / L/ ETL	L	T / S.Lr	P/ R	C
BMA17012	Prerequisite: MATHS III	Ty	3	1/0	0/0	4

13. Heap sort

14. Merge sort

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To study the basic concepts in Analytic functions and its application in flow of current.
- To understand the basic concepts in Numerical methods and its applications.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Understand the Basic Concepts in solution of Algebraic and Transactional equations.
CO2	Understand the Basic Concepts in Interpolation
CO3	Understand the Basic Concepts in Numerical Differentiation and integration.
CO4	Understand the Basic Concepts in Analytical functions.
CO5	Understand the Basic Concepts in Complex integration.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BMA17012 MATHEMATICS IV FOR ELECTRONICS ENGINEERS 3 1/0 0/0 4

UNIT- I : SOLUTION OF EQUATIONS 12 Hrs

Solution of Algebraic and Transcendental Equations – Method of false position – Iteration method- Newton- Raphson method – Solution of linear system of equations – Gauss Elimination method – Gauss – Jordan method- Iterative methods – Gauss – Jacobi method – Gauss – Seidel method - matrix Inversion by Gauss – Jordan method.

UNIT – II : INTERPOLATION 12 Hrs

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

UNIT- III : NUMERICAL DIFFERENTIATION AND INTEGRATION 12 Hrs

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.

UNIT- IV : ANALYTIC FUNCTIONS 12 Hrs

Analytic functions – Cauchy Riemann equations in Cartesian and Polar form – Properties of analytic functions – Construction of analytic functions – Simple Transformations – Standard transformations : $w = z^2$, $w = e^z$, $w = \sin z$, $w = \cosh z$ – Bilinear transformations.

UNIT- V : COMPLEX INTEGRATION 12 Hrs

Cauchy's integral theorem (without proof) – Cauchy's integral formulae (without proof) – Taylor's and Laurent's series (without proof) – Singularities: Types – Residues – Cauchy's residue theorem (without

proof) – Evaluation of real integrals by Contour Integration (excluding poles on real axis).

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total no. of hrs. 60

Reference 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).
3) Kreyszig E., *Advanced Engineering Mathematics (10 th ed.)*, John Wiley & Sons, (2011).
4) Kandasamy P., Thilagavathy, Gunavathy K., *Numerical Methods (Vol.IV)*, S.Chand & Co., (2008).
5) Veerarajan T., *Engineering Mathematics (for first year)*, Tata McGraw Hill Publishing Co., (2008).
6) Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers, (2012).

Subject Code: BEC17004	Subject Name : CONTROL SYSTEMS FOR ELECTRONICS ENGINEERS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Network System	Ty	3	1/0	0/0	4

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To learn the basic elements of control system with mathematical model.
- To understand the time response of first and second order system feedback.
- To learn the frequency response of systems using bode plot and polar plot.
- To check the stability of Control system using various techniques.
- To study different compensators and advance control system concepts using state variables.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Model physical systems using block diagram and signal grew.
CO2	Analyze the system using time response.
CO3	The open loop and closed loop analysis of systems in frequency domain.
CO4	Check the stability of the given system using root locus and Nyquist Plot.
CO5	Choose the compensator for the given system and do the analysis using state variables.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	H	H	

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

Department of Electronics and Communication Engineering

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

BEC17004 CONTROL SYSTEMS FOR ELECTRONICS ENGINEERS 3 1/0 0/0 4

UNIT- I: SYSTEM REPRESENTATION 12Hrs

Control Systems – Basic elements in control systems – Open and Closed loop systems – Mathematical models of physical systems – Transfer function – Block diagram reduction techniques – Signal flow graph.

UNIT- II: TIME RESPONSE 12 Hrs

Standard Test Signals-Time Domain study of first order and second order feedback control systems - Time domain Specifications - I and II order System Response - Error Coefficients - Generalized Error Series - Steady State Error - P, PI, PID Controllers.

UNIT - III: FREQUENCY RESPONSE 12 Hrs

Frequency Response - Bode plot - Polar plot - Constant M and N circles - Determination of Closed Loop Response from Open Loop Response - Correlation between Frequency Domain and Time Domain Specifications.

UNIT- IV: STABILITY OF CONTROL SYSTEM 12Hrs

Characteristics Equation - Location of Roots in S plane for stability - Routh Hurwitz Criterion - Root Locus Construction - Effect of Pole, Zero Addition - Gain Margin and Phase Margin - Nyquist Stability Criterion.

UNIT - V: COMPENSATORS AND STATE SPACE ANALYSIS 12 Hrs

Lag, Lead and Lag-Lead Compensators- State Space Analysis - State Space Formulation -State Variables - Phase variables and Canonical Variables –Concept of Controllability & Observabliity.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. K. Ogata, "*Modern Control Engineering*", 4th edition, Pearson Education, New Delhi, 2003 / PHI.
2. I.J. Nagrath & M. Gopal, "*Control Systems Engineering"*, New Age International Publishers, 2003.
3. B.C. Kuo, "*Automatic Control Systems*", Prentice Hall of India Ltd., New Delhi, 7th Edition, 1995.

Reference Books:

1. M. Gopal, "*Control Systems, Principles & De*sign", Tata McGraw Hill, New Delhi, 2002.
2. M.N. Bandyopadhyay, "*Control Engineering Theory and Practice"*, Prentice Hall of India, 2003.
3. A.Nagoor kani , "*Control System Engineering*" RBA Publications.
4. Stefani, Shanian, Savant, Hostetter, "*Design of Feedback Control Systems*", 4th Edition, Oxford university press 2002.

Subject Code: BEC17005	Subject Name: SIGNALS AND SYSTEMS	T / L/ ETL	L	T / S. Lr	P/ R	C
	Prerequisite: Engineering Mathematics	ETL	3	1/0	0/0	4

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To study the representation of discrete and continuous signals and systems.
- To study the analysis of continuous time systems using Laplace and Fourier transforms.
- To study the analysis of discrete time systems using DFT and Z transforms.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Classify continuous and discrete time signals and systems.
CO2	Analyze continuous signals and its spectrum with transforms.
CO3	Determine the response of continuous time systems with transforms and state variable approach.
CO4	Analyze discrete signals and its spectrum with transforms.
CO5	Determine the response of discrete time systems with transforms and state variable approach.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17005 SIGNALS AND SYSTEMS 3 1/0 0/0 4

UNIT- I: CLASSIFICATION OF SIGNALS AND SYSTEMS

10 Hrs

Continuous Time Signals (CT signals), Discrete Time Signals (DT Signals) – Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals – Periodic and aperiodic, Random Signals, CT Systems and DT Systems, Classification of Systems – Linear Time Invariant Systems(LTI).

UNIT - II: ANALYSIS OF C.T SIGNALS

12 Hrs

Fourier Series Analysis, Spectrum of C.T. Signals, Fourier Transform and Laplace Transform – Properties of Fourier Transform - Applications in Signal Analysis.

UNIT- III: LTI – CT SYSTEMS

12 Hrs

Differential Equation, Block Diagram Representation, Impulse Response, Step Response, Convolution Integral, Frequency Response, Fourier and Laplace Transforms in Signal Analysis, State Equations and Matrix.

UNIT - IV: ANALYSIS OF D.T. SIGNALS **13 Hrs**

Spectrum of D.T. Signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of DFT, Properties of Z – Transform in Signal Analysis, Inverse Z-Transform.

UNIT - V: LTI – DT SYSTEMS **13 Hrs**

Difference Equations, Block Diagram Representation, Impulse Response, Convolution, Frequency Response, Z – Transform Analysis, Realization of Digital Filters – Direct Form-I, Direct Form-II,

Transposed, Parallel, Cascade Structure, State Variable Equation and Matrix.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. Alan V Oppenheim, "*Signals and Systems*", Prentice Hall of India Pvt. Ltd, 2nd Edition, 1997.
2. Roger E. Zeimer et al, "*Signals and Systems*": Continuous and Discrete, McMillan, 2nd Edition, 1990
3. Hwei P. Hsu, Schaum's Outline Series, "*Signals and Systems*", Mc Graw Hill Companies, 2nd Edition.

Reference Books:

1. Douglas K Lindner, "*Signals and Systems*", McGraw Hill International, 1999.
2. Simon Haykin and Barry Van Veen ," *Signals and Systems*", John Wiley and Sons, Inc., 1999.
3. Robert A. Gabel and Richard A. Roberts, "*Signals and Linear Systems*", John Wiley, 3rd Edition, 1987.

Subject Code:	Subject Name: ELECTRONIC CIRCUITS	T / L / Ty	L	T / Sg Lr	P/ R	C
BEC17006	Prerequisite: Solid State Devices	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- On completion of this course the student will understand
- The methods of biasing transistors and Design of simple amplifier circuits
- Method of calculating cutoff frequencies and to determine bandwidth
- Design of power amplifiers and heat sinks

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Model various types of rectifiers.
CO2	Use the different amplifier independently
CO3	Construct the feedback amplifiers and oscillators.
CO4	Calculate the delay and switching time multivibrator.
CO5	Detect the efficiency of power amplifier.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17006 ELECTRONIC CIRCUITS 3 0/0 0/0 3

UNIT I: RECTIFIER & POWER SUPPLY

9 Hrs

Half & Full Wave Rectifies – Filters – Shunt, Inductor, LC Section & Ripple Factor, π filters, Calculation for C, L and LC Filters – Voltage Regulators – Zener – Series Voltage Regulator – Shunt Voltage Regulator – SMPS- IC Voltage Regulators.

UNIT II: AMPLIFIERS

9 Hrs

Amplifiers – Frequency Response of RC Coupled Amplifiers – Frequency Response of Emitter follower, Gain Band Width Product – FET - Amplifier at Low and High Frequency Cascaded Amplifiers

UNIT III: FEED BACK AMPLIFIER & OSCILLATORS

9 Hrs

Four Basic Type of Feedback – Effect of Feedback on Amplifier Performance-Examples of Different types of Feedback Amplifiers-Voltage Series & Shunt Feedback, Current Series & Shunt Feedback – Condition for Oscillation Barkhaushen Criteria – LC Oscillators – Hartley & Colpitts – RC Oscillators – Wein Bridge, RC Phase Shift, Crystal Oscillator.

UNIT IV: MULTIVIBRATORS

9 Hrs

Collector Coupled & Emitter Coupled Astable Multivibrator, – Mono Stable, Bistable Multivibrator – Triggering Methods – Storage Delay and Calculation of Switching Time - Schmitt Trigger Circuits, Speed up Capacitor in Switching – UJT based Relaxation Oscillator.

UNIT V: POWER AMPLIFIER **9 Hrs**

Classification – Class A, B, C & AB, Class B-push pull – Class B Complementary Symmetry, Class S, and Power sections Classifications, Efficiency, Distortion in Amplifiers-Tuned Amplifiers.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Mohammed. H. Rashid, "*Micro Electronic Circuits, Analysis and Design*", Thomson Learning
2. David. A. Bell, "*Solid state Pulse Circuits*", Prentice Hall India, 4th Edition, 2000.
3. Angsuman sarkar, "*Solid State Microelectroni and Optoelectronic Devices*", University press,2012.

Reference Books:

1. Millman Taub ,"*H Pulse Digital & Switching waveform* ", Tata McGraw Hill International, 2001
2. Jacob Millman, Cristas C. Halkias," *Integrated Electronics*", Tata McGraw Hill., Edition 1991.

Subject Code: BCS17I02	Subject Name : COMPUTER NETWORKS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Communication System	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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 different storage media and OSI layers
- To introduce the features of different I/O peripheral devices and protocols.
- To introduce the students the functions and standards of LAN.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.

COURSE OUTCOMES (COs) : (3- 5)

The Students will able to

CO1	Describe the basic concepts of data communication and OSI layers.
CO2	Analyze data link control protocol.
CO3	Explain different standards and protocols used in LAN
CO4	Express the duties of network support layer and WAN protocols
CO5	Define the functions of upper OSI layer

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

BCS17I02 COMPUTER NETWORKS 3 0 0 3

UNIT- I DATA COMMUNICATION 9 Hrs

Introduction, Basic concepts, OSI Reference Model, Transmission of Digital Data –Electrical Interface, Modems-Transmission rate-modem standards- Guided Media-Twisted –pair Cable-Coaxial cable-Performance- Error Detection and Correction (CRC) - Time and Frequency domains Signals

UNIT -II DATA LINK CONTROL AND PROTOCOLS 9 Hrs

Flow Control and Error Control, Stop And Wait - Sliding Windows- Automatic Repeat (ARQ), Asynchronous Protocols - X Modem, Y Modem, Synchronous Protocols – Character Oriented and Bit Oriented Protocols (HDLC).

UNIT- III LOCAL AREA NETWORKS 9 Hrs

IEEE 802 Standards, LLC, MAC Layer Protocols –CSMA/CD Ethernet, Token Bus, Token Ring, FDDI, Distributed Queue Dual Bus, Switched Multimegabit Data Service

UNIT- IV WIDE AREA NETWORKS 9 Hrs

Switching, Duties of the Transport Layer, ATM Protocol –Architecture Header Structure, Function of AAL Layer, Internetworking Devices, Repeater, Bridge, Routers and Gateways, Routing Algorithms-Link State and Distance Vector routing.

UNIT- V UPPER OSI LAYERS 9 Hrs

Session Layer - Presentation Layer –Translation, Brief Introduction to Encryption / Decryption, Authentication -Data Compression, Application Layer Protocols, MHS, File Transfer , Virtual Terminal, Common Management Information Protocol.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Behrouz A. Forouzan , "*Data Communication and Networking*", Tata McGraw Hill, 5th Edition, 2013.
2. William A, Shay, "*Understanding Data Communications and Networks*", Thomson Learning, 3rd Edition 2003.
3. Gallo, "*Computer Communications and Networking Technologies*", Thomson Learning, 1st edition 2001.

Reference Books:

1. William Stallings, "*Data and Computer Communication*", Prentice Hall of India, Fifth Edition 1997.
2. Andrew S. Tanenbaum, "*Computer Networks*", prentice hall of India, Third Edition 1996.
3. Fred Hallsall, "*Data Communication Computer Networks and Open System*", Addison – Wesley, 1992

Subject Code: BSK17ET1	Subject Name :SOFT SKILL – I CAREER & CONFIDENCE BUILDING	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: None	ETL	1	0/1	0/0	2

L : Lecture T : Tutorial 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 student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1			H
CO2			H
CO3			H
CO4			H

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

Department of Electronics and Communication Engineering

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

BSK17ET1 SOFT SKILL – I CAREER & CONFIDENCE BUILDING 1 0/1 0/0 2

UNIT- I **6 Hrs**

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

UNIT – II **6 Hrs**

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

UNIT – III **6 Hrs**

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 Hrs**

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

UNIT – V **6 Hrs**

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

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 30 Hrs

Subject Code:	Subject Name : ANALYSIS OF ELECTRO MAGNETIC FIELD THEORY	T / L/ ETL	L	T / S.L r	P/ R	C
BEC17ET2						

Department of Electronics and Communication Engineering

	Prerequisite: Engineering Physics, Vector Calculus	ETL	1	0/1	2/0	3

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

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

OBJECTIVE :

- To study the basic concepts in vector calculus and fundamental ideas in electrostatics and magneto statics.
- To understand the concepts of current density and to learn how to solve the electrostatic problems
- To learn the behavior of time varying fields and flow of electromagnetic power.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Apply the vector calculus in the field of electrostatics and electrodynamics.
CO2	Show their ability to analyze the behavior of electric field continuous across an interface.
CO3	Hone their inferences to solve complex electrostatic problems.
CO4	Demonstrate their skills in analyzing the effects of magnetic fields.
CO5	Apply their understanding of wave equations to design an antenna.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	-
CO3	H	H	M
CO4	H	H	-
CO5	-	-	M

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

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

BEC17ET2 ANALYSIS OF ELECTRO MAGNETIC FIELDS THEORY 1 0/1 2/0 3

UNIT I: VECTOR ANALYSIS 9Hrs

Scalars and Vectors, Cartesian, Cylindrical and Spherical Coordinate System, Integrals containing vectors, Gradient, Divergence and Curl, Divergence theorem and Stoke's theorem

Lab Experiments

- Vector Representation and Coordinate Systems using Software Package: 'CAEME'
- Coordinate Systems and Conversion using 'CAEME' Software

UNIT II: ELECTROSTATICS 9Hrs

Fundamental Postulates of Electrostatics in free space, Coulomb's law, Determination of Electric field, Gauss's law and its applications, Electric potential, Electric Flux Density and Dielectric constant, Boundary Conditions for Electrostatic fields, Determination of Capacitance and Electrostatic Energy,

Lab Experiments

- Electrical Field and Potential inside the Parallel Plate Capacitor
- Capacitance and Inductance of Transmission Lines
- Simulation of Electric Field and Potential Inside Capacitors

UNIT III: ELECTROSTATIC SOLUTIONS AND STEADY ELECTRIC CURRENTS 9Hrs

Laplace's Equations and Poisson's Equations, Uniqueness theorem, Boundary Value Problems in Cartesian, Cylindrical and Spherical Coordinate System, Current Density, Electromotive Force, Continuity Equation, Boundary Conditions for Current Density.

Lab Experiments

- Simulation of Electric Field and Potential Inside Capacitors

UNIT IV: MAGNETOSTATICS **9 Hrs**

Fundamental Postulates of Magneto statics in free space, Vector Magnetic Potential, Biot-Savart's law and its applications, Scalar Magnetic Potential, Magnetic Field Intensity and Relative Permeability, Boundary Conditions for Magneto static fields, Determination of Inductance and Magneto static Energy, Determination of magnetic Force and Torque.

Lab Experiments

- Magnetic Field outside a Straight Conductor
- Magnetic Field of Coils
- Magnetic Force on a Current Carrying Conductor
- Inductance of Transmission Lines

UNIT V: TIME-VARYING FIELDS AND ELECTROMAGNETIC POWER **9 Hrs**

Faraday's Law of Electromagnetic Induction, Maxwell's Equations (Integral and Differential Form), Wave Equations for a source-free region, Poynting vector and Poynting theorem.

Lab Experiments

- Electromagnetic Induction
- E.M Wave Radiation and Propagation

Total Number of Hours: 45 Hrs

Textbooks

1. David K.Cheng, "*Field and Wave Electromagnetics*", McGraw Hill Inc., Third Edition, Malaysia, 1995
2. William H. Hayt & John A.Buck, "*Engineering Electromagnetics*",Tata Mc-Graw-Hill 7th Edition 2005.
3. Y.Mallikarjuna reddy, "Eletromagnetic fields", Universities press, Edition 2013.

Reference Books:

1. John D Kraus, "*Electromagnetics*", Tata McGraw Hill Book Co., New York, Third Edition, 1989.
2. Joseph A Edminister, "*Theory and Problems of Electro Magnetics*", Schaum's Outline Series Tata McGraw Hill, New York, 1986
3. Mathew N. O. Sadiku, "*Elements of Electromagnetics*", Oxford International Student Edition, Fourth Edition

Subject Code: BEC17L03	Subject Name : ELECTRONIC CIRCUITS LAB	T / L/ Etg	L	T / S.Lr	P/ R	C

4. David J.Griffiths, "*Introduction to Electrodynamics*", Pearson Education Limited 2014.
5. S.P.Seth, "*Elements of Electromagnetic Fields*", Dhanpat Rai & Co.

Department of Electronics and Communication Engineering

	Prerequisite: Electronic Circuits	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To be able to design, implement different types of rectifier circuits.
- To be able to design different types of voltage regulators.
- To be able to design different amplifiers and oscillatory circuits.
- To be able to design power amplifier and study its characteristics.
- To be able to design tuned amplifier and analyze its behavior.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Design and implement different types of rectifier circuits.
CO2	Perform hands on design and analysis of different types of voltage regulators.
CO3	Perform hands on design on different amplifier and oscillatory circuits.
CO4	Perform hands on designing of power amplifier and study its characteristics.
CO5	Perform hands on designing tuned amplifier and analyze its behavior.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17L03 ELECTRONIC CIRCUITS LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

1. RECTIFIERS – HALF WAVE, FULL WAVE WITHOUT FILTER
2. FWR WITH SHUNT, L AND Π FILTERS
3. VOLTAGE REGULATOR-SERIES & SHUNT
4. RC COUPLED AMPLIFIER (WITH FEEDBACK)
5. FEEDBACK CIRCUITS(VOLTAGE SERIES FEEDBACK; VOLTAGE SHUNT FEEDBACK)
6. SCHMITT TRIGGER
7. MULTI VIBRATORS, MONOSTABLE, ASTABLE, BISTABLE
8. LC OSCILLATORS
    a) HARTLEY OSCILLATOR
    b) COLPITTS OSCILLATOR
9. AUDIO OSCILLATORS
    a) WEIN BRIDGE OSCILLATOR
    b) RC PHASE SHIFT OSCILLATOR
10. CLASS A – POWER AMPLIFIER
11. CLASS B – POWER AMPLIFIER
12. TUNED AMPLIFIER

Subject Code: BEC17L04	Subject Name : DIGITAL SIMULATION LAB	T / L/ E/ P	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: signals and Systems, Control System	Lb	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 :

- Programmatically generate different types of signals using MATLAB.
- Perform sampling and generate waveforms.
- Generate time series perform convolution check stability perform DFT and IDFT computation using MATLAB.
- Program and analyze behavior of different types of systems using MATLAB.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Generate different types of signals.
CO2	Perform sampling and generate waveforms.
CO3	Generate times series, perform convolution and check stability perform DFT and IDFT computation.
CO4	Program and analyze behavior of different types of systems using MATLAB.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M

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

Department of Electronics and Communication Engineering

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

BEC17L04 DIGITAL SIMULATION LAB 0 0/0 3/0 1

OBJECTIVES

- To implement continuous and Discrete time signal and control system using MATLAB

SIGNALS AND SYSTEMS

1. GENERATION OF SIGNAL SEQUENCE
2. SAMPLING & WAVEFORM GENERATION
3. REPRESENTATION OF TIME-SERIES; COMPUTATION OF CONVOLUTION
4. STABILITY OF LTI SYSTEM.
5. DFT & IDFT COMPUTATION

CONTROL SYSTEM

6. IMPULSE RESPONSE OF FIRST AND SECOND ORDER SYSTEMS
7. TIME DOMAIN SPECIFICATIONS FOR CLOSED LOOP TRANSFER FUNCTION.
8. BODE PLOT AND POLAR PLOT FOR OPEN LOOP SYSTEM
9. STABILITY CHECK USING ROUTH-HURWITZ CRITERION BODE PLOT AND ROOT LOCUS.
10. DETERMINATION OF CONTROLABILITY, OBSERVABILTY AND TRANSFER

Subject Code: BCS17IL2	Subject Name : COMPUTER NETWORKS LAB	T / E / ETL	L	T / S	P/ R	C

FUNCTION FROM STATE MODEL

Department of Electronics and Communication Engineering

	Prerequisite: C++ and Data structures lab	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- The students will be able to implement the different protocols
- The students will be able to implement and compare the various routing algorithms
- The students will be able to independently use the NS2 simulator tool.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Establish and observe the characteristics of point to point network with n nodes.
CO2	Transmit messages between different network nodes.
CO3	Encrypt and decrypt the message transmitted through a network.
CO4	Implement and compare various routing algorithms.
CO5	Use the simulation tools like NS2, OPNET etc.,

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BCS17IL2 **COMPUTER NETWORKS LAB** **0 0/0 3/0 1**

LIST OF EXPERIMENTS

Using NS2/OPNET

1. Simulate three nodes point-to-point networks with a duplex link between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
2. Apply TCP agent between n0 to n3 and UDP n1 to n3. Apply relevant applications over TCP and UDP agents changing the parameters and determine the number of packets sent by TCP/UDP.
3. Simulate the different type of internet traffic such as FTP and TELNET over a network and analyze the throughput.
4. Simulate a transmission of ping message over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
5. Simulate an Ethernet LAN using n nodes change error rate and data rate and compare the throughput.
6. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and determine the collision across different nodes.
7. Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source/destination

Using C/C++

8. Write a program for error detecting code using CRC-CCITT (16bit)
9. Write a program for distance vector algorithm to find suitable path for transmission
10. Write a program for simple RSA algorithm to encrypt and decrypt the data
11. Write a program for hamming code generation for error detection/correction

Subject Code: BEC17TS1	Subject Name : Technical Skill - I	T / L/ ETL	L	T / S.Lr	P/ R	C
		0	0	0	1	1

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

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

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

COURSE OUTCOMES (COs) : (3- 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

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

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

Approval	

Department of Electronics and Communication Engineering

Subject Code:		Subject Name : TRANSMISSION LINES & WAVE GUIDES	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17007	Prerequisite: Electro Magnetic Field	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To become familiar with transmission lines and losses associated with it.
- To understand signal propagation in transmission lines at Radio frequencies and analyze them under loss-less conditions.
- To give a thorough understanding about impedance transformation and matching in high frequencies.
- To understand different characteristics of TE and TM waves.
- To analyze circular and rectangular wave guides and behavior of TE & TM guides in these waveguides.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Familiar with transmission lines and various losses associated with it.
CO2	Analyze and understand signal propagation in loss-less conditions at radio frequencies
CO3	Understand different impedance transmission techniques and matching in high frequencies and able to solve case studies using Smith Chart.
CO4	Appreciate the behavior of TE&TM waves in different type of mediums.
CO5	Analyze and understand different types of waveguides and the behavior of TE & TM waves and will gain the ability to derive the field equations in rectangular and cylindrical wave-guides.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	

CO2	H	H							
CO3	H	H							
CO4	H	H							
CO5	H	H							
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low									

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

BEC17007 TRANSMISSION LINES & WAVE GUIDES 3 1/0 0/0 4

UNIT: I TRANSMISSION LINE THEORY 14 Hrs

General Theory of Transmission Lines –The transmission line, A General Solution – The Infinite Line – Wavelength, Velocity of propagation – Waveform Distortion – The Distortion-less line – Loading and Different methods of loading – Line not terminated in Z_0 – Reflection Co-efficient – Calculation of Current, Voltage, Power delivered and Efficiency of transmission – Input and transfer Impedance – Open and short circuited lines – Reflection loss .

UNIT: II HIGH FREQUENCY TRANSMISSION LINES 10 Hrs

Transmission lines equations at radio frequencies – Line of Zero dissipation – Voltage and Current on the dissipation-less line – Standing waves, Nodes, Standing wave ratio – Input impedance of the dissipation-less line – Power and impedance measurement on lines.

UNIT: III IMPEDANCE MATCHING IN HIGH FRENCY LINES 12 Hrs

Impedance matching: Quarter Wave Transformer – Impedance matching by Single and Double Stub – Smith chart, Problems and Solutions.

UNIT: IV GUIDED WAVES 12 Hrs

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – Characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation – Component uniform plane waves between parallel planes – Attenuation of TE and TM waves in parallel plane guides

UNIT: V RECTANGULAR AND CIRCULAR WAVEGUIDES 12 Hrs

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides-Impossibility of TEM waves in waveguides - Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. J.D. Ryder "*Networks, Lines and Fields*", PHI, New Delhi, 2003.
2. E.C. Jordan and K.G. Balmain "*Electro Magnetic Waves and Radiating System*", PHI, New Delhi, 2003.
3. Umesh Sinha " *Transmission lines and networks*", Sathya prakashan ,2010

Reference Books:

1. David K. Cheng,"*Field and Waves in Electromagnetism*", Pearson Education, 1989.
2. Ramo, Whineery and Van Duzer: "*Fields and Waves in Communication Electronics*", John Wiley, 2003.
3. David M. Pozar: "*Microwave Engineering*", 2nd Edition – John Wiley.
4. G.S.N Raju: *"Electromagnetic Field Theory and Transmission Lines"*, Pearson Education, First edition 2005.
5. John D Kraus and Daniel A Fleisch: *"Electromagnetics with Applications",* Mc Graw Hill Book Co, 2005

Subject Code:	Subject Name : DIGITAL SIGNAL PROCESSING	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17008	Prerequisite: Signals System	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To learn the concepts of Fourier transform and it's Applications.
- To understand the design techniques of digital IIR filters
- To learn the concepts and design techniques of digital FIR filters.
- To understand the concepts and applications of Multi – rate sampling.
- To introduce the architecture of Digital Signal Processors.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Apply Fourier transform concepts.
CO2	Have the ability to design IIR filters.
CO3	Have the ability to design FIR filters.
CO4	Apply Multi rate samplings techniques for system design.
CO5	Describe the modules in the architecture of digital signal processor.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17008 DIGITAL SIGNAL PROCESSING 3 1/0 0/0 4

UNIT –I: DFT AND FFT 12 Hrs

Discrete Fourier Transform (DFT) - Properties-Convolution of Sequences - Linear Convolution - Circular Convolution - Introduction to Radix-2 FFT- Properties - DIT (FFT)-DIF (FFT) - Algorithms of Radix-2FFT-Computing Inverse DFT by doing a direct DFT.

UNIT –II: DESIGN OF IIR FILTER 12 Hrs

IIR Filters- Properties of IIR Filters -Analog Low pass Filter Design - Butterworth Filter - Chebyshev Filter - Design of IIR Filters from Analog filters - Approximation of Derivatives – Impulse Invariance - Bilinear Transformation – The Matched z- Transformation - Frequency Transformation.

UNIT- III: DESIGN OF FIR FILTER 12 Hrs

FIR Filters - Characteristics of FIR Filters with Linear Phase-Properties of FIR Filters-Design of FIR Filters using Windows-Fourier Series Method-Frequency sampling Method – Limit cycle oscillations-Zero- Input Limit cycle oscillations- Overflow Limit cycle oscillations- Signal Scaling.

UNIT- IV: MULTIRATE SIGNAL PROCESSING 12 Hrs

Multirate Signal Processing- Interpolation - Decimation - Single and Multistage Realization - Filter Bank Implementation - Applications-Sub Band Coding.

UNIT –V: OVERVIEW OF DIGITAL SIGNAL PROCESSOR 12 Hrs

Overview of Digital Signal Processors – Application of Digital Signal Processor – Memory Architecture of DSP Processor – Von Neumann Architecture – Harvard Architecture - Architecture of TMS32C5X Processor – Addressing modes – Pipelining .

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. John . G. Proakis and Dimitris C.Manolakis, "*Digital Signal Processing Principles, Algorithms and Applications",* Pearson Education, Third edition 2006.
2. Sanjit k.Mitra "*Digital signal processing*", A Computer Based Approach, Tata McGraw Hill,New delhi,2001.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "*Discrete – Time Signal Processing*", 8th Indian reprint, Pearson 2004.

Reference Books:

1. Ashok Ambardar,"*Analog and Digital Signal Processing*", 2nd Edition,Thomson Learning 2000.
2. Ashok Ambardar,"*Analog and Digital Signal Processing A Modern Introduction*", 1st edition Thomson Learning 2006
3. Johnny R.Johnson, "*Introduction to Digital Signal Processing*", Minth printing,September 2001.
4. M.D.Srinath,P.K.Rajasekaran,R.Vishwanathan "*Introduction to Statistical Signal Processing With Application*", Prentice-Hall of India Pvt.Ltd.,New Delhi,1999.
5. B.Venkataramani, M.Bhaskar, "*Digital Signal Processors, Architecture, Programming and Application*", Tata McGraw Hill, New Delhi, 2003.

Subject Code: BEC17009	Subject Name : MICROPROCESSOR AND MICROCONTROLLER	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Digital Electronics	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To study the architecture, addressing modes, and assembly language program of 8085 and 8086 microprocessor.
- To understand the concepts of different peripherals and their applications
- To learn the functions of 8051 microcontroller and ARM processor and their applications.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Write assembly language program in 8085 and 8086 to perform arithmetic and logical operations
CO2	Show their ability to interface peripherals with microprocessors
CO3	Hone their inferences to develop a hardware using 8051 microcontroller
CO4	Demonstrate their skills in writing an ALP in 8051 to do real time applications
CO5	Apply their understanding to do a project to develop an application using ARM processor.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17009 MICROPROCESSOR AND MICROCONTROLLER 3 0/0 0/0 3

UNIT-I: CPU 8085 & 8086 **9 Hrs**

8085 Architecture -Instruction set –Addressing modes —Assembly language-Simple Programming – Counters –Time delays-Interrupts –Intel 8086 internal architecture–8086 Addressing modes –instruction set -8086 Assembly language-Interrupts

UNIT-II: PERIPHERALS INTERFACING **9 Hrs**

Interfacing serial I/O(8251)-Parallel I/O(8255) –Keyboard and display controller (8279)-ADC/DAC Interfacing-Timer (8253).Programmable Interrupt Controller (8259), DMA controller, Applications of 8085

UNIT-III: 8051 MICROCONTROLLER **9 Hrs**

8051 Microcontroller hardware I/O pins, Ports and circuits-External memory –Counters and Timers-Serial Data I/O –Interrupts.

UNIT – IV: 8051 PROGRAMMING AND APPLICATIONS **9 Hrs**

8051 Instruction set –Addressing Modes –Assembly Language Programming -8051 interfacing LCD, ADC, Sensors, Stepper motors, Motors, Keyboard and DAC

UNIT-V: INTRODUCTION TO ARM PROCESSOR **9 Hrs**

ARM Architecture –ARM programmer's model- ARM development tools-memory hierarchy-ARM assembly language programming-Simple Examples-Architectural support for operating system- ARM instruction Set-Embedded ARM Applications

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books:

1. Krishna Kant, "*Microprocessors and Microcontrollers, Architecture, programming and system design using 8085, 8086, 8051 and 8096*", PHI 2007.
2. Douglas V Hall, "*Microprocessor and Interfacing, Programming and hardware*", TMH, 2006.
3. R.S. Gaonkar, "*Microprocessor Architecture Programming and Application, with 8085"*, Wiley Eastern Ltd., New Delhi, 2013.

References

1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay "*The 8051 Microcontroller and Embedded Systems*", Second Edition, Pearson Education 2008.
2. Kenneth J. Ayala, "*The 8086 Microprocessor: Programming & Interfacing the PC*", Delmar Publishers, 2007.
3. A K Ray, K M Bhurchandi, *Advanced Microprocessors and Peripherals*, TMH, 2007.
4. Steve furber "*ARM Systems on chip Architecture*", Second Edition Addison Wesley trade computer publication,2000.
5. John .B.Peatman *"Design with PIC Microcontrollers*" ,Pearson Education, 3rd Edition, 2004

Subject Code: BEC17010	Subject Name : COMMUNICATION SYSTEMS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Probability and random process	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To study various Amplitude modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Explain about different types of Noise
CO2	Interpret continuous wave modulation systems
CO3	Express the generation & demodulation of FM systems.
CO4	Define different types of pulse modulation
CO5	Describe the basics of information coding

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17010 COMMUNICATION SYSTEMS 3 0/0 0/0 3

UNIT - I: INTRODUCTION TO COMMUNICATION SYSTEMS AND NOISE 9 Hrs

Basic Communication Systems – Need for Modulation in Communication Systems - Noise - Sources of Noise – Types of Noise - External Noise – Thermal Agitation – Shot Noise – Noise Figure – Signal to Noise Ratio – Equivalent Noise Resistance, Amplitude Modulation and demodulation - Frequency Spectrum – power relations in Amplitude Modulation.

UNIT- II: CONTINUOUS MODULATION SYSTEMS 9 Hrs

Balanced Modulator, DSB – SC, SSB and VSB – Modulation and Demodulation - AM Transmitter, Receiver - Types, AM receivers.

UNIT- III: ANGLE MODULATION 9 Hrs

Frequency modulation – Mathematical representation of FM – Frequency Spectrum – Phase Modulation – Noise triangle – Pre-emphasis, de- emphasis- Comparison of Wide band and Narrow band FM, AFC - Stereophonic FM multiplex system – Generation of FM - FM receivers - Communication receivers.

UNIT- IV: ANALOG TO DIGITAL CONVERSION 9 Hrs

Sampling Theorem - PAM - Quantization of signal - Quantization Error – PWM , PPM – Introduction to digital modulation systems – ASK, FSK, PSK – Transmitter and receiver.

UNIT -V: INFORMATION THEORY AND CODING 9 Hrs

Introduction – Information - Entropy - Information rate, Classification of codes, Kraft McMillan inequality –-Source coding theorem - Shannon , Fano coding - Huffman coding, Joint and conditional entropies – Channel capacity - Shannon limit - BSC - Discrete memory less channels - Mutual information.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Roy Blake, "*Electronic Communication Systems*", Thomson Learning 2nd Edition, 2002.
2. George Kennedy: "*Electronic Communication Systems*", Tata McGraw Hill publications, 1992.
3. R Bose, "*Information theory, Coding and Cryptography*", TMH 2007.

Reference Books:

1.Taub & Schilling," *Principles of Communication*", Tata McGraw Hill,1986
2.Simon Haykins, "*Principles of Communications*", Prentice Hall of India. 2001

Subject Code:	Subject Name : MEASUREMENT AND INSTRUMENTATION	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

BEI17I01	Prerequisite: Electronic Circuit	Ty	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 :

- Introduce students to the use of various electrical/electronic instruments, their construction, applications, principles of operation, standards and units of measurements .Basic measurement and transducers concepts
- Importance of signal generators and signal analyzers in measurements
- Instrumentation standard protocols.
- Relevance of digital instruments in measurements.
- Provide students with opportunities to develop basic skills in the design of electronic equipment's using PLC.

COURSE OUTCOMES (COs) : (3- 5)

The student will be able to

CO1	Well-grounded in their knowledge about various types of transducers, Identify electronics/ electrical instruments, their use, peculiar errors associated with the instruments and how to minimize such errors.
CO2	Understand the basic design techniques of electronic equipment signal generators and signal analyzers.
CO3	Gain knowledge about Instrumentation standard protocols HART and Foundation Field bus H1.
CO4	Use various laboratory instruments like cathode ray oscilloscope, function generators and analyze various patterns.
CO5	Develop basic skills in the design of electronic equipment's using PLC

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3				
CO1	H	-	H				
CO2	H	H	H				

CO3	H	M	H					
CO4	H	H	M					
CO5	H	H	H					

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

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

BEI17I01 MEASUREMENT AND INSTRUMENTATION 3 0/0 0/0 3

UNIT I: TRANSDUCERS 9 Hrs

Transducer definition, classification, and performance characteristics. Potentiometer and its types, loading effect, sensitivity, piezo-resistive, equivalent circuits, charge and voltage sensitivity. Measurements, Instrumentation, Errors in Measurements, Calibration and Standard.

UNIT II: SIGNAL GENERATOR AND SIGNAL ANALYZERS 9 Hrs

A.F. Generator, Pulse Generator, AM / FM Signal Generator, Function Generator, Sweep Frequency Generator, Wave Analyzers, Spectrum Analyzers, Logic Analyzer, Distortion Analyzers, Network Analyzer.

UNIT III: INSTRUMENTATION STANDARD PROTOCOLS 9 Hrs

Definition of protocol, HART Protocol: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Foundation Field bus H1: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Devicenet, Profibus, Controlnet, Industrial Ethernet.

UNIT IV: DATA DISPLAY AND RECORDING SYSTEM 9 Hrs

CRO, Single Beam, Dual Trace, Double Beam CRO, Digital Storage and Analog Storage Oscilloscope, Sampling Oscilloscope, Power Scope, Curve Tracer, Analog, Digital Recorders and Printers – Case Study on Lissajous Pattern.

UNIT V: COMPUTER CONTROLLED TEST SYSTEM 9 Hrs

Programmable logic controllers (PLC) Introduction, architecture, definition of discrete state process control, PLC Vs PC, PLC Vs DCS, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, high speed counter, PLC design, study of at least one industrial PLC.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Rangan C.S. "*Instrumentation Devices and Systems*", Tata McGraw Hill, 1998.
2. Sandeep Redkar, "Foundation Fieldbus control system", Rockwell Automation,2010,
3. A. K. Shawney "*Electronics and Electrical Instrumentation"*, Tata McGraw Hill, 1975.

Reference Books:

1. Bouwels A.J., "*Digital Instrumentation*", McGraw Hill, 1986.
2. Barney .C, "*Intelligent Instrumentation* ", Prentice Hall of India, 1985.
3. Oliver and Cage, "*Electronic Measurements and Instruments and Instrumentation*", McGraw Hill, 1975.
4. Deobelin, "*Measurements Systems*", McGraw Hill, 1990.
5. Cooper, "*Electronic Instrumentation and Measurement Techniques*", Prentice Hall of India, 1988.

Subject Code:	Subject Name : DESIGN AND IMPLEMENTATION OF LINEAR INTEGRATED CIRCUITS	T / L/ ETL	L	T / S.Lr	P/ R	C
BEC17ET3						

Department of Electronics and Communication Engineering

	Prerequisite: Electronic Circuits	ETL	1	0/0	2/0	3

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

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

OBJECTIVE :

- To introduce the basics of linear integrated circuits.
- To understand the applications of operational amplifiers.
- To learn the design of comparators, signal generators and timers.
- To design active filters and PLL.
- To learn the concepts of IC regulators and Data converters.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Understand the basics of linear IC's.
CO2	Apply op-amp for various applications.
CO3	Design comparators and signal generators using op-amp.
CO4	Design active filters and PLL.
CO5	Understand and apply data converters for real time application.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	
CO2	H	H	
CO3	H	H	
CO4	H	H	
CO5	H	H	

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

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

BEC17ET3 **1 0/0 2/0 3**

DESIGN AND IMPLEMENTATION OF LINEAR INTEGRATED CIRCUITS

UNIT-I: INTRODUCTION TO INTEGRATED CIRCUITS 9Hrs

Integrated circuit and its classification, Introduction to Operational amplifier, Ideal Op-Amp , DC & AC Characteristics, Slew rate and methods of improving slew rate, CMRR, PSRR, Frequency Response and Compensation techniques.

Lab Experiments:

- Measure input bias current, input offset current, input offset voltage of the given op-amp
- Design voltage follower to measure slew rate.
- Measure CMRR for a given circuit and Compare measured value with calculated value

UNIT-II: APPLICATIONS OF OPAMP IC741 9Hrs

Inverter and Non-Inverter - Summer and Subtractor – Multiplier and Divider – Differentiator and Integrator – Instrumentation Amplifier – AC Amplifier – Op- Amp Circuits using Diodes, Precision Rectifier – Clipper and Clamper – Sample and Hold Circuit – Log and Antilog Amplifiers.

Lab Experiments:

- Design an Inverting and Non Inverting amplifier for required gain using IC741
- Design and realize adder and subtractor using IC741.
- Design Integrator and Differentiator using IC741.
- Design Clipper and Clamper Circuit using IC741.

UNIT-III: COMPARATORS AND SIGNAL GENERATORS **9Hrs**

Applications of Comparators – Regenerative Comparators (Schmitt Trigger) – Square Wave Generator (Astable Multivibrator) – Monostable Multivibrator –Triangular Wave Generator – Saw Tooth Wave Generator – Sine Wave Generators.

Lab Experiments:

- Design Schmitt trigger using IC741 for given values of UTP & LTP
- Design Monostable multivibrator for required pulse width using IC741.
- Design Astable multivibrator for required frequency and duty cycle using IC741

UNIT-IV: ACTIVE FILTERS AND PLL **9Hrs**

RC Active Filters: Low pass – High pass – Band pass – Band reject – Notch – First order , Second order Filters– Switched Capacitor Filters – Counter Timers.PLL Basic Principles – Phase Detector and Comparator: Analog and Digital Voltage Controlled Oscillator – Low pass Filter - PLL – Applications of PLL

Lab Experiments: (PSPICE)

- Design & Obtain frequency response of First order HPF & LPF filters
- Design & Obtain frequency response of Notch, BPF & BRF filters

UNIT V: IC REGULATORS AND DATA CONVERTERS: **9Hrs**

IC voltage regulators: Introduction, Fixed voltage regulators, SMPS, current limiting and current foldback techniques using IC723.

DAC/ADC Techniques – Integrating DAC /ADC Specifications, High Speed A/D Converters

Lab Experiments: (PSPICE)

- Design a voltage regulator for a given voltage.
- Calculate line, load regulation for a voltage regulator using IC723
- Construct a 4-bit R-2R ladder type DAC
- Set up a 4-bit successive approximation type ADC and study its performance

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books:

1. James. M. Fiore, "*Operational Amplifiers and Linear Integrated Circuits*", First Edition, Thomson Learning.
2. Roy Choudhury and Shail Jain, "*Linear Integrated Circuits*", Wiley Eastern Ltd., 1991.
3. Coughlin and Dirscol, "*Operational Amplifiers and Linear Integrated Circuits*", Prentice Hall of India Pvt., Ltd., 1992

Reference books:

1. Millman and Halkias, "*Integrated Electronics*", McGraw Hill, 1992.
2. Sergio Franco, "*Design with Operational Amplifiers and Analog Integrated Circuits*", Third Edition, TMH, 2002.
3. Ramakant A. Gayakwad, "*Op – amp and Linear Integrated Circuits*", Fourth edition, PHI.

Department of Electronics and Communication Engineering

Subject Code: BEC17L05	Subject Name : COMMUNICATION LAB - I	T / L/ ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Communication Systems	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To design and implement FIR & IIR filters, Multi rate signal processing, adaptive filters and fast Fourier transform using DSP processors.
- To measure signal parameters in time domain and frequency domain.
- To perform modulation and demodulation of various signals.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Implement various kinds of digital filter perform Multi rate signal processing and perform Fast Fourier Transform using DSP processors.
CO2	Measure various signal parameters in time domain and frequency domain.
CO3	Perform modulation and demodulation of various signals.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3				
CO1	H	H	M				
CO2	H	H	M				
CO3	H	H	M				

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

Department of Electronics and Communication Engineering

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

BEC17L05 COMMUNICATION LAB - I 0 0/0 3/0 1

LIST OF EXPERIMENTS

DSP PROCESSOR IMPLEMENTATION

1. FIR & IIR FILTERS IMPLEMENTATION
2. MULTIRATE SIGNAL PROCESSING
3. ADAPTIVE FILTER
4. FAST FOURIER TRANSFORMS

MEASUREMENT ON SIGNAL PARAMETERS IN TIME DOMAIN & FREQUENCY DOMAIN

5. DETERMINATION OF THE PHASE DIFFERENCE BETWEEN TWO SIGNALS (DERIVED FROM THE SAME SOURCE (SAY 1 KHZ SQUARE WAVE SIGNAL) USING TWO DIFFERENT PATHS, ONE OF WHICH CONTAINS A DELAY UNIT) USING CRO AND A PHASE DETECTOR CIRCUIT.
6. DETERMINATION OF THE FREQUENCY OF UNKNOWN SIGNALS: USING CRO AND LISSAJOUS PATTERNS.

ANALOG COMMUNICATION LAB

7. DESIGN AND TESTING OF AMPLITUDE MODULATION AND DEMODULATION.
8. DESIGN AND TESTING OF FREQUENCY MODULATION AND DEMODULATION.
9. DESIGN AND TESTING OF PRE-EMPHASIS.
10. DESIGN AND TESTING OF NARROW FREQUENCY MODULATION.

Subject Code: BEC17L06	Subject Name : MICROPROCESSOR AND MICROCONTROLLERS LAB	T / L / ETL	L	T / Stg.r	P/ R	C
	Prerequisite: Digital Electronics, Digital System Design lab	Lb	0	0/0	3/0	1

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To learn the assembly language programs in 8085,8086
- To study the various interfacing techniques with microprocessor.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Apply different programming techniques.
CO2	Demonstrate interfacing techniques to perform specific applications.
CO3	Develop microcontroller program.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	-
CO2	H	H	M
CO3	H	H	-

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

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

							✓					
Approval												

BEC17L06 MICROPROCESSOR AND MICRO CONTROLLER LAB 0 0/0 3/0 1

8085 MICROPROCESSOR:

1. ASSEMBLY LANGUAGE PROGRAMMING FOR SINGLE BYTE, MULTIBYTE, ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION,

2. AVERAGE OF N NUMBERS, BLOCK MOVEMENT OF DATA, MAXIMUM OF GIVEN SERIES, SQUARE OF A GIVEN NUMBER

INTERFACING:

3. WAVE FORM GENERATION USING 8255 PPI

4. TRAFFIC LIGHT CONTROLLER

5. STEPPER MOTOR CONTROLLER

6. KEYBOARD INTERFACING

7. MATRIX DISPLAY

8. A/D INTERFACE USING ADC 0809

9. DAC INTERFACE USING DAC 0808.

Subject Code: BEE17IL1	Subject Name: SIMULATION OF ELECTRICAL AND ELECTRONICS CIRCUITS USING P SPICE	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Circuit theory and electronic devices and circuits	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To implement the various electrical and electronics circuits using PSPICE.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Apply PSPICE in various circuits.
CO2	Demonstrate their skills in designing multivibrator circuit.
CO3	Apply their skills for the design of filters.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	-
CO3	H	H	-

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

Department of Electronics and Communication Engineering

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

BEE17IL1 **0 0/0 3/0 1**

SIMULATION OF ELECTRICAL AND ELECTRONICS CIRCUITS USING P SPICE

LIST OF EXPERIMENTS

1. Characteristics of BJT.
2. Verification of superposition and MPT Theorems.
3. Frequency analysis of RC Coupled Amplifier
4. Frequency analysis of JFET Amplifier
5. Monostable Multivibrator circuits.
6. Astable Multivibrator circuits
7. Summer, Subtractor.
8. Differentiator, Integrator.
9. LPF, HPF filters
10. BPF, BRF FILTERS.

Subject Code:	Subject Name : TECHNICAL SKILL - II	T / L/ ETL	L	T / S.Lr	P/ R	C
BEC17TS2		0	0	0	1	1

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

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

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

COURSE OUTCOMES (COs) : (3- 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

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

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

Approval	

Subject Code: BEC17L07	Subject Name : INPLANT TRAINING	T / L/ ETL	L	T / S.Lr	P/ R	C
		0	0	0	1	1

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

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

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

COURSE OUTCOMES (COs) : (3- 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

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

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

Approval	

Subject Code: BEC17011	Subject Name : DIGITAL COMMUNICATION	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Communication System, Probability and Random Process, Mathematics-I	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To study detection, estimation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To understand the concepts of different digital modulation techniques and their applications in our day to day life
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Apply the sampling process in real-time systems and to detect and estimate the likely output of a communication system
CO2	Design a system without distortion and interference
CO3	Hone their inferences to develop various modulation technologies for the state of the art communication.
CO4	Demonstrate their skills in generating a unique code for the information to be transmitted across a channel.
CO5	Apply their understanding to improve the system efficiency in a multipath environment.

Mapping of Course Outcomes with Program Outcomes (POs)

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

CO2	H	H	-					
CO3	H	H	M					
CO4	H	H	-					
CO5	H	H	M					

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

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

BEC17011 DIGITAL COMMUNICATION 3 1/0 0/0 4

UNIT- I: DETECTION, ESTIMATION AND SAMPLING PROCESS 12 hrs

Model of Digital Communication System, Gram Schmidt Orthogonalization Procedure, Matched Filters, Correlation Receivers, Error Probability, Maximum Likelihood Estimation, Linear Prediction and Prediction Filters, Sampling Theorem, Quadrature Sampling of Band-Pass Signals, Reconstruction of a message from its samples

UNIT - II: WAVEFORM CODING TECHNIQUES AND BASEBAND SHAPING 12 hrs

PCM and TDMA Principles, Channel Noise and Error Probability, Quantization Noise and SNR, Differential Pulse Code Modulation and Delta Modulation, Speech Coding at Low Bit Rates, Power Spectra of PAM Signals, Inter Symbol Interference, Nyquist Criterion for distortionless baseband transmission, Correlative Coding and Precoding, Eye Patterns and Equalization Techniques.

UNIT - III: DIGITAL MODULATION TECHNIQUES 12 hrs

Coherent Binary Modulation Techniques, Coherent Quadrature Modulation Techniques, NonCoherent

Binary Modulation Techniques, Power Spectra, Bandwidth Efficiency, Bit versus Symbol Error Probabilities

UNIT - IV: ERROR CONTROL CODING **12 hrs**

Need for Coding, Types of Codes, Linear Block Codes, Cyclic Codes, Convolution Codes, Maximum

Likelihood Decoding of convolutional Codes, Distance Properties and Sequential Decoding of convolutional Codes, Trellis coding, Viterbi coding.

UNIT - V: SPREAD SPECTRUM SYSTEMS **12 hrs**

Generation of Pseudo Noise Sequences, Correlation Properties, Direct Sequence Spread Spectrum Systems, Frequency Hop System, Signal Space Dimension and Processing Gain , Probability of Error, Antijam and Multipath Performance.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks:

1. Simon Haykin, "Digital *communications*", John Wiley & Sons, 1988.
2. John. G. Proakis, "*Digital Communication*", McGraw Hill Inc., Third Edition, Malaysia, 1995.
3. B.P. Lathi, "*Modern Digital and Analog communication system*", Oxford publications, Third edition.

Reference Books:

1. Roy Blake, "*Electronic Communication systems*",Thomson Learning, 2nd edition 2002.
2. M.K. Simen, "*Digital Communication Techniques Signal Design & Detection*", Prentice Hall of India, 1999.
3. Bernard Sklar, "*Digital Communication: Fundamentals and Applications*", Prentice Hall, 2011 Edition.
4. Upamanyu Madhow, "*Fundamentals of Digital Communication*",Cambridge University Press, 2008
5. Robert G. Gallager, "*Principles of Digital Communication*",Cambridge University Press 2008.

Subject Code: BEC17012	Subject Name : ANTENNA AND WAVE PROPAGATION	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: EMF, TLWG	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To study Antenna Parameters.
- To study Radiation Resistance, Antenna Efficiency Measurement.
- To study Antenna Arrays.
- To study different types Antennas
- To study Radio wave propagation.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand the knowledge about antenna basics.
CO2	Write about the radiation from a current element.
CO3	Analyze the antenna arrays.
CO4	Explain various types of antenna.
CO5	Explain the various types of radio wave propagation.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17012 ANTENNA AND WAVE PROPAGATION 3 0/0 0/0 3

UNIT - I ANTENNA BASICS 12 Hrs

Antenna Parameters – Gain, Directivity, Effective Aperture Polarization, Beam width, Balun, Ground System, Top loading, monopole and Half wave dipole antenna, Short linear antenna, Beam solid angle, Antenna Temperature.

UNIT - II RADIATION PRINCIPLE AND ANTENNA TERMINOLOGIES 12 Hrs

Principle of Radiation, pattern, Antenna Terminologies – Reciprocity Theorem, Friss Formula, Slot Antennas, SWR(Standing Wave Radiators)

UNIT - III ANTENNA ARRAYS 12 Hrs

Arrays – Two Element Arrays – Uniform Linear Array – Broadside Array – End fire array – Principle of Pattern Multiplication – Binomial Arrays.

UNIT - IV SPECIAL ANTENNA 12 Hrs

Dish Antenna – Helical Antenna, Biconical Antenna, Microstip Patch Antenna, Turnstile Antenna, Yagi – uda antenna, Loop Antenna, Antenna Low and Medium Frequencies.

UNIT - V WAVE PROPAGATION 12 Hrs

Wave Propagation - Surface Wave Propagation , Structure of the Ionosphere, Space Wave Propagation- Determination of Critical Frequencies - Maximum Usable Frequency - Effect of Earth's Magnetic Field - Fading - Super Refraction - Scatter Propagation.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60Hrs

Textbooks:

1. Constantine A.Balanis, "*Antenna theory analysis and design*" JohnWiley , 2nd Edition 2007.
2. G.S.V. Raju, "*Antenna wave propagation*", pearson education, 2004.
3. R.E. Collins, "*Antenna and Radio wave propagation*".

Reference Books:

1. John D. Kraus, Ronald J Marhefka. "*Antenna for all Appplications*" Tata McGraw Hill 3nd Edition,2007.
2. A.R.Harish, M. Sachidanada, "*Antenna and wave propagation*", Oxford university press,2007.
3. W.L.Stutzman and G.A. Thiele, "*Antenna analysis and design*", John willey,2000.

Subject Code:	Subject Name : BASICS OF ROBOTICS	T / L/ FTL	L	T / S Lr	P/ R	C

Department of Electronics and Communication Engineering

Department of Electronics and Communication Engineering

BME17I04	Prerequisite: Microprocessor and Microcontroller	Ty	3	0/0	0/0	3

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

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

OBJECTIVE :

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot.
- To develop a deep knowledge sensors and their applications in robot.
- To discuss about the various end effectors and manipulators.
- To develop a path planning and programming of robots.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand the importance of robotics in today and future goods production.
CO2	Have knowledge on robot configuration and subsystems.
CO3	Understand the principles of robot programming.
CO4	Handle with typical robot.
CO5	Implement specialized software and working of mobile robot.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✓				✓						
Approval												

BME17I04 BASICS OF ROBOTICS 3 0/0 0/0 3

UNIT I : INTRODUCTION 9Hrs

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots- robot kinematics and dynamics -Positions, Orientations and frames, Mappings: Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics of Six Degree of Freedom Robot Arm – Robot Arm dynamics

UNIT II : ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS 9Hrs

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link - Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws.

UNIT III : MANIPULATORS 9 Hrs

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators.

UNIT IV: ROBOT END EFFECTORS 9Hrs

Classification of End effectors – Tools as end effectors. Drive system for grippers-Mechanical adhesive-vacuum, magnetic-grippers. Hooks & Scoops. Gripper force analysis and gripper design. Active and passive grippers.

UNIT V : PATHPLANNING & PROGRAMMING **9Hrs**

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion – straight line motion-Robot languages -.computer control and Robot software.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60Hrs

Text books:

1. Deb S. R. and Deb S., “Robotics Technology and Flexible Automation”, Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J.Craig , “Introduction to Robotics”, Pearson, 2009. 3. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

References:

1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd., 2006.
2. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics : Control, Sensing, Vision and Intelligence", McGraw Hill, 1987

Subject Code: BSK17ET2	Subject Name : SOFT SKILLS - II QUALITATIVE AND QUANTITATIVE SKILLS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Soft Skills - I	Lb	1	0/1	0/0	1

Department of Electronics and Communication Engineering

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

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

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

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recognize and apply arithmetic knowledge in a variety of contexts.
CO2	Ability to identify and critically evaluate philosophical arguments and defend them from criticism.
CO3	Define data and interpret information from graphs.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

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

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

Approval	

Department of Electronics and Communication Engineering

BSK17ET2	**SOFT SKILLS –II**	**1**	**0/1**	**0/0**	**1**

UNIT 1 Logical Reasoning I

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT 2 Logical Reasoning II

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT 3 Arithmetical Reasoning I

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

UNIT 4 Arithmetical Reasoning II

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

UNIT 5 Data Interpretation

Tabulation – Bar graphs – Pie graphs – Line graphs.

Reference Book:

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: BEC17L08	Subject Name : COMMUNICATION LAB II	T / L/ ETL	L	T / SLr	P/ R	C
	Prerequisite: Digital Communication, Communication Systems	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To learn the concepts of analog pulse modulation techniques.
- To study the working of digital modulation system.
- To study the different types of information coding.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Understand and apply the concept of analog pulse modulation.
CO2	Generate codes for transmission of data.
CO3	Apply digital modulation techniques.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M

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

Department of Electronics and Communication Engineering

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

BEC17L08	**COMMUNICATION LAB II**	**0**	**0/0**	**3/0**	**1**

LIST OF EXPERIMENTS

1. DESIGN AND TESTING OF PULSE AMPLITUDE MODULATION & DEMODULATION.
2. DESIGN AND TESTING OF PULSE WIDTH MODULATION & DEMODULATION.
3. DESIGN AND TESTING OF PULSE POSITION MODULATION & DEMODULATION.
4. DESIGN AND TESTING OF ASK, FSK AND PSK
5. STUDY OF LINE CODING AND DECODING TECHNIQUES
6. STUDY OF SAMPLING
7. STUDY OF PULSE CODE MODULATION
8. DESIGN & TESTING OF EYE PATTERN
9. BLOCK/HAMMING CODES.
10. PN SEQUENCE GENERATOR.
11. DELTA MODULATION AND TIME DIVISION MULTIPLEXING.

Subject Code: BEC17L09	Subject Name : ROBOTICS LAB	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Microprocessor and Microcontroller lab	Lb	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

Department of Electronics and Communication Engineering

OBJECTIVE :

- To understand the different robotic configurations and their subsystems.

COURSE OUTCOMES (COs) : (3- 5)
The Students will be able to

CO1	Visualize the configurations of various types of robots.
CO2	Understanding the components of robots like arms, linkages, drive systems and end effectors.
CO3	Measure the performance of robots.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	CO1	CO2	CO3
CO1	H	H	M
CO2	H	H	H
CO3	H	H	M

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

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

Approval	

BEC17L09 ROBOTICS LAB 0 0/0 3/0 1

Subject Code: BEC17L10	Subject Name : OPEN CV-PYTHON FOR DIGITAL IMAGE PROCESSING LAB	T / L/ Eg.	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

LIST OF EXPERIMENTS

1. Simple Robot circuit
2. Build a Light-Tracking Robot
3. Simple Insect Robot
4. Line follower Robot
5. Two-Legged Walking Robot
6. Robot Control using 555 Timer
7. Study of AVR Studio and code Debugging
8. Interfacing Switch to turn on Bar graph LEDs. (Implementing a “Push to ON” indicator)
9. LCD Interfacing to display alphanumeric characters.
10. LCD Interfacing to displaying integer values on the LCD.
11. Generation of delay using timer and turning ‘ON’ the buzzer
12. Indication of the value of counter on LCD
13. DC Motor Interfacing
14. PWM control of the DC motor

Department of Electronics and Communication Engineering

	Prerequisite: Digital Image Processing	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- The fundamentals of digital image processing
- Image transform used in digital image processing
- Image enhancement techniques used in digital image processing

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Describe different modalities and current techniques in image acquisition
CO2	Use the mathematical principles of digital image enhancement (contrast, gradients, noise)
CO3	Describe and apply the concepts of feature detection and contour finding algorithms.
CO4	Apply the knowledge primarily obtained by studying examples and cases in the field of biomedical imaging to other engineering disciplines
CO5	Independently work in OpenCV software using python programming

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17L10 Open CV-PYTHON FOR DIGITAL IMAGE PROCESSING 0 0/0 3/0 1

LIST OF EXPERIMENTS

1. IMAGE PROCESSING IN OPEN CV
2. CHANGING COLOR-SPACE
3. IMAGE THRESHOLDING
4. GEOMETRIC TRANSFORMATIONS OF IMAGES
5. SMOOTHING IMAGES
6. MORPHOLOGICAL TRANSFORMATIONS
7. IMAGE GRADIENTS
8. CANNY EDGE DETECTION
9. IMAGE PYRAMIDS
10. CONTOURS IN OPENCV
11. HISTOGRAMS IN OPENCV
12. IMAGE TRANSFORMS IN OPENCV
13. FEATURE DETECTION AND DESCRIPTION

Subject Code: BEC17L11	Subject Name : MINI PROJECT	T / L / ETL	L	T / S.Lr	P / R	C
	Prerequisite: NIL					1

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

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

OBJECTIVE : To acquire hands-on experience in converting a novel idea / technique into a working model / prototype involving multi-disciplinary skills and / or knowledge and working in at team.

14. CAMERA CALIBRATION AND 3D RECONSTRUCTION

Subject Code: BEC17TS3	Subject Name : TECHNICAL SKILL - III	T / L/ ETL	L	T / S.Lr	P/ R	C
		0	0	0	1	1

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

COURSE OUTCOMES (COs) : (3- 5)

CO1	To conceptualize a novel idea / technique into a product
CO2	To develop a multi-disciplinary thinking and enable teamwork
CO3	Ideate and develop a prototype

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

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

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

Approval	

Department of Electronics and Communication Engineering

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

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

COURSE OUTCOMES (COs) : (3- 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			
CO1								
CO2								

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

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

Approval	

Subject Code: BEC17013	Subject Name : INTRODUCTION TO VLSI AND EMBEDDED SYSTEM DESIGN	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Digital Electronics and Data Structures	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To learn the basics of MOS Transistors.
- To study the design of combinational logic circuit using CMOS.
- To learn CMOS sequential logic circuits design.
- To learn the concepts of modeling a digital system using HDL.
- To study the basics of PIC microcontroller.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand the basics of MOS Transistor.
CO2	Design combinational circuits using CMOS logic.
CO3	Design sequential circuits using CMOS.
CO4	Write program to model a digital system using VHDL & Verilog.
CO5	Understand the basics of 16F877 PIC Microcontroller.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M

CO5	H		H		-						
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
				✓							
Approval											

BEC17013 INTRODUCTION TO VLSI AND EMBEDDED SYSTEM DESIGN 3 1/0 0/0 4

UNIT –I: MOS TRANSISTOR THEORY 12Hrs

Introduction – NMOS and PMOS transistor, Threshold voltage, Body effect, MOS device – Basic DC equations ,Second order effects, MOS models, Small signal AC characteristics, Complementary CMOS Inverter, Power dissipation and scaling of MOS transistors.

UNIT –II: DESIGNING COMBINATIONAL LOGIC CIRCUITS 12Hrs

Static CMOS design – Complementary CMOS, Propagation Delay and Power Consumption in static CMOS, Pseudo NMOS Logic, Pass Transistor Logic, Transmission gates, Dynamic CMOS Design – Basic principle, Speed and Power dissipation of Dynamic logic, Signal integrity issues in dynamic design, CMOS Domino logic, np CMOS logic.

UNIT -III: DESIGNING SEQUENTIAL LOGIC CIRCUITS 12Hrs

Introduction – Timing metrics for sequential circuits, Classification of memory elements, Static latches and registers – The bi-stability principle, Multiplexer based latch, Master slave edge triggered register, Static SR flip flop, Dynamic latches and registers – Dynamic transmission gate edge triggered registers, clocked CMOS register.

UNIT -IV: VHDL & VERILOG PROGRAMMING 12Hrs

VHDL background – VHDL requirement, Elements of VHDL, operators, Basic concepts in VHDL, Structural modeling, Behavioral modeling and Dataflow modeling in VHDL and Simple programs, Verilog HDL – Basic concepts – Gate Level modeling, Dataflow modeling and Behavioral modeling – Simple programs.

Subject Code: BEC17014	Subject Name : OPTICAL COMMUNICATION AND NETWORKS	T / L/ ETL	L	T / S.Lr	P/ R	C

UNIT -V: PIC MICROCONTROLLER **12Hrs**

Introduction - PIC16F877 Micro controller overview, Special Function Registers, I/O Ports, Timers, Oscillators, Capture/ Compare and PWM module, Serial communication module, Analog module and Instruction set.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. Neil H.E. Weste, Kamran Eshraghian, "*Principles of CMOS VLSI Design – A system perspective*", second edition,Addison Wesley,1997.
2. Jan M.Rabaey, Ananth Chandrakasan, Borivoje Nikolic, " *Digital Integrated Circuits : A Design perspective*", second edition, Prentice Hall of India, 2003.
3. Zainalabedin Navabi, " *VHDL – Analysis and modeling of Digital Systems*" , Second edition, Mcgraw – Hill International Editions, 1998.

Reference Books:

1. A. Pucknell, Kamran Eshraghian, " *Basic VLSI Design*", Third Edition, Prentice Hall of India,2007.
2. R.Jacob Baker, Harry W.Li, David E. Boyce, "*CMOS circuit design, Layout and Simulation*", Prentice Hall of india, 2005.
3. J.Baskar, "*A VHDL Primer*", Third edition, Pearson Education,2004.
4. Samir Palnitkar, "*Verilog HDL, A Guide to Digital Design and Synthesis*", second edition, Pearson Education,2003.
5. pic-microcontroller.com / free- ebook- pic-microcontrollers.

	Prerequisite: Digital communication	Ty	3	1/0	0/0	4

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

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

OBJECTIVE :

- To learn the basic elements of optical fiber transmission link, types of fibers, Slicing and connectors.
- To understand the different kind of loss and system design consideration.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN, APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn different types of optical networks.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Design any types of fibers.
CO2	Design lossless fibers.
CO3	Include newer technique for designing optical sources.
CO4	Design efficient optical detectors using innovative idea.
CO5	Implement modern technology for designing optical networks.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

Department of Electronics and Communication Engineering

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✓								
Approval												

BEC17014 OPTICAL COMMUNICATION AND NETWORKS 3 1/0 0/0 4

UNIT I: INTRODUCTION TO OPTICAL FIBERS 12Hrs

The General System – Evolution of Fiber Optical System – Elements of an Optical Fiber Transmission Link – Cylindrical Fiber – Single Mode Fibers and Multimode Fibers - Fiber Splicing and Connectors .

UNIT II: OPTICAL LOSSES AND DESIGN 12Hrs

Absorption Losses, Scattering Losses – Bending Losses – Core and Cladding Losses – Signal Distortion in SM Fibers - Point to Point Links – System Design Consideration — Line Power Budget – Rise Time Budget.

UNIT III: OPTICAL SOURCES 12Hrs

Direct and Indirect Band Gap Material – LED Structures - LED Power and Efficiency – Modulation – Laser Diodes Structures and Radiation Pattern – Single Mode Lasers – Modulation of Laser Diodes.

UNIT IV: OPTICAL DETECTORS 12Hrs

PIN and APD Diodes – Photo Detector Noise, SNR, Detector Response Time, Avalanche Multiplication Noise – Comparison of Photo Detectors – Fundamentals Receiver Operation – FET Pre-amplifiers

UNIT V: OPTICAL NETWORKS 12Hrs

Operational Principles of WDM – Introduction to Optical Networks - Principles of SONET/SDH, OFDM, OTDM – Multiplexing and De multiplexing techniques - Synchronization.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 60 Hrs

Textbooks :

1. Gerd Keiser, "*Optical Fiber Communication System*", McGraw Hill, International, Singapore 3rd ed., 2000.
2. John M. Senior, "*Optical Fiber Communication principles and practice*", Prentice Hall of India private limited, 1996.
3. Rajiv Ramaswami and Kumar N. Sivarajan, "*A Practical Perspective*", Harcourt Asia Ptv Ltd., Second Edition, 2004.

Reference Books:

1. J. Gower, "*Optical communication system*", Prentice Hall of India, 2001.
2. Govind P. Agrawal " *Fiber-Optic Communication Systems*", Wiley India 3rd Edition
3. C. Siva Ram Moorthy and Mohan Gurusamy, "*WDM Optical Networks: Concept, Design and Algorithms"*, Prentice Hall of India, Ist Edition, 2002. 54
4. P.E. Green, Jr., "*Fiber Optic Networks*", Prentice Hall, NJ, 1993.
5. Biswanath Mukherjee, "*Optical WDM Networks*", Springer Series, 2006.

Subject Code: BMG17001	Subject Name : PRINCIPLES OF MANAGEMENT	T / L/ ETL	L	T / S. Lr	P/ R	C
	Prerequisite: None	Ty	3	0/0	0/0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To enable the students to study the evolution of Management and types of business organization organizational culture and environment and trends and issues in management.
- To enable the students understand the nature of planning and its processes and decision making steps and process.
- To enable the students understand the nature and purpose of organizing types of organization authority and its types and Human Resource Management and its concepts.
- To understand the foundation of individual and group behavior and various motivational theories, techniques, job satisfaction concepts and communication theories.
- To understand the concept of controlling its system and processes.

COURSE OUTCOMES (COs) : (3- 5)

The Students will able to

CO1	Understanding of evolution of management, types of business organization, organizational culture and environment and trends and issues in management.
CO2	Understand the planning and processes associates with tools and decision making steps.
CO3	Understand concept of organizing, HR and its concepts.
CO4	Analyze individual, group behavior and related concepts.
CO5	Understand system and process of controlling techniques.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO 1	PSO 2	PSO 3
CO1	H	H	H

CO2	H	H	-					
CO3	H	H	M					
CO4	H	H	-					
CO5			M					
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

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

BMG17001 PRINCIPLES OF MANAGEMENT 3 0/0 0/0 3

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9 Hrs

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers -managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Organization culture and Environment- Current trends and issues in Management.

UNIT II PLANNING 9 Hrs

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9 Hrs

Subject Code:	Subject Name : INTERNET OF THINGS	T / E/ ETL	L	T / S. Lr	P/ R	C

Nature and purpose – Formal and informal organization – organization chart –organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization.– Job Design – HR Planning, Recruitment, selection, Training and Development, Performance Appraisal Management , Career planning and stages

UNIT IV DIRECTING **9Hrs**

Group dynamics,formation of groups,managing groups – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership –styles and theories of leadership – communication – process of communication – barrier in communication —communication in IT.

UNIT V CONTROLLING **9Hrs**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Textbooks:

1. Stephen P. Robbins & Mary Coulter, "*Management*", 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2. Harold Koontz & Heinz Weihrich "*Essentials of management*" Tata Mc Graw Hill, 1998.
3. L.M. Prasad , *Principles and Practice of Management*, Sultan Chand & Sons 2015.

References:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "*Fundamentals of Management*" 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, "*Management*", Biztantra, 2008.

Department of Electronics and Communication Engineering

BEC17ET4	Prerequisite: Sensor, Linux Basics	ETL	1	0/0	2/0	3

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

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

OBJECTIVE :

- To study basic of IoT and M2M.
- To study IoT with Cloud environment.
- To design IoT systems with Python and study physical devices.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Design IoT based devices.
CO2	Implement new approach based on IoT and M2M.
CO3	Design IoT systems with Cloud environment.
CO4	IoT devices can be operated using Python software.
CO5	Implement new applications based on Raspberry Pi and Intel Galileo Arduino board.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17ET4 INTERNET OF THINGS 1 0/0 2/2 3

UNIT I: INTRODUCTION TO INTERNET OF THINGS 9 Hrs

Definition and Characteristics of IoT – Things in IoT – IoT Protocols – Logical Design of IoT – IoT enabling technologies – IoT Levels.

UNIT II: DOMAIN SPECIFIC IoT AND M2M 9 Hrs

Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Life style – Introduction to M2M – Difference between IoT to M2M –SDN and NFV for IoT.

UNIT III: IoT SYSTEM MANAGEMENT AND CLOUD 9 Hrs

Need for IoT System Management - SNMP – NETCONF – YANG – NETOPEER – IoT design methodology - Case study for IoT System – WAMP –AutoBahn for IoT – Xively – Django- Amazon Web for IoT – SkyNet IoT.

UNIT IV: IoT SYSTEMS – LOGICAL DESIGN USING PYTHON 9 Hrs

Introduction – Installing Python – Python Data types and data structures – Control flow – Functions – Modules – Packages – File Handling – Data / Time Operations – Classes – Python packages of Interest for IoT.

UNIT V: IoT PHYSICAL DEVICES 9 Hrs

Raspberry Pi – Linux on Raspberry Pi - Raspberry Pi Interfaces – Programming Raspberry Pi with Python – Arduino boards – Other IoT devices – Data analytics for IoT – Intel Galileo Arduino board Specification (with simple programs).

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Textbooks :

1. Arshdeep Bahga.Vijay madisetti , *" Internet of things – A hands- on approach "* , Universities press, First Editon, 2015.
2. Adrian McEwen and Hakim Cassimally, "*Designing the Internet of Things*",Wiley,First edition 2014.
3. C Hillar Gastn, "*Internet of Things with Python*", Packt publishing, first edition ,2016.

Reference Books:

1. Dominique D. Guinard and Vlad M. Trifa "*Building the Web of Things With examples in Node.js and Raspberry Pi*", June 2016 ISBN 9781617292682
2. Charalampos Doukas, "*Building Internet of Things with the Arduino*" ISBN/EAN13:1470023431 / 9781470023430
3. Gastón C. Hillar, "*Internet of Things with Python*", May 2016 , PACKT Publishing limited.
4. Marco Schwartz "*Internet of Things with the Raspberry Pi: Build Internet of Things Projects Using the Raspberry Pi Platform*", Kindle Edition.

Subject Code: BEC17L12	Subject Name : MICROWAVE AND OPTICAL COMMUNICATION LAB	T / L / ETL	L	T / Sdr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Microwave Engineering, Optical communication	Ty	0	0/0	3/0	1

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

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

OBJECTIVE :

- To have a detailed practical study of microwave equipments
- To study the optical devices and to use in the appropriate application.
- To learn the fiber optical receivers and connectors.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Demonstrate the ability to design and conduct experiments, analyze and interpret data.
CO2	Demonstrate the skills to use modern engineering tools, software and equipments to analyze problems.
CO3	Design a system and to learn about measurement of fiber parameters.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	H
CO2	H	H	H
CO3	H	M	M

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

Department of Electronics and Communication Engineering

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

BEC17L12 MICROWAVE AND OPTICAL COMMUNICATION LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

1. REFLEX KLYSTRON MODE CHARACTERISTICS.
2. MEASUREMENT OF GUIDE WAVELENGTH
3. MEASUREMENT OF VSWR AND IMPEDANCE OF UNKNOWN LOADS, INCLUDING MEASUREMENT OF HIGH VSWR.
4. MEASUREMENT OF THE COUPLING AND THE DIRECTIVITY OF WAVEGUIDE DIRECTIONAL COUPLERS.
5. MEASUREMENT OF INSERTION LOSS AND ISOLATION OF NON – RECIPROCAL FERRITE DEVICES.
6. STUDY OF TEE JUNCTION (E-PLANE, H-PLANE AND E-H PLANE TEES.)
7. MEASUREMENT OF THE GAIN AND RADIATION PATTERN OF A WAVEGUIDE HORN ANTENNA
8. STUDY OF GUNN OSCILLATOR CHARACTERISTICS.
9. STUDY OF A FIBER-OPTIC COMMUNICATION LINK.
10. CHARACTERISTICS OF LED AND PIN DIODE
11. CHARACTERISTICS OF LASER DIODE
12. CHARACTERISTICS OF AVALANCHE PHOTODIODE
13. MEASUREMENTS OF FIBER PARAMETERS : NUMERICAL APERTURE, ATTENUATION

Subject Code: BEC17L13	Subject Name : VLSI & EMBEDDED SYSTEM DESIGN LAB	T / L /	L	T / S Lr	P/ R	C

		ETL				
	Prerequisite: Introduction of VLSI & embedded system design	Lb	0	0/0	3/0	1

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

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

OBJECTIVE :

- To design and simulate combinational logic circuits using Xilinx.
- To design and simulate sequential logic circuits.
- To interface ADC, DAC, DC motor, stepper motor with PIC microcontroller.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Write programs to implement combinational circuits like adder, multiplexer, de multiplexer etc.,
CO2	Simulate sequential circuits like FFs, counters, shift registers.
CO3	Interface I/O devices, ADC, DAC, motors with microcontroller.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M

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

Department of Electronics and Communication Engineering

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

BEC17L13 VLSI & EMBEDDED SYSTEM DESIGN LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

SIMULATION OF DIGITAL CIRCUITS USING XILINX

1. DESIGN AND TESTING OF ADDER AND SUBTRACTOR
2. DESIGN AND TESTING OF MULTIPLEXER, DEMULTIPLEXER, ENCODER, DECODER.
3. DESIGN AND TESTING OF MAGNITUDE COMPARATOR WITH 4/8 BITS.
4. DESIGN AND TESTING OF JK, D, T AND SR FLIP FLOPS, AND REGISTERS
5. DESIGN AND TESTING OF SYNCHRONOUS & ASYNCHRONOUS COUNTERS.
6. DESIGN AND TESTING OF SHIFT REGISTERS (RIGHT / LEFT).

INTERFACING WITH PIC MICROCONTROLLER

7. ADC INTERFACE WITH LM35.
8. STEPPER MOTOR INTERFACE
9. TRAFFIC LIGHT CONTROLLER INTERFACE
10. DC MOTOR INTERFACE
11. LCD DISPLAY INTERFACE.
12. LED INTERFACE

Subject Code: BEC17L14	Subject Name : PROJECT PHASE - I	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Lb	0	0/0	3/1	2

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

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

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

COURSE OUTCOMES (COs) : (3- 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5			

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

Subject Code:	Subject Name : FOREIGN LANGUAGE								T / E / ETL	L	T / S.Lr		P/ R	C
BFL17001														
Category	Prerequisite: NIL								Ty	1	1			2

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

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

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

	Basic Sciences	Engineering sciences	Humanities and Social sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internship / Technical Skill	Soft Skills
COURSE OUTCOMES (COs) : (3-5)									
CO1	Achieve functional proficiency in listening, speaking, reading, and writing.								
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.								
Approval									

Department of Electronics and Communication Engineering

Subject Code:	Subject Name : TOTAL QUALITY MANAGEMENT	T / L/ ETL	L	T / S.Lr	P/ R	C
BMG17003	Prerequisite: None	Ty	3	0/0	0/0	3

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1					

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

OBJECTIVE :

- To give a brief introduction to Deming's philosophy, trails of the customer complaints and feedback.
- To give an idea about different continuous process involvement techniques supplier partnership and performance measures.
- To give an introduction to ISO 9000, QFD, quality by design different tests for statistical and orthogonal design.

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

- To give an introduction to Taguchi and quality engineering concepts, loss function, orthogonal arrays signal/noise design etc.
- To give an understanding of ISO 14000 and 14001 tools.

COURSE OUTCOMES (COs) :

The Students will be able to

CO1	Introduction to Deming's philosophy, trails of the customer complaints and feedback.
CO2	An idea about different continuous process involvement techniques supplier partnership and performance measures.
CO3	Understanding of ISO 9000, QFD, quality by design different tests for statistical and orthogonal design.
CO4	Understanding of Taguchi and quality engineering concepts, loss function, orthogonal arrays signal/noise design etc.
CO5	Understanding of ISO 14000 and 14001 tools.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BMG17003 TOTAL QUALITY MANAGEMENT 3 0/0 0/0 3

UNIT-I **9 Hrs**

Introduction to Deming's Philosophy, Customer Satisfaction: Who is the Customer, Complaints, and Feedback, Employee Involvement.

UNIT-II **9 Hrs**

Continuous Process Improvement: IIT, Kan Ban, Cellular Manufacturing, Juran's Trilogy, PDSA, Kizan, Re – Engineering, Supplier Partnership, Performance Measures.

UNIT-III **9 Hrs**

Quality Systems – ISO 9000, Others. QFD, Quality by Design: Tools and Pitfalls Design of Expressions: Statistical Tests (F.T. Etc.) Orthogonal Design.

UNIT-IV **9 Hrs**

Taguchi and Quality Engineering: Loss Function, Orthogonal Arrays, Signal / Noise Parameter Design, Tolerance Design, Failure Mode Effect Analysis.

UNIT-V **9 Hrs**

ISO 14000 and 14001.Management tools: Forced Field Analysis, Nominal Group Techniques, Affinity Diagrams, Interrelationship Diagram, Tree Diagram, Matrix Diagram, Prioritization Matrix, Process Decision program charts, Activity Network Diagram.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. James R. Williams and Lindsey M., "*The Management and Control of Quality*", Thomson Press, SW, 2002.
2. Feighbaunn A.V.," Total Quality Management", McGraw Hill

References:

1. Oakland, J.S." *Total Quality Management* ", Butterworth – Heinemann Ltd.
2. Subbraj Ramaswamy, "*Total Quality Management*", Tata Mc. Graw Hill, 2005.

Subject Code: BEC17L15	Subject Name : PROJECT PHASE - 2	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL					8

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

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

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

COURSE OUTCOMES (COs) : (3- 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Subject Code: BEC17E01	Subject Name : BIOMEDICAL INSTRUMENTATION	T / L/ ETL	L	T / S.Lr	P/ R	C
Approval						

-

ELECTIVES

	Prerequisite: Measurement and Instrumentation, control Systems	Ty	3	0	0	3

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

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

OBJECTIVE :

- To study the methods of recording various bio potentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals

COURSE OUTCOMES (COs) :

The students will able to

CO1	Enable the students to develop knowledge of how instruments work in the various department and laboratories of a hospital and thereby recognize their limitations.
CO2	Interpret technical aspects of medicine.
CO3	Familiarize students with various medical equipment's and their technical aspects. Understand medical diagnosis and therapy.
CO4	Introduce students to the measurements involved in some medical equipment's.
CO5	Understanding the problem and ability to identify the necessity of equipment's to a specific problem.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1			H
CO2		M	H
CO3		M	H
CO4	H	M	H

CO5	H	M	H						
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low									

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

BEC17E01 BIOMEDICAL INSTRUMENTATION 3 0 0 3

UNIT I: BASIC PHYSIOLOGY 9 Hrs

Cells and their Structures – Transport of Ions Through Cell Membrane – Resting and Excited State – Transmembrane Potential – Action Potential – Bio-Electric Potential – Nervous System – Physiology of Muscles – Heart and Blood Circulation – Respiratory System – Urinary System.

UNIT II: BASIC TRANSDUCER PRINCIPLES AND ELECTRODES 9 Hrs

The Transducer Principles – Active Transducers – Passive Transducers – Transducer for Bio-Medical Application – Electrode Theory- Bio-Potential Electrode – Bio-Chemical Transducer.

UNIT III: CARDIOVASCULAR SYSTEM 9 Hrs

The Heart and Cardiovascular System – Blood Pressure – Characteristics of Blood Flow – Heart Sounds - Electro Cardiograph – Measurements of Blood Pressure – Measurement of Blood Flow and Cardiac O/P Plethysmography – Measurements of Heart Sounds

UNIT IV: X-RAY AND RADIOISOTOPE INSTRUMENTATION: 9 Hrs

X-ray Imaging Radiography – Fluoroscopy – Image Intensifiers – Angiography - Medical use of Radioisotopes – Beta Radiations – Detectors – Radiation Therapy.

UNIT V: BIO-TELEMETRY 9 Hrs

Introduction to Bio-Telemetry – Physiological Parameters Adaptable to Bio-Telemetry – The Components of Bio-Telemetry Systems – Implantable Units – Applications of Telemetry in Patient Care – Application of Computer in Bio-Medical Instrumentation, Anatomy of Nervous System – Measurement from the

Nervous System – EEG – EMG.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books:

1. M. Arumugam, "*Bio-medical Instrumentation*" – Anuradha Agencies Publishers, 1992.
2. Khandpur," *Handbook on Biomedical Instrumentation*" – Tata McGraw Hill Co Ltd., 1989.

References:

1. Leusis Cromwell Fred, J. Werbell and Erich A.pfraffer, "*Biomedical instrumentation and Measurements*" – Prentice Hall of India, 1990.
2. Joseph J. Carr and John M. Brown, "*Introduction to Biomedical equipment Technology*", John Wiley and Sons, New York, 1997

Subject Code:	Subject Name : PATTERN RECOGNITION	T / L / Th	L	T / S / Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17E02	Prerequisite: Probability Random Process	Ty	3	0	0	3

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

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

OBJECTIVE :

- To learn the different techniques of pattern recognition and training.
- To learn various rules available in decision making.
- Study the different approaches of pattern classification and application in clinical diagnosis

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Identify areas where pattern recognition can offer a solution
CO2	Describe algorithms, validation methods and sampling techniques.
CO3	Describe the advances in algorithms for classification and recognition.
CO4	Interpret the basics of neural, feature and data engineering.
CO5	Recall the applications of neural processing.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1			
CO2		M	
CO3		M	
CO4	M	M	M
CO5			

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

Department of Electronics and Communication Engineering

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

BEC17E02 PATTERN RECOGNITION 3 0 0 3

\

UNIT-I FUNDAMENTALS OF PATTERN RECOGNITION 9 Hrs

Basic Concepts of Pattern Recognition - Decision Theoretic Algorithms - Structural Pattern Recognition.

UNIT-II INTRODUCTORY NEURAL NETWORKS 9Hrs

Artificial Neural Network Structures - Supervised Training via Error back Propagation: Derivations.

UNIT-III ADVANCED FUNDAMENTALS OF NEURAL NETWORKS 9 Hrs

Acceleration and Stabilization of Supervised Gradient Training of MLPs - Advances in Network Algorithms for Classification and Recongnition - Recurrent Neural Networks.

UNIT-IV NEURAL, FEATURE AND DATA ENGINEERING 9 Hrs

Neural Engineering and Testing of FANNs - Feature and Data Engineering

UNIT- V TESTING AND APPLICATIONS 9 Hrs

Some Comparative Studies of forward Artificial Neural Networks-Pattern recognition Applications in Texture Classifications & recognition- Speech recognition- Neural processing of Digital images- character recognition.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text Books:

1. Caral g. Looney," *Pattern Recognition Using Neural Networks – Theory and Algorithms for Engineering and Scientists*" – New York Oxford University Press 1997.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "*Pattern Recognition and Image Analysis*", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

REFERENCES:

1. P. A. Devijver and J. Kittler, "*Pattern Recognition",* Prentice-Hall International, Englewood Cliffs, NJ, 1980.
2. William Gibson, *Pattern Recognition*, Science fiction,2003

Subject Code: BEC17E03	Subject Name : DEVICE MODELING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Solid State Device	Ty	3	0	0	3

Department of Electronics and Communication Engineering

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 passive devices and structures
- To understand the integrated BJT and MOS devices

COURSE OUTCOMES (COs) :

The Student will be able to

CO1	Describe in brief about integrated passive devices.
CO2	Present a review on monolithic technologies.
CO3	Analyze different models of integrated bipolar transistor.
CO4	Solve the basic equations of integrated MOS transistor.
CO5	Recall the concepts of spice modeling.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E03 **DEVICE MODELING** **3 0 0 3**

UNIT I: INTEGRATED PASSIVE DEVICES: **9 Hrs**

Types and Structures of Resistors and Capacitors in Monolithic Technology – Dependence of Model Parameters on Structure.

UNIT II: INTEGRATED DIODES: **9 Hrs**

Junction and Schottky Diodes in Monolithic Technologies – Static and Dynamic Behavior – Small and Large Signal Models – SPICE Models.

UNIT III: INTEGRATED BIPOLAR TRANSISTOR: **9 Hrs**

Types and Structures in Monolithic Technologies – Basic Model (Eber Moll_-Cunmel – Poon Model – Dynamic Model, Parasitic Effects – SPICE Model –Parameter Extraction.

UNIT IV: INTEGRATED MOS TRANSISTOR: **9 Hrs**

n-MOS and p-MOS Transistor – Threshold Voltage -Threshold Voltage Equations – MOS Device Equations – Basic DC Equations Second Order Effects – MOS Models Small Signal AC Characteristics – MOSFET SPICE Model Level 1,2,3,4.

UNIT V: SPICE MODELLING **9 Hrs**

Advanced Concepts of Large Signal & Low Signal Modeling.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Text books:

1. Daniel Foty, "MOSFET *Modeling with Spice"* prentice hall, 1997.
2. Neil Weste and Kamran Eshranghian *"Principles of CMOS VLSI Design, A System Perspective*", "Addition – Wesley, 1993.

References:

1. Jacob Millman& Arvin Millman, "*Micro Electronics*", McGraw Hill (Second Edi) 1987.
2. M. Satyagi, John Wiley" *Introduction to Semi-conductor materials and devices"*, New Edition

Subject Code: BEC17E04	Subject Name : QUANTUM COMPUTING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Engineering Physics	Ty	3	0	0	3

Department of Electronics and Communication Engineering

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 building blocks of a quantum computer.
- To understand the principles, quantum information and limitation of quantum operations formalizing.
- To understand the various quantum algorithms.

COURSE OUTCOMES (COs) : (3- 5)

The Students will be able to

CO1	Demonstrate the importance of quantum computing and superposition states.
CO2	Possess a deep insight on Quantum operator and its Applications.
CO3	Attain the knowledge about variety of quantum gates and build quantum circuits.
CO4	Apply the concept of different quantum algorithms and have the insight of QKD.
CO5	Recognize, test and correct various Quantum errors through Quantum error correcting codes.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

BEC17E04 **QUANTUM COMPUTING** **3 0 0 3**

UNIT I: INTRODUCTION **9 Hrs**

Introduction to Quantum Computing- Power of Quantum Computing- Quantum Information- Quantum Computers. The Wave and the Corpuscular Nature of Light Photon Behavior, State Description, Measurement in Multiple Bases, Superposition States – The Superposition probability Rule.

UNIT II: QUANTUM MECHANICS **9 Hrs**

Quantum Postulates – State space, Evolution, Quantum Measurement, Distinguishing Quantum states, Projective measurements, POVM measurements -Quantum Mechanics-Hilbert Space-Linear Operators Tensor and Outer Products-Quantum Operators- Application Quantum mechanism: Super dense Coding - Double Silt Experiments.

UNIT III: QUBITS AND QUANTUM GATES **9 Hrs**

Qubits, Bloch Sphere Representation-Rotation Operation-The Measurement of a Single Qubits-A Pair of Qubits- Bell States- Qubits as Spin Half- Integer Particles- Qubits as Polarized Photon-Entanglement, Exchange of Information / Teleportation – Quantum Coping Circuit - The Non-Cloning Theorem-Quantum Gates – Universal Quantum Gate Gates – Matrix Representation – Quantum Circuits- Single and Multiple Qubit Controlled Operations.

UNIT IV: QUANTUM ALGORITHM **9 Hrs**

Turing Machine - Quantum Parallelism-Deutsch's Problem, Deutsch – Jozsa Algorithm -QFT(Quantum Fourier Transform)-Short's Factoring Algorithm-Simon's Algorithm-Quantum Search Algorithm-Quantum key distribution - Mathematical Models of Quantum Computers - Introduction Different implementations of quantum computer.

UNIT V: QUANTUM ERROR CORRECTION **9 Hrs**

Quantum error correction and simple examples – The Three Qubit flip code, Three Qubit Phase flip code, The Shor Code - Brief Introduction to Quantum Computing Software - Quantum error-correcting codes: Error models, Criteria for a good code: reversible operations.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks :

1. Dan C. Marinescu, Gabriela M. Marinescu, "*Approaching Quantum Computing*", Pearson Education 2008-09.
2. M.A. Neilson and I.L .Chuang "*Quantum computing and Quantum information"*, Cambridge University Press, 2009.
3. Vishal Sahani "*Introduction to Quantum Computing*", TATA McGraw-Hill Publishing Company Limited.

Reference Books:

1. A.Yu.Kitaev, A.H.Shen, M.N.Vyalyi, "*Classical and Quantum Computation*", American Mathematical Society.
2. Mark.M.Wilde, "*Quantum information theory*" Cambridge university press.
3. J.A.Jones, "*Quantum information, computation and communication*" Cambridge University Press.
4. Scott Aaronson, "*Quantum computing since Democritus*", Cambridge University Press 2013.

Subject Code: BEC17E05	Subject Name : MICROWAVE ENGINEERING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Transmission Lines and Waveguides, Antenna and Wave Propagation	1y 3	3	0	0	3

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

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

OBJECTIVE :

- To study Microwave sources and amplifiers.
- To study passive microwave components and their S- Parameter analysis.
- To study Microwave semiconductor devices & applications.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand the characteristics of microwave passive devices and their scattering parameter analysis.
CO2	Understand the concept of microwave generators and amplifiers.
CO3	Understand the concepts of microwave solid state devices and their characteristics.
CO4	Understand the concepts of microwave transistors in RF circuits.
CO5	Measure different parameters like frequency, wavelength, power, VSWR in RF circuits.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

Department of Electronics and Communication Engineering

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E05 MICROWAVE ENGINEERING 3 0 0 3

UNIT I: MICROWAVE PASSIVE DEVICES 9 Hrs

Transmission Lines for use at Microwave Frequencies – Attenuators, Directional Couplers, Terminators, Phase Shifters, Faraday Rotation Isolators and Circulators, Field Displacement Isolators, Microwave Filters, Frequency Meters, Hybrid Junctions – Scattering Analysis.

UNIT II: MICROWAVE GENERATORS 10Hrs

Limitations of Conventional Tubes at Very High Frequencies – Velocity – Modulated Tubes, Two – Cavity Klystron Amplifiers, Reflex Klystron Oscillators – Periodic Slow Wave Structures and their Use in Travelling Wave Tube Amplifiers, Focusing Techniques, TWTA Performance Characteristics – Electron Motion in Crossed Electric and Magnetic Fields - Magnetron Oscillators, Hartree Equation Rieke Diagram and Performance Charts .

UNIT III: MICROWAVE SOLID-STATE DEVICES 9 Hrs

Varactor Diodes, Manley – Rowe Relations, Low Noise Parametric Amplifiers – Transferred – Electron Devices and Their Operation, Cavity – Controlled Modes, LSA Mode-Avalanche – Transit Time Devices and Their Operation, TRAPATT Mode, BARITT mode, PIN Diodes and Their use as Attenuators and Switches.

UNIT IV: MICROWAVE CIRCUITS 8 Hrs

Small – Signal Equivalent Circuits, High-Frequency Applications, Performance Criteria and Limitations of BJTs and FETs – HEMTs – Fabrication Techniques.

UNIT V: MICROWAVE MEASUREMENTS 9 Hrs

Slotted - Line Techniques – Measurements of Wavelength – Measurement of Low and High VSWR –

Measurement of Frequency and Frequency Meters – Measurement of Insertion Loss and Attenuation by Substitution Methods – Measurement of Low and High Powers at Microwave Frequencies – Modern Measurement Techniques using Automatic Network Analyzer and Spectrum Analyzer.

Practical component P: Include case studies / application scenarios

Research component R: Future trends / research areas / Comparative Analysis

Total Number of Hours: 45 Hrs

Textbooks:

1. Annapurna Das, Sisir. K. Das, "*Microwave Engineering*", Tata McGraw Hill Co., Ltd., 1999. Reprint 2001.
2. Samuel Y. Liao: "*Microwave Devices and Circuits*" , Prentice Hall of India – 3rd Edition (2003)
3. Subal Kar , "*Microwave Engineering*" , Universities press(India) private limited – 1st Edition (2016)

Reference Books:

1. D.M. Pozer, "*Microwave Engineering*", Addison – Wesley, 1998.
2. R.E. Collins: "*Foundations for Microwave Engineering*", IEEE Press Second Edition (2002)
3. David K. Cheng," *Field and Waves in Electromagnetism*", Pearson Education, 1989.

Subject Code: BEC17E06	Subject Name : REAL TIME OPERATING SYSTEMS	T / L / ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: Operating Systems Concepts	Ty	3	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 :

- Review of elements and fundamentals of Systems.
- To understand the embedded tools.
- To understand the queues and scheduling

COURSE OUTCOMES (COs) :

The Student will be able to

CO1	Describe the different between the general computing system and the embedded system.
CO2	Identify different software architecture.
CO3	Become aware of the elements of RTOS.
CO4	Implement the design concepts of RTOS.
CO5	Use the embedded software development tools.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

BEC17E06 REAL TIME OPERATING SYSTEMS 3 0 0 3

UNIT- I EMBEDDED SYSTEM FUNDAMENTALS 9 Hrs

Introduction, Characteristics of embedded systems and challenges in system design –Design issues in embedded real-time systems, critical performance issues in embedded real-time systems.

UNIT - II SURVEY OF SOFTWARE ARCHITECTURES 9 Hrs

Round –robin, Round-robin with interrupts, queues. Function- scheduling architecture, Real time operating system architecture, Scheduling architecture.

UNIT- III ELEMENTS OF REAL TIME OPERATING SYSTEMS 9 Hrs

Tasks & Task states, Tasks & data, Semaphores & shares data, Message Queues, Mailboxes and Pipes, Timer functions, Events, Memory management and Interrupt Routines in an RTOS environment.

UNIT –IV BASIC DESIGN USING REAL-TIME OPERATING SYSTEMS 9 Hrs

Principles, encapsulating semaphores & queues, hard real-time scheduling considerations, saving memory space, saving power.

UNIT- V EMBEDDED TOOLS 9 Hrs

Embedded software development tools- host and target machines, linker/locators for embedded software, getting embedded software into the target system. Debugging techniques- testing on host system, instruction set simulators, the assert, macro using laboratory tools.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Wayne Wolf, "*Computers as Components- Principles of Embedded Computing Systems Design*", Academic press, 2001.
2. David E. Simon, "*An Embedded Software Primer*", Pearson education, 1999.

References:

1. Arnold S. Berger, "*Embedded Systems Design- an Introduction to Processes, Tools & Techniques"*, CMP books, 2002.
2. Jean J. Labrosse, "*Embedded Systems Building Blocks*", CMP books, 2002.
3. Michael Barr, "*Programming Embedded Systems in C and C++",* O'Reilly, 1999.

Subject Code:	Subject Name: POWER ELECTRONICS	T / L / ETL	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17E07	Prerequisite: Electronic Circuits, Electronic Devices	Ty	3	0	0	3

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

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

OBJECTIVE :

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification of AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

COURSE OUTCOMES (COs)

The Students will be able to

CO1	Analyze power electronic circuits for voltage and current control and protection
CO2	Analyze switching characteristics of transistors and SCRs.
CO3	Apply the function phase controlled converters.
CO4	Demonstrate the applications of inverters and choppers.
CO5	Develop the applications specific to power electronics in industries.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E07 POWER ELECTRONICS 3 0 0 3

UNIT-I: POWER ELECTRONIC DEVICES 9 Hrs

Characteristics of Power Devices – Characteristics of SCR – Two Transistor Model of SCR,Characteristics of TRIAC, BJT, MOSFET, IGBT, GTO both Static and Switching Characteristics – Protection of Thyristors against Over Voltage – Over Current, dv/dt and di/dt.

UNIT-II: TRIGGERING & COMMUTATION TECHNIQUES 9 Hrs

Turn on Circuits for SCR – Triggering with Single Pulse & Train of Pulses – Triggering with Microprocessor – Different Techniques of Commutation – Natural and Forced Commutation – Series & Parallel Operations.

UNIT-III: PHASE CONTROLLED CONVERTERS 9 Hrs

Converters – Single Phase – Three Phase – Half Controlled and Fully Controlled Rectifiers with R, RL and RLE Loads – Waveforms of Load Voltage and Line Current – Harmonic Factor, Power Factor, Ripple Factor, Distortion Factor – Operation with Freewheeling Diode – Effect of Source Inductance – Dual Converter**.**

UNIT-IV: INVERTERS & CHOPPERS 9Hrs

Voltage and Current Source Inverters, Resonant, Series Inverter – Basic Series Inverter, Modified, Improved – PWM Techniques – Single Phase AC Choppers with R and RL Load – Half Wave and Full Wave – DC Choppers – Various Classes of Operation – Buck, Boost and Buck – Boost Type Choppers – Merits and Applications.

UNIT-V: AC VOLTAGE CONTROLLERS & INDUSTRIAL APPLICATIONS 9 Hrs

Single - Phase and Three - Phase AC Voltage Controllers - Sequence Control of AC Voltage Regulators. Cycloconverters – Single-Phase and Three - Phase Cycloconverters, SMPS & UPS – Static Compensators – HVDC Transmission System.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Rashid, M.H., "*Power Electronics - Circuits Devices and Applications*", Prentice Hall of India, 3rd Edition, 2004.
2. Singh.M.D and Kanchandani, "*Power Electronics*", Tata McGraw Hill & Hill publication Company Ltd, New Delhi, 2002.

References:

1. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., "*Thyristorised Power Controllers*", Wiley Eastern Limited,
1986.
2. Lander,W., "*Power Electronics*", McGraw Hill and Company, Third Edition, 1993.
3. P.S. Bimbhra, "*Power Electronics*", Khanna Publishers, 3rd Edition, 1999.

Subject Code:	Subject Name : CRYPTOGRAPHY AND NETWORK SECURITY	T / L / ETL	L	T / S.Lr	P/ R	C
BEC17E08						

Department of Electronics and Communication Engineering

	Prerequisite: Computer Networks	Ty	3	0	0	3

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

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

OBJECTIVE :

- To study the various cryptographic algorithms, firewall.
- To study Integrity, Authentication.
- To study about wireless network security concepts.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Identify different types of attacks and techniques used for transmission of information.
CO2	Encrypt and decrypt messages using different types of ciphers.
CO3	Verify message using well know signature generation and verification algorithms.
CO4	To have a clear knowledge on network security, web security and firewalls.
CO5	To test and identify the various security attack issues in wireless systems.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

BEC17E08 CRYPTOGRAPHY AND NETWORK SECURITY 3 0 0 3

UNIT –I: INTRODUCTION ON SECURITY 9 Hrs

Security Goals, Types of Attacks: Passive attack, active attack, attacks on confidentiality, attacks on Integrity and availability. Security services and mechanisms, Techniques: Cryptography, Steganography, Revision on Mathematics for Cryptography.

UNIT- II: SYMMETRIC & ASYMMETRIC KEY ALGORITHMS 9 Hrs

Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers, Data Encryption Standards (DES), Advanced Encryption Standard (AES), RC4, Principle of asymmetric key algorithms, RSA Key distribution.

UNIT –III: INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT 9 Hrs

Message Integrity, Hash functions: SHA, Digital signatures: Digital signature standards. Authentication Entity Authentication: Biometrics, Key management Techniques, Introduction to Quantum Cryptography.

UNIT- IV: NETWORK SECURITY, FIREWALLS AND WEB SECURITY 9 Hrs

Introduction on Firewalls, Types of Firewalls, Firewall Configuration and Limitation of Firewall. IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key Management. Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature

UNIT- V: WIRELESS NETWORK SECURITY 9 Hrs

Security Attack issues specific to Wireless systems: Worm hole, Tunneling, DoS WEP for Wi-Fi network, Security for 4G networks: Secure Ad hoc Network, Secure Sensor Network

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

References:

1. Behrouz A. Fourouzan , "*Cryptography and Network security*" Tata McGraw- Hill, 2008
2. William Stallings, *"Cryptography and Network security: principles and practice*", 2nd Edition, Prentice Hall of India, New Delhi, 2002
3. Atul Kahate , "*Cryptography and Network security*", 2nd Edition, Tata McGraw- Hill, 2008
4. R.K.Nichols and P.C. Lekkas ,""*Wireless Security*", Mc Graw-Hill Professional, New York, NY, USA, 2001
5. H. Yang et al., "*Security in Mobile Ad Hoc Networks: Challenges and Solution*", IEEE Wireless Communications, Feb. 2004.
6. Securing Ad Hoc Networks, *IEEE Network Magazine*, vol. 13, no. 6, pp. 24-30, December 1999.

Subject Code:	Subject Name : DISASTER MANAGEMENT	T / L/ ETL	L	T / S.Lr	P/ R	C
BEC17E10						

	Prerequisite: BPE 13001, BPE 13002 Environment and health sciences	Ty	3	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 :

- Disaster management refers to the policies, programs, administrative actions and operations undertaken to address a Natural or man-made disaster through preparedness, mitigation, response and recovery.

COURSE OUTCOMES (COs) :

The Students will be able to

CO1	Describe the basic types of hazard and disasters.
CO2	Demonstrate knowledge of risk management.
CO3	Implement the risk reduction techniques during emergency.
CO4	Aware of the relationship between disaster and development.
CO5	Aware of the various risk management in India.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E10 DISASTER MANAGEMENT 3 0 0 3

UNIT-I INTRODUCTION TO DISASTERS: **9 Hrs**

Concepts, and definitions-Disaster, Hazard, Vulnerability, Resilience, Risks Disasters: Classification, Causes, Impacts - including social, economic, political, environmental, health, psychosocial, etc.)

UNIT-II RISK MANAGEMENT **9 Hrs**

Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages -Principle of risk partnership.

UNIT-III RISK REDUCTION **9 Hrs**

Trigger mechanism – constitution of trigger mechanism - risk reduction by education -disaster information network - risk reduction by public awareness Application of various technologies: Data bases - RDBMS - Management Information systems - Decision support system and other systems - Geographic information systems Remote sensing-an insight - contribution of remote sensing and GIS - Case study.

UNIT-IV INTER-RELATIONSHIPS BETWEEN DISASTERS AND DEVELOPMENT: **9 Hrs**

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc., Climate Change Adaptation, Relevance of indigenous knowledge, appropriate technology and local resources financial arrangements – areas of improvement – disaster preparedness — emergency response.

UNIT-V DISASTER RISK MANAGEMENT IN INDIA **9 Hrs**

Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, and Health, Waste Management Institutional arrangements (Mitigation, Response and

Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Pardeep Sahni, Madhavi Malalgoda and Ariyabandu, "*Disaster risk reduction in Southasia*", PHI
2. Amita Sinvhal, "*Understanding earthquake disasters*" TMH, 2010.

References:

1. Pardeep Sahni, Alka Dhameja and Uma Medury, "*Disaster mitigation: Experiences and reflections*".

Subject Code:	Subject Name : TELEVISION & VIDEO ENGINEERING	T / L/ Etg.	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17E11	Prerequisite: Communication systems, Microwave Engineering	Ty	3	0	0	3

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

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

OBJECTIVE :

- To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and Television Camera Tubes
- To study the principles of Monochrome Television Transmitter and Receiver systems.
- To study the various Color Television systems with a greater emphasis on PAL system.
- To study the advanced topics in Television systems and Video Engineering.

COURSE OUTCOMES (COs) :

The Students will able to

CO1	Incorporate and recall the fundamentals of television.
CO2	Describe the various components of monochrome TV receiver.
CO3	Distinguish between various colour TV systems.
CO4	Identify the character of colour TV receiver.
CO5	Beware of recent trends and technologies of TV.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

Department of Electronics and Communication Engineering

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low												
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✓							
Approval												

BEC17E11 TELEVISION AND VIDEO ENGINEERING 3 0 0 3

UNIT- I: FUNDAMENTALS OF TELEVISION 9 Hrs

Characteristics of Eye and Television Pictures – Resolution and Brightness Gradation- Theory of Scanning, Camera Tubes – Videocon and Silicon Diode Array Videocon- Monochrome Picture Tube, Composite.

UNIT-II: MONOCHROME TELEVISION RECEIVER 9 Hrs

Transmission and Propagation of TV signal- TV Antenna, Receiver VHF Tuners - Vision IF Subsystem, Inter Carrier Sound System, and Video Amplifiers - Synchronous Separation AFC and Deflection Oscillators - Frame and Line Deflection Circuits.

UNIT-III: COLOUR TELEVISION SYSTEMS 9 Hrs

Color Characteristics – Color Cameras Color Picture Tubes, Color signal Generation and Encoding, NTSC, PAL and SECAM Systems.

UNIT- IV: COLOUR TELEVISION RECEIVERS 9 Hrs

Block Diagram of PAL-D Receivers, Luminance Channel, Chrominance amplifier, Color Burst Separation and Burst phase Discriminators, R, G, B Matrix and Drives.

UNIT-V: SPECIAL TOPICS IN TELEVISION 9 Hrs

Digital Tuning Techniques, Remote Control, Introduction to Cable and Satellite Television, Video Tape

Recorders, Videodisc system, Fundamental of Digital TV and High Definition Television.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Gulati. R.R "*Modern Television Practice, Principle of Technology and Servicing"*, New Age International Pvt. Ltd., 2002.
2. R.R. Gulati "*Monochrome and colour television"*, New age International Publisher, 2003

References:

1. Dhake A, M., "*Television and Video Engineering*", Tata McGraw Hill, 1995.
2. Grob. B. Herndon. C.E., "*Basic Television and Video Systems*", McGraw Hill 1999.

Subject Code: BEC17E12	Subject Name : OPERATING SYSTEMS	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Data structures, OOPS	Ty	3	0	0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To have an overview of different types of operating systems
- To know the components of an operating system
- To have a thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file system

COURSE OUTCOMES (COs) :

The Students will be able to

CO1	Review functions, structures and history of operating systems.
CO2	Process management concepts including scheduling
CO3	Be familiar with multithreading
CO4	Present and document concepts of memory management schemes.
CO5	Appreciate secondary storage management

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E12 OPERATING SYSTEMS 3 0 0 3

UNIT- I: INTRODUCTION 9 Hrs

Mainframe Systems – Desktop Systems – Multi Processor Systems - Distributed Systems – Cluster Systems – Real Time Systems-Hardware Protection-System Components-Handheld Systems-Operating System Services-System Calls-System Programs-System Structure-Visual Machines-System Design and Implementation.

UNIT- II: PROCESS MANAGEMENT 9 Hrs

Process Concept-Process Scheduling-Operation on Process-Co-operating Processes- Inter Process Communication-Threads-Overview-Multithreading Models. CPU Scheduling-Basic Concepts-Scheduling Criteria-Scheduling Algorithms-Multiple-Processor Scheduling-Real Time Scheduling-Algorithm Evaluation

UNIT -1II: SYNCHRONIZATION AND DEADLOCKS 9 Hrs

Process Synchronization-The Critical Section Problem-Synchronization Hardware-Semaphores-Classical Problems Of Synchronization-Deadlocks-System Model-Deadlock Characterization-Methods Of Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery form Deadlock.

UNIT- 1V: MEMORY MANAGEMENT 9 Hrs

Background-Swapping-Contiguous Memory Allocations - Virtual Memory – Address Translation – Paging – Segmentation – Segmentation with Paging - Static Paging Algorithm – Dynamic Paging Algorithm

UNIT –V: FILES AND SECONDARY STORAGE MANAGEMENT 9 Hrs

File Systems – File Concepts – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – File System Structure – File System Implementation – Recovery – Disk Structure – Disk Scheduling – Disk Management

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Silberschatz, Galvin, GAGNE "*Operating System Concepts*" John Wiley & Sons INC, 6th Edition, 2002
2. William Stallings, "*Operating Systems*", Prentice Hall of India, 1997.

References:

1. D.M. Dhamdhere, "*Operating Systems*", Tata McGraw Hill, 2002
2. Charles Crowley, "*Operating Systems: A Design Oriented Approach*", Tata McGraw Hill 1999.
3. Andrew S. Tanenbaum, "*Modern Operating Systems*", Prentice Hall of India, 1995.
4. Harvey M. Deitel, "*Operating Systems*", Second Edition, Pearson Education Pvt. Ltd, 2002.

Subject Code: BEC17E13	Subject Name: VISUAL PROGRAMMING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: C++, Data structures	Th	3	0	0	3

Department of Electronics and Communication Engineering

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To introduce the concepts of windows programming
- To introduce GUI programming using Microsoft Foundation Classes
- To enable the students to develop programs and simple applications using Visual C++
- To make the students to understand the simple application using visual C+++
- To develop a deep knowledge about advanced concept for windows applications.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Demonstrate fundamental skills in utilizing the tools of visual environment in terms of the set of command menus and tool bars.
CO2	Implement specialized new GUI components.
CO3	Apply visual programming to software development by designing projects.
CO4	Use visual programming environment to create simple visual applications.
CO5	Motivate to understand concepts and tools for windows applications.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E13 VISUAL PROGRAMMING 3 0 0 3

UNIT I: FORMS AND CONTROL 9 Hrs

Customizing a Form-Writing Simple Programs-Toolbox-Creating Controls-Name Property-Command Button-Access Keys-
Image Controls-Text Boxes-Labels-Message Boxes-Grid-Editing Tools-Variables-Data Types-String – Numbers.

UNIT II: FUNCTIONS AND EVENTS 9 Hrs

Displaying Information-Determinate Loops-Indeterminate Loops-Conditionals-Built-In Functions-Functions and Procedures- Lists-Arrays-Sorting and Searching-Records-Control Arrays-Combo Boxes-Grid Control-Projects with Multiple forms-Do Events and Sub Main-Error Trapping.

UNIT III: MENUS AND MOUSE ACTIVITY 9 Hrs

VB Objects-Dialogue Boxes-Common Controls-Menus-MDI Forms-Testing, Debugging and Optimization-Working with Graphics- Monitoring Mouse Activity-File Handling-File System Controls-File System Objects-COM/OLE-Automation-DLL Services-OLE Drag and Drop.

UNIT IV: VISUAL C++ PROGRAMMING 9 Hrs

Visual C++ Components – Developing Simple Applications – Microsoft Foundation Classes – Controls – Message Handling

– Document View Architecture – Dialog Based Applications – Mouse and Keyboard Events –Reading and Writing Documents – SDI and MDI Environments – Splitter Windows and Multiple Views.

UNIT V: ADVANCED CONCEPTS 9 Hrs

Concepts and Tools for Windows Application – Procedure Oriented Windows Applications –Windows Applications using the MFC – Application and Class Wizards – Getting Started with OLE – Getting Started with Active X Controls – COM and DHTML

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Gary Cornell-"*Visual Basic 6 from the Ground Up*"-Tata McGraw Hill, New Delhi,1999
2. David Kruglirski J, "*Inside Visual C++*", Microsoft Press 1993.
3. CHRIS H.PAPPAS & WILLIAM H.MURRAY –"*The Complete reference –Visual C++*", Tata McGraw Hill, edition 1999, Chapter 1, 2,3,4,16-27 (IV & V unit)

References:

1. Deitel & Deitel, T.R.Nieto, "*Visual Basic 6, How to program*", Prentice Hall of India, 1999.
2. Lars Klander, "*Core visual C++ 6*", Pearson Education Asia, 2000.
3. Gray J.Bronson,"*A first book of Visual C++",* Vikas Publishing House Thomson Learning) 2000.
4. Steven Holzner –"*Visual Basic 6 – Programming Black Book*" by Dream tech Press ,edition 2000
5. Noel Jerke-"*Visual Basic 6(The Complete Reference)"*-Tata McGraw Hill, New Delhi1999.

Subject Code: BEC17E14	Subject Name : BIO SIGNAL PROCESSING	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Signals and Systems	Ty	3	0	0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To introduce the concepts of spectrum in biosignal
- To introduce adaptive filtering and wavelet detection in biosignal.
- To understand the biosignal classification and recognition

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Identify various types of signals.
CO2	Solve problems in time series analysis.
CO3	Implement various adaptive filters.
CO4	Classify and recognize the bio signals
CO5	Be aware of applications of bio signal processing

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E14 BIO-SIGNAL PROCESSING 3 0 0 3

UNIT I: SIGNAL, SYSTEM AND SPECTRUM 10 Hrs

Characteristics of Some Dynamic Signals – Bio-Electric Signals, Impedance,. Acoustic Signals, Mechanical Signals, Bio-Magnetic Signals, Bio-Chemical Signals, Signal Conversion – Simple Signal Conversion Systems, Conversion Requirements for Bio-Medical Signals. Basics of Digital Filtering – FIR and IIR filters. Spectral Analysis – Power Spectral Densities Function, Cross Spectral Density and Co-Herence Function, Cepstral Analysis and Homomorphic Filtering, Estimation of Mean with Finite Time Signal

UNIT II: TIME SERIES ANALYSIS AND SPECTRAL ESTIMATION 9 Hrs

Time Series Analysis – Linear Prediction Models, Process Order Estimation, Attic Representation, Non-Stationary Process, Adaptive Segmentation, Model Based ECG Simulator, Spectral Estimation – Blackman Turkey Method, Periodogram and Model Based Estimation.

UNIT III: ADAPTIVE FILTERING AND WAVELET DETECTION 9 Hrs

Filtering – LMS adaptive filter, adaptive noise canceling in ECG, improved adaptive filtering in FECG. Wavelet detection in ECG – Structural, features, matched filtering, adaptive wavelet detection, detection of overlapping wavelets.

UNIT IV: BIOSIGNAL CLASSIFICATION AND RECOGITION 9Hrs

Signal classification and recognition – statistical signal classification, linear discriminate function, direct feature selection and ordering, Back propagation neural network based classification.

UNIT V: SELECTED TOPICS IN BIO-SIGNAL PROCESSING 8 Hrs

Application of wavelet transform on Bio-signal – TFR representation, ECG data compression, ECG characterization, Application of Chaos theory on Biomedical signals, Software implementation of signal processing algorithms on biomedical signals.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Vallaru Rao and Hayagiva Rao, "*C++ Neural Networks and Fuzzy Logic*", BPS Publication, New Delhi, 1996
2. Special topics on" *The Applications of Chaos Theory on Bio-Signal*", Journal of IEEE Engg. In Medicine and Biology Magazine, October, 1996.

References:

1. Willies J Tompkins, "*Bio-medical Digital Signal Processing*" Prentice Hall, New Jersey, 1993.
2. Samuel D. Stearns Ruth A. David, "*Signal Processing Algorithms using FORTRAN and C*", Prentice Hall, New Jersey, 1993.

Subject Code:	Subject Name: DIGITAL IMAGE PROCESSING	L/ ETL		T/ S.Lr	P/ R	C

Department of Electronics and Communication Engineering

BEC17E15	Prerequisite: Transforms, Signals and Systems	Ty	3	0	0	3

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

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

OBJECTIVE :

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedure
- To study the image segmentation and representation techniques

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Solve the mathematical transforms of image processing.
CO2	Derive the various image transform techniques.
CO3	Discuss the image enhancement techniques.
CO4	Model and restore image using filters.
CO5	Process an image through various image processing techniques.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E15 DIGITAL IMAGE PROCESSING 3 0 0 3

UNIT I: CONTINUOUS AND DISCRETE IMAGES AND SYSTEMS 9 Hrs

Light, Luminance, Brightness and Contrast, Eye, The Monochrome Vision Model, Processing Problems and Applications, Vision Camera, Digital Processing System, 2-D Sampling Theory, Aliasing, Image Quantization, Lloyd Max Quantizer, Dither, Color Images, Linear Systems And Shift Invariance, Fourier Transform, Z-Transform, Matrix theory Results, Block Matrices and Kronecker Products.

UNIT II: IMAGE TRANSFORMS 9 Hrs

2-D Orthogonal and Unitary Transforms, 1-D and 2-D DFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-Loeve, Singular Value Decomposition Transforms.

UNIT III: IMAGE ENHANCEMENT 9Hrs

Point Operations- Contrast Stretching, Clipping and Thresholding Density Slicing, Histogram Equalization, Modification and Specification, Spatial Operations – Spatial Averaging, Low Pass, High Pass, Band Pass Filtering, Direction Smoothing, Medium Filtering, Generalized Cepstrum and Homomorphic Filtering, Edge Enhancement using 2-D IIR and FIR filters, Color Image Enhancement

UNIT IV: IMAGE RESTORATION 9 Hrs

Image Observation Models, Sources of Degradation, Inverse and Wiener Filtering, Geometric Mean Filter, Non-Linear Filters. Smoothing Splines and Interpolation, Constrained Least Squares Restoration.

UNIT V: IMAGE DATA COMPRESSION AND IMAGE RECONSTRUCTION FROM PROJECTION 9 Hrs

Image Data Rates, Pixel Coding, Predictive Techniques, Transform Coding and Vector DPCM, Block Truncation Coding, Wavelet Transform Coding of Images, Color Image Coding, Random Transform -

Introduction to Python Programming- Introduction to OpenCV-Python

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Anil K. Jain, "*Fundamentals of Digital Image Processing*", PHI 1995.
2. Milan Sonka,*" Image Processing – Analysis and Machine vision*", Thomson Learning. 2nd Edition.
3. Alasdar McAndrew, "*Introduction to Digital Image Processing*", Thomson Learning 2004.

References:

1. M.A. Sid Ahmed, "*Image Processing*", McGraw Hill, Inc, 1995.
2. R. Gonzalaz and P. Wintz, "*Digital Image Processing*", Addition Wesley 2nd Ed, 1987.
3. William. K. Pratt, "*Digital Image Processing*", Wiley Inter Science, 2nd Ed, 1991.
4. John V Guttag. "*Introduction to Computation and Programming Using Python*", Prentice Hall of India
5. https://opencv-python-tutroals.readthedocs.io/en/latest/

Subject Code:	Subject Name : NEURAL NETWORKS AND	T /	L	T /	P/	C

Department of Electronics and Communication Engineering

BEC17E16	ITS APPLICATIONS	L/ ETL		S.Lr	R	
	Prerequisite: None	Ty	3	0	0	3

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

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

OBJECTIVE :

- To study the various neural network algorithms and its application in pattern recognition.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Describe the basic concepts of art neural networks.
CO2	Explain about BPN and BAM
CO3	Implement the concept of simulated annealing and CPN
CO4	Interpret the concepts of SOM and ART.
CO5	Implement BPN algorithm.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

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

BEC17E16 NEURAL NETWORKS AND ITS APPLICATIONS 3 0 0 3

UNIT I: INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 9 Hrs

Neuro – Physiology – General Processing Element – ADALINE – LMS Learning Rule – MADALINE – Perception Networks

UNIT II: BPN AND BAM 9 Hrs

Back Propagation Network – Updating of Output and Hidden Layer Weights – Application of BPN – Associative Memory – Bi-Directional Associative Memory - Hopfield Memory – Traveling Sales Man Problem

UNIT III: SIMULATED ANNEALING AND CPN 9 Hrs

Annealing, Boltzmann Machine – Learning – Application – Counter Propagation Network – Architecture – Training – Application.

UNIT IV: SOM AND ART 9 Hrs

Self-Organizing Map – Learning Algorithm – Feature Map Classifier – Applications – Architecture of Adaptive Resonance Theory – Pattern Matching in ART Network. Neocognitron: Architecture of Neocognitron – Data Processing and Performance of Architecture of Spacio – Temporal Networks for Speech Recognition

UNIT V CASE STUDY 9 Hrs

Implementation of BPN Algorithm in a Computer Language - Application of Neural Networks for Pattern Recognition - Data Comparison - Hopfield Networks for an n-bit A/D Converter

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Hagan, "*Neural Networks Design",* Thomson Learning.
2. J.A. Freeman and B.M. Skapura, "*Neural Networks, Algorithms Applications and Programming Techniques*", Addison-Wesley, 1990.

References:

1. Laurence Fausett, "*Fundamentals of Neural Networks: Architecture, Algorithms and Applications*", Prentice Hall,
1994.
2. Simon Haykin, "*Neural Networks and Learning Machines*" -3/E - Pearson/ Prentice Hall 2009

Subject Code:	Subject Name: ADVANCED	T / L/	L	T /	P/	C

Department of Electronics and Communication Engineering

Department of Electronics and Communication Engineering

BEC17E17	MICROPROCESSORS	ETL		S.Lr	R	
	Prerequisite: Microprocessor and Microcontroller	Ty	3	0	0	3

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

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

OBJECTIVE :

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Explain the generalized architecture of advanced microprocessor
CO2	Develop algorithm/ program of advanced microprocessor or a particular task
CO3	Appreciate the microprocessor based system design
CO4	Analyze the MOTOROLA MC 68000 family
CO5	Describe about the various RISC processors

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E17 ADVANCED MICROPROCESSORS 3 0 0 3

UNIT I: THE INTEL X86 FAMILY 9 Hrs

The Intel X86 Family Architecture, 32 bit Processor Evolution Systems Connections and Timing, Instruction and Data Formats, Instruction set of X86 Processors, Addressing Modes.

UNIT II: INTEL X86 ASSEMBLY LANGUAGE PROGRAM 9 Hrs

Implementation of Strings, Procedures, Macros, BIOS and DOS Services using X86 Assembly Language Programming, Memory and I/O Interfacing, Analog Interfacing and Industrial Control.

UNIT III: SYSTEM DEVELOPMENT 9 Hrs

Microprocessors Based System Design, TMS 320 Series DSP Based Signal Processing, Microcontroller 8096, Architecture, Addressing mode and system design.

UNIT IV: THE MOTOROLA MC 68000 FAMILY 9 Hrs

The MC 68000 Architecture, CPU Registers, Data Formats, Addressing Modes, Instruction Set and Assembler Directors, Memory Management Instruction and Data, Caches, Exception Processing.

UNIT V: RISC PROCESSORS 9 Hrs

RISC vs CISC, RISC Properties and Evaluation, Advanced RISC Microprocessors, DEC ALPHA, The Power PC family. The SUN SPARC Family, the MIPS RX 100 Family, the Intel 860 Family. The Motorola M88000 Family, HP Precision Architecture.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. B.B. Bery, "*The Intel Microprocessors 8086 / 8088, 80186 / 80188, 80286, 80386, 80486, PENTIUM, and PENTIUM Processors*", Prentice Hall, 1997.
2. K Udaya kumar, B.S. Uma Shankar, "*Advanced Microprocessors and IBM PC Assembly Language Programming*",
   Tata McGraw Hill, 1996.

References:

1. Daniel Tabak, "*Advanced Microprocessors*", McGraw Hill, 1995.
2. Douglas V. Hall, "Microprocessors *and Interfacing – Programming Hardware*", McGraw Hill, 1992.
3. W.A. Tribel & A. Singh, "*The 68000 and 68020 Microprocessors – Architecture, Software and Interfacing Techniques*", Prentice hall of India, 1991
4. Rifiquzzaman, "*Microprocessors – Theory and Applications: Intel and Motorola*", Prentice Hall, 1992.
5. Kenneth J. Ayala, "*The 8051 Microcontroller, Architecture, Programming and Application*", Penram International
   Publishing (India), 1996.
6. John Peatman, "*Design with Microcontrollers*", McGraw Hill International, 1988.

Subject Code: BEC17E18	Subject Name : DATABASE MANAGEMENT SYSTEMS Prerequisite: C++ and Data structures	T / L/ ETL Ty	L 3	T / S.Lr 0	P/ R 0	C 3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram
- To make a study of SQL and relational database design
- To understand the internal storage structures using different file and indexing techniques
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Master the basic concepts of database systems.
CO2	Identify and construct queries using SQL
CO3	Be familiar with relational database theory
CO4	Write SQL program for queries
CO5	Work successfully on a team by design and developing database management systems

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17E18 DATABASE MANAGEMENT SYSTEMS 3 0 0 3

UNIT-I : INTRODUCTION 9 Hrs

Definition -Need for a DBMS-Uses of DBMS- Advantages and Disadvantages of DBMS

Database and Database users- View of Data –Architecture-Data Models-Data Dictionary –Database Languages

UNIT II: RELATIONAL APPROACH 9 Hrs

Relational Model-Structure of a Relational Database-Relational Algebra- Tuple Relational Calculus-Domain Relational Calculus-SQL-Embedded SQL-Query Languages

UNIT III : RELATIONAL DATABASE DESIGN 9 Hrs

Relational Database Design-Integrity Constraint-Pitfalls and Design –Functional Dependency-Normalization-Entity Relationship Model-Storage and File Structure-Indexing and Hashing-Basic Concepts-B+ tree Index File-B+ tree Index File-Static Hashing –Dynamic Hashing.

UNIT IV: OBJECT ORIENTED RELATIONAL DATABASE TECHNOLOGY 9 Hrs

Concepts for Object Oriented Data Model – Object Oriented Database Languages -Persistent Programming Language-Object Relational Databases. System Implementation techniques: Query Processing-Transaction Processing-Concurrency Control-Recovery System.

UNIT V : ENHANCED DATA MODELS FOR ADVANCED APPLICATIONS 9 Hrs

Database System Architecture- Client Server System-Centralized Systems-Parallel Systems-Distributed System-Distributed Databases

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. Abraham Silberschatz, Henry F.korth, S.Sudharshan, "*Database system concepts*" 4th Edition, Tata McGraw-Hill, 1997
2. Ramez Elmasri, Shamkant B.Navathe, "*Fundamentals of database systems*", 4th edition Pearson Education-2002

References:

1. C.J.Date, "*An Introduction to Database systems*",7th Edition, Pearson Education,1997.
2. Raghu Ramakrishnan, "*Database Management Systems*", WCB McGraw Hill, 1998.
3. Bipin C.Desai, "*An Introduction to Database Systems*", Galgotia publications, 2001

Dr.M.G.R. Educational and Research Institute
(Deemed to be University U/S 3 of the UGC Act 1956)
An ISO 9001:2008 Certified Institution
Maduravoyal, Chennai - 95
Department of Electronics and Communication Engineering

OPEN ELECTIVES

Subject Code:	Subject Name: CELLULAR MOBILE	Tut/	T / S.	P/	C

Department of Electronics and Communication Engineering

BEC17OE1	COMMUNICATION	ETL		Lr	R	
	Prerequisite: Communication systems, Computer Networks	Ty	3	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 :

- It deals with the fundamental cellular radio concepts such as frequency reuse and handoff.
- It presents different ways to radio propagation models and predict the large scale effects of radio propagation in many operating environment.
- To understand signal processing concept in cellular technology
- To study basic wireless networking and advanced technology
- To study overview of basic wireless sensor network.

COURSE OUTCOMES (COs) : (3- 5)

The students will be able to

CO1	Understand basic concept behind cellular technology
CO2	Apply propagation models for designing mobile antenna.
CO3	Allocate frequency spectrum for mobile technology.
CO4	Design 5G technology using LTE.
CO5	Implement sensor network using Ad - hoc.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	H	M
CO2	H	H	M
CO3	H	H	M
CO4	H	H	M

CO5	H		H	H							
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
					✓						
Approval											

BEC17OE1 CELLULAR MOBILE COMMUNICATION 3 0 0 3

UNIT I: CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS 9 Hrs

Introduction to Wireless communication - Cellular Concept and Frequency Reuse, - Channel Assignment and Handoff, Interface and System Capacity, Trunking and Erlang Capacity Calculations.

UNIT II: MOBILE RADIO PROPAGATION 9 Hrs

Radio Wave Propagation Issues in Personal Wireless Systems, Propagation Models, Multipath Fading and Based and Impulse Models, Parameters of Mobile Multipath Channels, Antenna System in Mobile Radio.

UNIT III: SIGNAL PROCESSING AND MULTIPLE ACCESS SCHEMES 9 Hrs

Spectral Efficiency, Error Rate, Equalization / Rake Receiver Concepts, Diversity and Space-Time Processing, Speech Coding and Channel Coding - Multiple Access Techniques – FDMA, TDMA and CDMA Systems

UNIT IV: WIRELESS NETWORKS AND ADVANCED TECHNOLOGY 9 Hrs

Wireless Networking- adhoc Network, Design Issues in Personal Wireless Systems - 4G Features and Challenges - Software-Defined Radio – WIMAX, LTE, Convergent devices - Interconnection with UMTS and GSM – LTE Advanced – Introduction to 5G.

UNIT V: OVERVIEW OF WIRELESS SENSOR NETWORKS 9 Hrs

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks, Single Node Architecture-

Hardware Components, Energy Consumption of Sensor Nodes

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Textbooks :

1. T.S. Rappaport, "*Wireless Communication, Principle and Practice*", Prentice Hall, NJ, 1996
2. Roy Blake, "*Wireless Communication technology*", Thomson Learning, 1st Edition 2001.
3. Maritn Sauter, "From GSM to LTE: *An Introduction to Mobile Networks and Mobile Broadband"*, John Wiley and Sons, 2011.

Reference Books:

1. K. Feher, "*Wireless Digital Communication*", Prentice Hall of India, New Delhi, 1995.
2. W.C.Y. Lee, "*Mobile Communication Engineering Theory and Application*", McGraw Hill International, Second Edition, 1998.
3. Dharma P. Agarwal, "*Introduction to wireless and Mobile systems*", Thomson Learning, II Edition, 2006.
4. Leonhard Korowajczuk, "LTE, WiMAX and WLAN Network Design, Optimization and Performance Analysis", Wiley-Blackwell, 2011.
5. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, 2015.

Subject Code: BEC17OE2	Subject Name : SATELLITE COMMUNICATION	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Communication Systems	Ty	3	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 :

- Overview of satellite systems in relation to other terrestrial systems
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Be aware of various element of orbital machine.
CO2	Identify and interpret various multiple access and switching techniques.
CO3	Explain the concepts involved in satellite link design
CO4	Explain the principles, concepts and operation of satellite communication systems
CO5	Explore the various process of earth station design.

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	M
CO2	H	H	H
CO3	H	H	M
CO4	H	H	M

CO5	H	M						
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low								

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

BEC17OE2 SATELLITE COMMUNICATION 3 0 0 3

UNIT I: ELEMENTS OF ORBITAL MECHANICS 9 Hrs

Equation, Orbital Elements, Orbital Perturbation, Tracking and Orbital Determination, Orbital Correction Control.

ELEMENTS OF COMMUNICATION SATELLITE DESIGN

Space Environment, Spacecraft Configuration, Spacecraft Subsystem, Payload, Reliability Consideration – Spacecraft Integration and Testing.

UNIT II: MULTIPLE ACCESS TECHNIQUES 9 Hrs

FDM – FM – FDMA, TDMA, SSMA / CDMA, RANDOM MULTIPLE Access Techniques; Packet Switching and Packet Satellite Networks Satellite on Board Processing and Switching.

UNIT III: SATELLITE LINK DESIGN 9 Hrs

Types of System: BSS, Performance Requirements and Standards for Telephony, TV and DATA, Performance Impairments, Noise, Interference, Inter modulation, Design of Typical Satellite Links.

UNIT IV: DOMESTIC SATELLITE SYSTEMS 9 Hrs

The INSAT System, International System, INTELSAT, IMMARSAT, Satellite Based Personal Communication LEO, ICO, GEO Systems.

UNIT V: EARTH STATION DESIGN 9 Hrs

Earth Station Configuration, Site Selection, Antenna and Tracking Systems, Receiver and Transmitter Subsystems, Terminal Equipment: Telephone / Video Interface, Rearward Links, Miscellaneous Facilities Like Echo Suppressor, FM Digitizers, Ground Station Measurements, Elements of Frequency Co-ordination and Control, VSAT Networks and Terminals – Satellite Broadcasting, Satellite TV Systems.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books

1. T. Pratt and C.W. Bostian, "*Satellite Communication*" – John Wiley & Son, 1986.
2. A. Abdul Namith, "Satellite *Communication*"-Lakshmi Publications.

References:

1. B.N. Agarwal, "*Design of Geosynchronous Spacecraft*" – Prentice Hall, 1986.
2. D. Roddy, "*Satellite Communication*" – Prentice Hall, 1989
3. M. Richharia, "*Satellite Communication Systems Design Principles*", Macmillan Press Ltd. Second Edition 2003.

Subject Code: BEC17OE3	Subject Name : RADAR & NAVIGATIONAL AIDS	T / L/ EG	L	T / S.Lr	P/ R	C

Department of Electronics and Communication Engineering

	Prerequisite: EMF, Antenna Theory, μw	Ty	3	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 derive and discuss the Range equation and the nature of detection.
- To apply Doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation
- To understand navigation of ships from shore to shore

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Describe the range equation and nature of detection
CO2	Detect radar signals in noise
CO3	Recall the principles of AWP related to radars
CO4	Beware of the propagation of radar waves
CO5	Document the recent navigational aids

Mapping of Course Outcomes with Program Outcomes (POs)

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

COs / PSOs	PSO1	PSO2	PSO3
CO1	H	M	
CO2	H	H	
CO3	H		
CO4	H		M

CO5	H		M								
H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low											
Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills		
					✓						
Approval											

BEC17OE3 RADAR AND NAVIGATIONAL AIDS 3 0 0 3

UNIT I: RANGE AND EQUATION AND TYPES FO RADAR 9 Hrs

Range Parameters, Pulsed Radars, Signal to Noise Ratio, Integration of Pluses Beam Parameters, System Losses and Propagation Effects, CW and Pulse-Doppler Radar, Delay Lines Tracking Radar, Mono pulse, Sequential, Simultaneous, Conical Scan and Monopulse Trackers, Beacons,

UNIT II: TRANSMITTER, RECEIVERS AND ANTENNAS 9 Hrs

Klystron, Magnetron, TWT Amplifiers and Oscillators, Crossed Fields Devices, Parabolic Casse grain, Coefficient Squares Antennas, Radomes, Feeds, Receivers, Performance Figures, Displays Scope and PPI Duplexers.

UNIT III: DETECTION OF RADAR SIGNALS IN NOISE 9 Hrs

MF, Correlation Detection, Detector Characteristics, Automatic Detection, CFAR Receiver, Pulse Compression and Classification of Targets with Radar.

UNIT IV: PROPAGATION OF RADAR WAVES AND CLUTTER 9 Hrs

Plane Earth and Spherical Earth Problem, Refraction and Diffraction, GTD Analyzers, Surface and Sea Clutter, Detection of Targets, Effects of Weather on Radar.

UNIT V: TRENDS IN RADAR AND NAVIGATIONAL AIDS 9 Hrs

Synthetic Aperture, Over the Horizon Radar, ARSR, ASR, Bistatic and Monostatic Radars, LORAN, ILS, GCA, Direction Finder, VOR Concepts, Airborne Doppler Navigation.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Text books:

1. M.I. Skoinik "*Introduction to Radar Systems*:, McGraw Hill 1981.
2. N.S. Nagaraja, "*Elements of Electronic Navigation Systems"*, 2nd Edition, TMH, 2000.

References:

1. F.E. Terman, "*Electronics and Radio Engineering*" McGraw Hill
2. Peyton Z. Peebles:, "*Radar Principles*", John Wiley, 2004
3. J.C Toomay, " *Principles of Radar*", 2nd Edition –PHI, 2004

Subject Code:	Subject Name : ADHOC AND SENSOR NETWORKS	T / L/ ETL	L	T / S.Lr	P/ R	C
BEC17OE4	Prerequisite: Wireless Network, Data Communication	Ty	3	0	0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- Learn the different types of MAC protocols.
- Be familiar with different types of Adhoc routing protocols.
- Understand the design issues in Transport layer and security.
- Learn the cross layer design and mobile IP network.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Provide knowledge of different concept of Adhoc network, application, to characteristics of wireless channels.
CO2	Provide knowledge of MAC layer protocols and design issues.
CO3	Provide knowledge of Routing mechanisms and Routing algorithm.
CO4	Provide knowledge of Transport layer and security issues.
CO5	Provide knowledge of Cross layer design and mobile IP network.

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17OE4 ADHOC AND SENSOR NETWORKS 3 0 0 3

UNIT I: INTRODUCTION 9 Hrs

Introduction to Adhoc networks – Definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models- Indoor and Outdoor Models.

UNIT II: MEDIUM ACCESS PROTOCOLS 9 Hrs

MAC Protocols: Design issues, Goals and classification. Contention based protocols With Reservation, Scheduling Algorithms, Protocols using Directional Antennas. IEEE Standards: 802.11a. HiperLAN.

UNIT III: NETWORK PROTOCOLS 9 Hrs

Routing Protocols: Design Issues, Goals and Classification. Proactive Vs Reactive routing, Unicast routing algorithms, Multicast routing algorithms, Hybrid Routing Algorithm, Energy Aware Routing Algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV: END-END DELIVERY AND SECURITY 9 Hrs

Transport layer: Issues in Designing- Transport layer Classification, Adhoc Transport Protocols. Security Issues in Adhoc Networks: Issues and Challenges, Network Security attacks, Secure Routing Protocols.

UNIT V: CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G 9 Hrs

Cross Layer Design: Need for Cross Layer Design, Cross Layer Optimization, Parameter Optimization Techniques, Cross Layer Cautionary Prespective, Intergration of Adhoc with Mobile IP networks.

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

Textbooks:

1. C.Siva Ram Murthy and B.S.Manoj, "*Ad hoc Wireless Networks Architectures and protocols"*, 2nd edition, Pearson Education. 2007
2. Charles E. Perkins, *"Ad hoc Networking"*, Addison – Wesley, 2000

References:

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, "*Mobile ad-hoc Networking*", Wiley-IEEE press, 2004.
2. Mohammad Ilyas, "*The handbook of adhoc wireless networks*", CRC press, 2002.
3. T. Camp, J. Boleng, and V. Davies "*A Survey of Mobility Models for Ad Hoc Network Research*," Wireless Commun. and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
4. Fekri M. Abduljalil and Shrikant K. Bodhe, "*A survey of integrating IP mobility protocols and Mobile Ad hoc networks*", IEEE communication Survey and tutorials, v 9.no.1 2007

Subject Code: BEC17OE5	Subject Name : MULTIMEDIA COMPRESSION TECHNIQUES	T / L/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: Digital Electronics	Ty	3	0	0	3

Department of Electronics and Communication Engineering

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

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

OBJECTIVE :

- To provide in-depth knowledge about Data Compression.
- Text compression and audio compression
- To understand about image and video compression.
- Apply the necessary mathematical tools, fundamentals and advanced knowledge of multimedia compression technique.
- To develop a deep understanding of principles, theory and application of data compression.

COURSE OUTCOMES (COs) :

The students will be able to

CO1	Explain scalar quantization theory and rate distribution theory
CO2	Understand different coding techniques
CO3	Describe contour based compression and motion estimation techniques
CO4	Understand the concepts of requirements for memory space reduction
CO5	Motivate to develop efficient algorithms for compression

Mapping of Course Outcomes with Program Outcomes (POs)

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

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

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

Department of Electronics and Communication Engineering

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

BEC17OE5 MULTIMEDIA COMPRESSION TECHNIQUES 3 0 0 3

UNIT – I: INTRODUCTION 9 Hrs

Brief history of data compression applications, Overview of information theory, Redundancy, Overview of Human audio, visual systems, Taxonomy of compression techniques, Overview of source coding, source models, scalar quantization theory, rate distribution theory, vector quantization, structure quanitizers, Evaluation techniques-error analysis and methodologies.

UNIT – II: TEXT COMPRESSION 9Hrs

Compact techniques- Huffman coding – arithmetic coding – Shannon Fano Coding and dictionary techniques – LZW family algorithms. Entropy measures of performance – Quality measures.

UNIT – III: AUDIO COMPRESSION 9 Hrs

Audio compression techniques-frequency domain and filtering-basic sub-band coding-application to speech coding- G.722-application to audio coding-MPEG audio,progressive encoding for audio—silence compression,speech compression techniques-Vocoders

UNIT – IV: IMAGE COMPRESSION 9 Hrs

Predictive techniques PCM, DPCM, DM. Contour based compression- quadtrees, EPIC, SPIHT, Transform coding, JPEG, JPEG- 2000, JBIG

UNIT – V: VIDEO COMPRESSION **9 Hrs**

Video signal representation, Video compression techniques-MPEG,Motion estimation technioques-H.261.Overview of Wavelet based compression and DVI technology,Motion video compression,PLV performance,DVI real time compression

Practical component P : Include case studies / application scenarios

Research component R : Future trends / research areas / Comparative Analysis

Total Number of Hours: 45Hrs

References:

1. Mark Nelson, "*Data Compression Book*", BPB Publishers, New Delhi, 1998.
2. Sayood Khaleed, "*Introduction to Data Compression"*, Morgan Kauffman, London,1995.
3. Warkinson, J. "*Compression in Video and Audio"*, Facol press, London. 1995
4. Jan Vozer, "*Video Compression for Multimedia*", AP profes, Newyork, 1995

OPEN ELECTIVES LIST (SEMESTER 6)

1. AUTOMOTIVE ENGINEERING
2. ELECTRIC AND HYBRID VEHICLES
3. BOUNDARY LAYER THEORY
4. COMPUTATIONAL FLUID DYNAMICS
5. FINITE ELEMENT ANALYSIS
6. ARTIFICIAL INTELLIGENCE/EXPERT SYSTEMS IN DESIGN AND MANUFACTURING
7. CREATIVITY, INNOVATION AND NEW PRODUCT DEVELOPMENT
8. COMPOSITE MATERIALS AND STRUCTURES
9. MACHINE LEARNING IN BIOINFORMATICS
10. PRINCIPLES AND APPLICATIONS OF BIOINFORMATICS
11. BIOSIMULATIONS USING MATLAB
12. DATA MINING IN BIOINFORMATICS
13. BIOINFORMATICS FOR BIOENGINEERS
14. INTRODUCTION TO BIOMEDICAL DEVICES
15. FUNDAMENTALS OF BIOSIGNAL PROCESSING
16. BIOREFINERY
17. DIGITAL IMAGE PROCESSING
18. WATER POLLUTION AND ITS MANAGEMENT
19. LOBAL WARMING AND CLIMATE CHANGE
20. DISASTER MANAGEMENT AND MITIGATION
21. ENERGY ENGINEERING TECHNOLOGY AND MANAGEMENT
22. RENEWABLE ENERGY TECHNOLOGY
23. INDUSTRIAL POLLUTION PREVENTION AND CONTROL
24. PETROLEUM TECHNOLOGY
25. INTRODUCTION TO TRANSPORT PROCESSES
26. DATA STRUCTURES
27. DATABASE CONCEPTS
28. SOFT COMPUTING
29. WEB DESIGN
30. ELECTRONIC CIRCUITS AND SYSTEMS
31. TELECOMMUNICATION SYSTEMS
32. POWER PLANT INSTRUMENTATION
33. BIOMEDICAL INSTRUMENTATION
34. RENEWABLE ENERGY RESOURCES
35. MICROCONTROLLERS AND THEIR APPLICATIONS
36. ELECTRICAL MACHINES AND DRIVES
37. FUNDAMENTALS OF ELECTRIC POWER UTILIZATION

38. INDUSTRIAL ELECTRONICS
39. REAL-TIME EMBEDDED SYSTEMS
40. CONTROLLER BASED SYSTEM DESIGN
41. INSTRUMENTATION ENGINEERING
42. HUMAN NUTRITION AND HEALTH
43. TECHNOLOGY OF BAKERY AND CONFECTIONERY PRODUCTS
44. FOOD PROCESSING AND PRESERVATION TECHNOLOGY
45. DISASTER MANAGEMENT
46. CYBER SECURITY
47. DAY-TO-DAY BIOLOGY
48. INTRODUCTION TO AUTOMATION
49. VIRTUAL INSTRUMENTATION
50. FUNDAMENTALS OF MEMS
51. INFORMATION SECURITY
52. INTRODUCTION TO DATABASE MANAGEMENT SYSTEM
53. PROFICIENCY IN ENGLISH AND ACCENT TRAINING
54. CREATIVE WRITING
55. INDIAN WRITING IN ENGLISH
56. SCIENCE FICTION
57. INTELLECTUAL PROPERTY RIGHTS , INNOVATION AND TECHNOLOGY
58. PRINCIPLES OF TECHNOLOGY AND INNOVATION MANAGEMENT
59. MARKETING MANAGEMENT
60. INDUSTRIAL MARKETING
61. STRESS MANAGEMENT
62. BASICS OF BANKING AND CAPITAL MARKETS
63. FINANCE FOR NON FINANCE EXECUTIVES
64. FUNDAMENTALS OF ENTREPRENEURSHIP
65. OPERATIONS RESEARCH
66. ETHICAL VALUES FOR BUSINESS
67. INFORMATION SYSTEMS FOR ENGINEERS
68. DATA WAREHOUSING AND DATA
69. LEGAL ASPECTS OF BUSINESS
70. INDUSTRIAL ENGINEERING AND MANAGEMENT
71. BUSINESS ENVIRONMENT
72. CONCURRENT ENGINEERING
73. MEMS AND NANO MANUFACTURING
74. NON DESTRUCTIVE TESTING
75. NANO PROCESSING
76. LOW COST AUTOMATION
77. MANUFACTURING COST ESTIMATION
78. MICRO ELECTRO MECHANICAL SYSTEMS
79. INTRODUCTION TO HYDRAULICS AND PNEUMATICS
80. PLASTIC ENGINEERING
81. INTRODUCTION TO ROBOTICS
82. BASIC THERMODYNAMICS AND HEAT TRANSFER
83. RENEWABLE AND SUSTAINABLE ENERGY
84. ENERGY AUDITING
85. ENERGY CONSERVATION

86. SOLAR ENERGY UTILIZATION
87. HUMAN COMPUTER INTERFACE
88. ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS
89. APPLICATIONS OF NANOTECHNOLOGY
90. SOFTWARE DEVELOPMENT AND MANAGEMENT
91. TELECOM BILLING
92. Fire and Safety
93. NSS

Department of Electronics and Communication Engineering

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**
1	Humanities and Social Sciences (HS), including Management;	5(9.25)	10(18.5)	14	**13**
	TECHNICAL ENGLISH - I				**2**
	TECHNICAL ENGLISH - II				**2**
	ENVIRONMENTAL SCIENCE				**3**
	MANAGEMENT PAPER 1				**3**
	MANAGEMENT PAPER 2				**3**

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**
2	Basic Sciences(BS) including Mathematics, Physics, Chemistry, Biology;	15(27.75)	20(37)	30	**30**
	MATHS - I				**4**
	ENGINEERING PHYSICS				**3**
	MATERIAL SCIENCE				**3**
	ENGINEERING CHEMISTRY - I				**3**
	ENGINEERING CHEMISTRY - II				**3**
	MATHS - II				**4**
	PHYSICS LAB				**1**
	CHEMISTRY LAB				**1**
	MATHS - III				**4**
	MATHS - IV				**4**

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**
3	Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/Electronics/Mechanical/Computer Engineering, Instrumentation;	15(27.75)	20(37)	30	**29**
	BASIC ELECTRICAL & ELECTRONICS ENGINEERING				**3**
	BASIC MECHANICAL & CIVIL ENGINEERING				**3**
	BASIC ENGINEERING GRAPHICS				**2**
	WORKSHOP & PROJECT LAB				**1**
	PROGRAMMING LAB				**2**
	BASIC ENGINEERING SCIENCE				**3**
	INTER DISCIPLINARY THEORY (4 PAPERS)				**12**
	INTER DISCIPLINARY LAB (3 LABS)				**3**

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**
4	Professional Subjects-Core (PC), relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required;)	30(55.5)	40(74)	50	**68**
	4 CREDIT DEPT CORE PAPER (9 papers)				**36**

	3 CREDIT DEPT CORE PAPER (7 papers)				**21**
	DEPARTMENT CORE LABS				**11**

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**
5	Professional Subjects – Electives (PE), relevant to the chosen specialization/ branch;	10(18.5)	15(27.75)	20	**15**
	DEPT CORE ELECTIVES (5 PAPERS)				**15**

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**
6	Open Subjects- Electives (OE), from other technical and/or emerging subject areas;	5(9.25)	10(18.5)	12	**10**
	OPEN ELECTIVE (Inter Disciplinary No Prerequisite)				**3**
	SPECIAL ELECTIVE (Emerging Technology Syllabus to be framed)				**3**
	SOFT SKILL 1				**2**
	SOFT SKILL 2				**2**

S.No.	Course Work- Subject Area	Range of Total Credits (%) Min	Max	Suggested Breakdown on Credits (for Total 176)	**Dr.MGR E&R Inst University credits**

7	Project Work, Seminar and/or Internship in Industry or elsewhere.	10(18.5)	15(27.75)	20	**20**
	TECHNICAL SKILLS (3)				**3**
	INPLANT TRAINING				**1**
	PROJECT PHASE – 1 & 2				**12**
	FOREIGN LANGUAGE				**2**
	MINI PROJECT				**1**
	ENTREPRENEURAIL SKIL DEVELOPMENT & PROJECT LAB				**1**

Credits Distribution

S. No	Description	No. of Papers	Credits
1	Department Core (3 credits) Inclusive of 3 ETL subjects	7	21
2	Department Core (4 credits)	9	36
3	Department Core Electives	5	15
4	Open Elective	1	3
5	Special Elective (ETL)	1	3
6	Management Papers	2	6
7	Core Department Lab	11	11
8	Interdisciplinary Theory	4	12
9	Interdisciplinary Lab	3	3
10	Mathematics	4	16
11	Basic Humanities & Sciences	6	16
12	Environmental Science	1	3
13	Basic Engineering Science	4	11
14	Basic Engineering & Science Labs	4	5
15	Technical Skills	3	3
16	Soft Skills	2	4
17	Foreign Language	1	2
18	Mini Project	1	1
19	Project (Phase 1 & 2)	2	12

20	In Plant Training	1	1
21	Entrepreneurial Skill Development & Project Lab	1	1
	Total	**73**	**185**

Note:

Revision-2 curriculum modified with the following changes

- In the 2nd semester curriculum, Entrepreneurial Skill Development and Project lab courses included with one credit weightage.

- Total number of Credits for the 1st year program has been increased to 41 credits and the overall credit has been increased to 185 credits.