COURSE HAND-OUT

PTU B.TECH. - SEMESTER I

DEPARTMENT OF ELECTRICAL ENGINEERING

Bhai Gurdas Institute of Engineering & Technology

VISION

To impart value based multidisciplinary quality education to the students which can enable them to contribute their knowledge in industrial development, technology revolution and economic growth of the nation with global Perspective.

MISSION

Mission No.	Mission Statements
M1	To develop technical manpower of quality standards with capabilities of accepting new challenges.
M2	To provide teaching and research environment.
M3	To promote collaborative coexistence amongst academic institute and industries for resources sharing.

DEPARTMENT OF ELECTRICAL ENGINEERING,BGIET

VISION

- It is aimed to provide the finest environment for teaching, learning, research, innovation and character building so as to mould youth of today into world-class technocrats of tomorrow who would Endeavour to increase the quality of life for mankind.

- To provide quality technical education to prepare globally competent and ethically strong Electrical Engineers with power of innovation to contribute the knowledge for the betterment of society .

- To emerge as a leading Department of Electrical Engineering that caters to the latest needs of power sector, electrical & allied industry in the region.

MISSION

M1: To evolve as an innovative & globally competent Electrical Engineering department that contributes to the socio - economic growth of region by utilizing the advancement in Electrical Engineering by providing conducive learning and interactive environment to students and faculty.

M2: To impart the quality education and enhance skills for developing globally competent Electrical Engineers.

M3: To provide state –of –the –art facilities and opportunities to create, interpret, apply and disseminate knowledge.

M4: To develop students and faculty to cope up with modern technology with research attitude to meet industry standards effective industry interface.

B.TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To provide students with strong fundamentals of basic sciences and domain knowledge of Electrical Engineering.
2. To develop multidisciplinary approach and to develop their professional competency.
3. To enable students to design and analyze system, and develop solution for real life engineering problems.
4. To inculcate professionalism, ethics, communication, teamwork and leadership skills in students to serve for the betterment of the industry

PROGRAMME OUTCOMES (POs)

Graduates will be able to achieve

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of theinformation to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant tothe professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and needfor sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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SCHEME: B.TECH 1ST SEMESTER

(ELECTRICAL ENGINEERING)

I.K. Gujral Punjab Technical University Revised Scheme for B.Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTCH101-18	Chemistry-I	3-1-0	4	4
B	BTCH102-18	Chemistry-I (Lab)	0-0-3	3	1.5
C	BTAM101-18	Math-I	3-1-0	4	4
D	BTPS101-18	Programming for Problem Solving	3-0-0	3	3
E	BTPS102-18	Programming for Problem Solving (Lab)	0-0-4	4	2
F	BTMP101-18	Workshop / Manufacturing Practices	1-0-4	5	3
G	BTHU101-18	English	2-0-0	2	2
H	BTHU102-18	English (Lab)	0-0-2	2	1
I	BMPD101-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 20.5 Hours: 29

BTCH101-18 CHEMISTRY-I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE- CHEMISTRY-I	SEMESTER-1 CREDITS-4
COURSE CODE- BTCH101-18 Year of introduction – 2018	COURSE TYPE - CORE
COURSE AREA/DOMAIN- CHEMISTRY	CONTACT HOURS: 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTCH102-18	LAB COURSE NAME: CHEMISTRY-I LAB

SYLLABUS:

MODULE	DETAILS	HOURS
I	**Atomic and molecular structure** Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nano particles. Forms of the hydrogen atom wave functions and the plots ofthese functions to explore their spatial variations. Molecular orbitals of diatomic moleculesand plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energylevel diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.	12
II	**Spectroscopic techniques and applications** Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging,surface characterisation techniques. Diffraction and scattering.	8
III	**Intermolecular forces and potential energy surfaces** Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.	4
IV	**Use of free energy in chemical equilibria** Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.	6
V	**Periodic properties**	4

	Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries	
VI	**Stereochemistry** Representations of 3 dimensional structures, structural isomers and stereoisomer's, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds	4
VII	**Organic reactions and synthesis of a drug molecule** Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.	4

Total hours – 42

TEXT/REFERENCE BOOKS:

S.No	BOOK TITLE/AUTHORS/PUBLICATION
1.	University chemistry, by B. H. Mahan
2.	Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane
3.	Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4.	Physical Chemistry, by P. W. Atkins
5.	Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5thEdition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Conceptual of engineering chemistry,by Dr. S.K.Bhasin.
2	Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M.S Krishnan.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Small Group Instruction.
- Making real world connections
- Presentatons

E- CONTENT USED:

- https://youtu.be/dkARLSQWHH8

ADDITIONAL TOPICS:

- Huckel's rule and concept of aromaticity
- Fullerenes

COURSE OBJECTIVES:

The aim and objective of the course on Chemistry-I is to introduce the students of B. Tech. class to the formal structure of Chemistry-I so that they can use these in Engineering as per their requirement.

COURSE OUTCOMES:

	Course: CHEMISTRY-I	
	Subject Code- BTCH101-18	
	Course Outcomes	**BT Level**
1	Illustrate the structures of diatomic and polyatomic in terms of molecular orbital's and relate intermolecular forces.	2
2	Interpret the molecular interactions by choosing suitable spectroscopic methods and interpreting corresponding data.	2
3	Make use of free energy in chemical equilibria and relate intermolecular forces.	3
4	Analyze periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity	4
5	Determine the stereochemistry of organic compounds and major chemical reactions that are used in the synthesis of molecules.	5
6	Formulate the reactivity/stability of compound and identification of drug molecule.	6

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	1	1								2		1	1
CO2	2		1	1								2	1	1	1
CO3	1	1	1	1								2			1
CO4	2	1	2	1								2	1	1	
CO5	1	1	1	1								2			
CO6		1	1				1					2		1	

BTCH102-18 CHEMISTRY-I(LAB)

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE AREA/DOMAIN- CHEMISTRY	CONTACT HOURS: 0(L)-0(T)-3(P)
CORRESPONDING LAB COURSE CODE (IF ANY): BTCH102-18	LAB COURSE NAME: CHEMISTRY-I LAB

SYLLABUS:

PRACTICALS

Choice of 10-12 experiments from the following

▪ Determination of surface tension and viscosity
▪ Thin Layer Chromatography
▪ Ion exchange column for removal of hardness of water
▪ Colligative properties using freezing point depression
▪ Determination of the rate constant of a reaction
▪ Determination of cell constant and conductance of solutions
▪ Potentiometry-determination of redox potentials and emf
▪ Synthesis of a polymer/drug
▪ Saponification/acid value of an oil
▪ Chemical analysis of a salt
▪ Lattice structures and packing of spheres
▪ Models of potential energy surfaces
▪ Chemical oscillations- Iodine clock reaction
▪ Determination of the partition coefficient of a substance between two immiscible liquids
▪ Adsorption of acetic acid by charcoal

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.
2	Vogel's *Textbook* of Quantitative chemical analysis
3	Text *Book* of *engineering chemistry* by. R. N. Goyal and HarrmendraGoel, Ane *Books* Private Ltd.,.
4	Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Inorganic quantitative analysis, Vogel.
2	*Laboratory Manual* on *Engineering Chemistry*, Sudharani (Dhanpat Rai Publishing Company).

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Chalk & Talk
Small Group Instruction.
Making real world connections
Presentatons

E- CONTENT USED:

https://youtu.be/qvUyVrUb8Fo

ADDITIONAL TOPICS:

Aim and objective of the Lab course on Chemistry is to introduce the students of B.Tech. class to the formal structure of Chemistry so that they can use these in Engineering as per their requirement.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
BTCH102-18	**Chemistry Lab-I**	**Introduction to Chemistry lab**	**1 & 2**

COURSE OUTCOMES:

Course: CHEMISTRY-I LAB		
Subject Code- BTCH102-18		
	Course Outcomes	**BT Level**
1.	Classify different physical properties such as surface tension and viscosity of unknown liquids.	2
2.	Build skills in method of creating different chromatographic techniques.	3
3.	Make use of the rate constants, cell constant, redox potentials and conductance for different chemical solutions.	3
4.	Survey basic techniques and procedures in laboratory for synthesis and purification of any organic compounds	4
5.	Inspect acid value of oil and analysis of salt.	4
6.	Measure the partition coefficient of substance and adsorption of acetic acid by different methods.	5

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1												1	1		1
CO2	2	1	1									1		1	
CO3	2	1	1									1			
CO4												1		1	
CO5												1			
CO6												1			

MATHEMATICS -I

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE- MATHEMATICS PAPER-I	SEMESTER-1 CREDITS-5
COURSE CODE- BTAM101-18 Year of introduction – 2018	COURSE TYPE - CORE
COURSE AREA/DOMAIN- MATHEMATICS	CONTACT HOURS: 4-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	LAB COURSE NAME: NA

SYLLABUS:

MODULE	DETAILS	HOURS
I	**Calculus** Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L' Hôpital's rule; Maxima and minima; Evaluation of definite and Improper integrals; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	10
II	**Multivariable Calculus** Limit, continuity and partial derivatives, Total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration), Center of mass and Gravity (constant and variable densities).	15
III	**Sequences and Series** Convergence of sequence and series, tests for convergence of positive term series: root test, ratio test, p-test, comparison test; Alternate series and Lebinitz's test; Power series, Taylor's series, series for exponential, trigonometric and logarithmic functions.	12
IV	**Matrices** Algebra of matrices, Inverse and rank of a matrix, introduction of null space and kernel, statement of rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Similar matrices; Diagonalization of matrices; Cayley-Hamilton Theorem.	13

Total hours – 50

TEXT/REFERENCE BOOKS:

Sr.	BOOK TITLE/AUTHORS/PUBLICATION
1.	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2.	T. Veerarajan, Engineering Mathematics for first year, Tata McGraw-Hill, NewDelhi, 2008.
3.	B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010
4.	D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

Sr.	BOOK TITLE SUGGESTED BY FACULTY
1.	Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2.	N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2008

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Chalk & Talk
Small Group Instruction.
Making real world connections
Inquiry-based Learning

E- CONTENT USED:

https://youtu.be/eTp5wq-cSXY
https://youtu.be/LYYGJ_5qx5M

ADDITIONAL TOPICS:

The fundamental theorem of line integrals
Raabe's test
Cauchy's Root test

COURSE OBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

COURSE OUTCOMES:

	Course: MATHEMATICS-I	
	Course Code: BTAM101-18	
	Course Outcomes	**BT LEVEL**
1	Understand the fundamental concepts of pure and applied mathematics to enhance mathematical skills	**2**
2	Apply differential and integral calculus to evaluate definite, improper integrals and its applications.	**3**
3	Make use of limit, continuity, differentiation and determine the optimal points of single variable and multivariable functions	**3**
4	Simplify the integration w.r.t multiple variables and also apply the same to determine the areas and volumes using double integration using change of order or change of variables, if needed.	**4**
5	Determine the convergence and divergence conditions of various types of infinite series.	**5**
6	Solve linear system of equations ,find the Eigen values and Eigen vectors and also apply Cayley Hamilton theorem.	**6**

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2								2	1	1	
CO2	2	2	2		1							1	1	1	1
CO3	3	1	1										1		1
CO4	3	3		1								2		1	
CO5	3	3		2								2	1		1
CO6	2	2	2	2								2		1	

BTPS101-18 COURSE INFORMATION SHEET

SYLLABUS

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE:PPS	SEMESTER-2 CREDITS-3
COURSE CODE- BTPS101-18 Year of Introduction – 2018	COURSE TYPE – CORE
COURSE AREA/DOMAIN- PPS	CONTACT HOURS:3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTPS102-18	LAB COURSE NAME:PPS - LAB

MODULE	DETAILS	HOURS
1.	Introduction to Programming, Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of algorithm Flowchart/ Pseudo code with examples. Syntax and logical errors in compilation	8
2.	Introduction about constants, variables, data types, operators, precedence and expressions. Evaluation of conditional Branching and loops.	14
3.	1-D and 2-D Arrays, Character Array and strings.	6
4.	Searching, Sorting algorithms (Bubble, insertion and selection) quick sort and merge sort.	6
5.	Functions, Parameter passing in functions, call by value and call by reference, passing array to functions.	6
6.	Recursion Recursion, as a different pointers, Use of Pointers in self-referential structures, notion of linked list	5
7.	Defining structures and Array of structures	4
8.	Idea of pointers ,Use of pointers in structure.	2
6.	Introduction, File reading/writing in different modes	3

Total hours –52

TEXT/REFERENCE BOOKS:

S.No	BOOK TITLE/AUTHORS/PUBLICATION
1.	"The Programming Language" ,Braian W. Kernighan and Desnnis M. Ritchie.
2.	"Let Us C",By Yashwant Kanetkar, Saurav Kulkarni.
3.	"C Programming Language", A step by step beginners guide to learn C programming by Darel L Graham.
4.	"Programming in C", by Reema Thareja
5.	."C in Depth",by Deepali Srivastava and S K Srivastava.
6.	Computer Programming using C language – Vipan Arora, Eagle's Publications.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Small Group Instruction.
- Making real world connections
- Presentations

E- CONTENT USED:

- https://www.youtube.com/watch?v=8PopR3x-VMY
- https://www.youtube.com/watch?v=3lqgdqoY83o
- https://www.youtube.com/watch?v=08LWytp6PNI

ADDITIONAL TOPICS:

- Object Oriented Programming Concepts
- Use of Class in OOPS
- Use of Inhertance
- Introduction about N/w Security
- Introduction about Web Technology

COURSE OBJECTIVES:

The aim and objective of the course on English is to introduce the students of B. Tech. class to the formal structure of English so that they can use these in Engineering as per their requirement.

COURSE OUTCOMES:

Course: PPS		
Subject Code- BTPS101-18		
	Course Outcomes	**BT Level**
1.	Explore the working of program development, characteristics of C, compilation process, Flowchart and it's working.	1
2.	Explain the use of different data types, operators, expressions, Input / Output statements, Library Functions.	2
3.	Run programs based on control statements like if-else, if-else-if, for loop, while loop, do-while loop, Switch statement and break statement.	3
4.	Identify the use of functions (Call by value, call by reference), parameter passing in functions, Passing array to functions, Categorize sorting algorithms (Bubble, Insertion and Selection)	4
5.	Order of complexity through Programs, Use of array (1-d Array & 2-d Array), Relate the use of structures, Array of structures, Use of pointer in C	4
6.	Describe Strings, reading & writing strings, standard library string functions, Study of reading from a file, writing to a file, structure of file program, Error handling in file and command line arguments in file.	6

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	1	1	-		-	-	-	-	-	2	1	1	1
CO2	2	1-	-	-	3	-	2	`-	-	1	-	1	-	2	
CO3	1	-	-	2	2	-	3	-	-	-	-	3	2	1	
CO4	3	-	3	2	2	-	-	-	-	-	3	2	-	2	
CO5	2	3	-	2	2	-	-	-	-	-	-	3	3	2	1
CO6	2	-	3	-	3	-	1	-	-	-	1	1	-	2	

BTPS102-18

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE:PPS Lab	SEMESTER-2 CREDITS-2
COURSE CODE- BTPS102-18 Year of Introduction – 2018	COURSE TYPE – CORE
COURSE AREA/DOMAIN- PPS	CONTACT HOURS:0-0-4
CORRESPONDING LAB COURSE CODE (IF ANY): NA	

List Of Practicals:

S.No	DETAILS	HOURS
1.	Familiarization with programming environment	3
2.	Simple computational problems using arithmetic expressions	4
3.	Problems involving if-then-else structures.	2
4.	Iterative Problems	1
5.	1D Array manipulation	2
6.	Matrix problems, String operations	2
7.	Simple functions	1
8.	Pointers and structures	2
9.	File handling	3

TEXT/REFERENCE BOOKS:

S.No	BOOK TITLE/AUTHORS/PUBLICATION
1.	"The Programming Language" ,Braian W. Kernighan and Desnnis M. Ritchie.
2.	"Let Us C",By Yashwant Kanetkar, Saurav Kulkarni.
3.	"C Programming Language", A step by step beginners guide to learn C programming by Darel L Graham.
4.	"Programming in C", by Reema Thareja
5.	."C in Depth",by Deepali Srivastava and S K Srivastava.
6.	Computer Programming using C language – Vipan Arora, Eagle's Publications.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Chalk & Talk
Small Group Instruction.
Making real world connections
Presentations

E- CONTENT

https://youtu.be/GIqcZXtqh_U
https://youtu.be/dQa4A2Z0_Ro

ADDITIONAL TOPIC

Basic programs of OOPS
Program of class in C++
Practical work related to network security

COURSE OBJECTIVES

The aim and objective of the course on English is to introduce the students of B. Tech. class to the formal structure of English So that they can use these in Engineering as per their requirement**.**

COURSE OUTCOMES:

Course: PPS lab		
Subject Code- BTPS102-18		
	Course Outcomes	**BT Level**
1.	Familiarization with programming environment	1
2.	Simple computational problems using arithmetic expressions	2
3.	Problems involving if-then-else structures, 1D Array manipulation	3
4.	Matrix problems, String operations	4
5.	Simple functions	4
6.	Pointers and structures, File handling	6

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	1	-	1	-	-	-	-	-	-	2	1	1	1
CO2	2	1	1	-	-	-	-	`-	-	-	-	1	-	1	
CO3	3	1	2	-	-	-	-	-	-	-	-	2	-	-	1
CO4	1	2	1	1	-	-	-	-	-	-	2	2	2	1	
CO5	1	2	1	-	-	-	-	-	-	-	-	1	1	1	1
CO6	2	1	1	1	-	-	-	-	-	-	-	-	-	-	

WORKSHOP/MANUFACTURING PRACTICES

COURSE INFORMATION SHEET

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: WORKSHOP/MANUFACTURING PRACTICES	**SEMESTER: 1 CREDITS: 3**
COURSECODE: BTMP101-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN:	**CONTACT HOURS: 1(L) + 4(P) hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS
	THEORY	
I	Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods	**3**
II	CNC machining, Additive manufacturing	**1**
III	Fitting operations & power tools	**1**
IV	Electrical &Electronics	**1**
V	Carpentry	**1**
VI	Plastic moulding, glass cutting	**1**
VII	Metal casting	**1**
VIII	Welding (arc welding & gas welding), brazing	**1**
	WORKSHOP PRACTICE	
I	Machine shop	**10**
II	Fitting shop	**8**
III	Carpentry	**6**
IV	Electrical & Electronics	**8**
V	Welding shop (Arc welding 4 hrs + gas welding 4 hrs)	**8**
VI	Casting	**8**
VII	Smithy	**6**
VII	Plastic moulding & Glass Cutting	**6**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., " Elements of Workshop Technology" , Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2	Kalpakjian S. And Steven S. Schmid, " Manufacturing Engineering and Technology" , 4th edition, Pearson Education India Edition, 2002.
3	Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
4	Roy A. Lindberg, " Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5	Rao P.N., " Manufacturing Technology" , Vol. I and Vol. II, Tata McGrawHill House, 2017.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	B.S Raghuwanshi, A course in Workshop Technology, Dhanpat Rai & Co.
2	R S Khurmi,J K Gupta, Textbook of Workshop Technology, S Chand
3	O P Khanna, Production Technology Manufacturing Processes, Dhanpat Rai Publications.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Small Group Instruction.
- Making real world connections
- Presentatons

E- CONTENT USED:

- NPTEL Notes and videos

ADDITIONAL TOPICS:

- Sheet Metal: Shop development of surfaces of various objects; sheet metal forming and joining operations, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.
- Foundry Shop: Introduction to molding materials; moulds; use of cores; melting furnaces; tools and equipment used in foundry shops; firing of a cupola furnace; exercises involving preparation of small sand moulds and castings

COURSE OBJECTIVES:

1. Upon completion of this course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM

PROGRAME SPECIFIC OUTCOMES:

S.NO	DESCRIPTION
PSO1	Graduates will be able to specify structure and breakdown frameworks that productively create, transmit, appropriate and use electrical force.
PSO2	Graduates will be able to apply present day programming devices for plan, recreation and investigation of electrical frameworks to participate in long lasting learning and to effectively adjust in multi-disciplinary situations.
PSO3	Graduates will be able to generate, effective transmission and dissemination of electric power with unique reference to non-conventional and sustainable power source assets.

COURSE OUTCOMES:

S.NO	DESCRIPTION	BT Level
CO1	Define different manufacturing process commonly employed in the industry to fabricate components using different materials.	1
CO2	Explain the mechanisms of metal cutting and chip formation in machining and distinguish between various process of casting and welding technology.	2
CO3	Understand CNC Machining and different additive manufacturing techniques.	2
CO4	Demonstrate practical knowledge of dimensional accuracies and dimensional tolerances possible with different manufacturing processes.	3
CO5	Apply the skills of basic electrical engineering for house wiring practice and illustrate the working of electronic components and its utilization	3
CO6	By assembling different components, they will be able to produce small devices of their interest and fabricate components with their own hands.	6

CO –PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO1
CO1	3	2		-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	-	2	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	3	1	-	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	1	-	-	-	-	-	-	-	1	1	2	2
CO6	1	2	3	-	-	-	-	1	-	2	-	-	1	-	-

BTHU101-18 ENGLISH

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE:ENGLISH	SEMESTER-1 CREDITS-4
COURSE CODE- BTHU101-18 Year of introduction – 2018	COURSE TYPE – CORE
COURSE AREA/DOMAIN- ENGLISH	CONTACT HOURS: 3-1-0
CORRESPONDING LAB COURSE CODE (IF ANY): BTHU102-18	LAB COURSE NAME: ENGLISH- LAB

SYLLABUS:

MODULE	DETAILS	HOURS
I	**Vocabulary Building & Basic Writing Skills** The concept of Word Formation • Root words from foreign languages and their use in English • Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations. • Sentence Structures • Use of phrases and clauses in sentences • Importance of proper punctuation • Creating coherence • Organizing principles of paragraphs in documents • Techniques for writing precisely	4
II	**Identifying Common Errors in Writing** Subject-verb agreement • Noun-pronoun agreement • Misplaced modifiers • Articles • Prepositions • Redundancies • Clichés	6
III	**Mechanics of Writing** Writing introduction and conclusion • Describing • Defining • Classifying • Providing examples or evidence	4
IV	**Writing Practices** Comprehension • Précis Writing • Essay Writing • Business Writing-Business letters, Business Emails, Report Writing, Resume/CV	4

Total hours – 42

TEXT/REFERENCE BOOKS:

S.No	BOOK TITLE/AUTHORS/PUBLICATION
1.	Practical English Usage. Michael Swan. OUP. 1995.
2.	Remedial English Grammar. F.T. Wood. Macmillan.2007
3.	On Writing Well. William Zinsser. Harper Resource Book. 2001
4.	Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006
5.	Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6.	Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

	BOOK TITLE SUGGESTED BY FACULTY
1	Oxford modern English grammar by B. Aarts
2	English Grammar by Michael swan

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Group Discussion.
- Projector
- Presentations

E- CONTENT USED:

- https://www.youtube.com/watch?v=zfbUzWqsH74

COURSE OBJECTIVES:

The aim and objective of the course on English is to introduce the students of B. Tech. class to the formal structure of English so that they can use these in Engineering as per their requirement.

COURSE OUTCOMES:

Course: ENGLISH		
Subject Code- BTHU-101-18		
	Course Outcomes	**BT Level**
1	Choose basic proficiency in listening and speaking skills.	1
2	Interpret the independent user of English language.	2
3	Make use of communication training.	3
4	Discover different strategy of effective communication and select the most appropriate mode of communication for a given situation.	4
5	Distinguish effectively and assertively.	4
6	Combine effectively through different mode of written communication.	6

CO MAPPING WITH PO:

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		3				2		3		2			
CO2	1	3		2		1			2	2					
CO3			3			2		2	3	3		2			
CO4	1	3				2			1	2		1			
CO5	2					3			2	1	3	2			
CO6	3		2	2				1	1			2			

BTHU102-18

ENGLISH LAB

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE:ENGLISH	SEMESTER-2 CREDITS-4
COURSE CODE- BTHU102-18 Year of introduction – 2021	COURSE TYPE - CORE
COURSE AREA/DOMAIN- ENGLISH	CONTACT HOURS: 0(L)-0(T)-2(P)
CORRESPONDING LAB COURSE CODE (IF ANY): BTHU102-18	LAB COURSE NAME: ENGLISH- LAB

SYLLABUS:

MODULE	DETAILS
I	Listening Comprehension
II	Self-Introduction, Group Discussion and Role Play
III	Common Everyday Situations: Conversations and Dialogues
IV	Communication at Workplace
V	Interviews
VI	Formal Presentations

Total hours – 42

TEXT/REFERENCE BOOKS:

S.No	BOOK TITLE/AUTHORS/PUBLICATION
1.	(i) Practical English Usage. Michael Swan. OUP. 1995.
2.	(ii) Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
3.	(iii) Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Oxford modern English grammar by B. Aarts
2	English Grammar by Michael swan

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Group Discussion.
- Projector
- Presentations

E- CONTENT USED:

- **https://www.youtube.com/watch?v=JuBAXrPGiXg&list=RDQMjCpImeiKYJo&start_radio=1**

COURSE OBJECTIVES:

The aim and objective of the course on English Lab is to introduce the students of B. Tech. class to the formal structure of English Lab so that they can use these in Engineering as per their requirement.

COURSE OUTCOMES

Course: ENGLISH		
Subject Code- BTHU-102-18		
	Course Outcomes	**BT Level**
CO1	Recall the content of audio inputs for effective listening skills.	1
CO2	Demonstrate the physiological characteristics of proper voice and diction for better speaking skills.	2
CO3	Practice the worksheets related to stress and intonation on words for better fluency in language.	3
CO4	Analyze everyday situations through role play activities for better presentation in corporate sector and daily life.	4
CO5	Illustrate interview skills through mock interview practices.	4
CO6	Implement Listening, Speaking, Reading and Writing skills through formal presentation	6

CO MAPPING WITH PO

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
1.								1	3	3		3		
2.								2	3	2		2		
3.								2	2	3		2		
4.								1	3	3		3		
5.								1	2	2		2		
6.								2	2	2		2		

2ND SEMESTER

INDEX

SCHEME: B.TECH 2nd SEMESTER

(ELECTRICAL ENGINEERING)

I.K. Gujral Punjab Technical University Revised Scheme for B.Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTPH102-18	Optics and Modern Physics	3-1-0	4	4
B	BTPH112-18	Optics and Modern Physics Lab	0-0-3	3	1.5
C	BTAM202-18	Mathematics-II	3-1-0	4	4
D	BTEE101-18	Basic Electrical Engineering	3-1-0	4	4
E	BTEE102-18	Basic Electrical Engineering (Lab)	0-0-2	2	1
F	BTME101-21	Engineering Graphics & Design	1-0-5	5	3
G	BMPD201-18	Mentoring and Professional Development	0-0-2	2	0

Total Credits = 17.5 Hours: 25

BTPH102-18 OPTICS AND MODERN PHYSICS

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE: BTECH**
COURSE: OPTICS AND MODREN PHYSICS	**SEMESTER: 2 CREDITS: 4**
COURSE CODE: BTPH-102-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: OPTICS AND MODREN PHYSICS	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : BTPH-112-18	**LAB COURSE NAME: : OPTICS AND MODREN PHYSICS LAB**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Waves and Oscillations** Mechanical simple harmonic oscillators, damped harmonic oscillator, forced mechanical oscillators, impedance, steady state motion of forced damped harmonic oscillator, Transverse wave on a string, wave equation on a string, reflection and transmission of waves at a boundary, impedance matching, standing waves, longitudinal waves and their wave equation, reflection and transmission of waves at a boundary.	**10**
II	**Optics and LASERS** Optics: Light as an electromagnetic wave, reflectance and transmittance, Fresnel equations (Qualitative idea), Brewster's angle, total internal reflection: Interference: Huygens' principle, superposition of waves and interference of light by wavefront splitting and amplitude splitting; Young's double slit experiment, Michelson interferometer. Diffraction: Farunhofer diffraction from a single slit and a circular aperture, Diffraction gratings and their resolving power; LASERS: Spontaneous and stimulated emission, Einstein's theory of matter radiation interaction and A and B coefficients; population inversion, pumping, various modes, properties of laser beams, types of lasers: gas lasers (He-Ne), solid-state lasers (ruby), and its applications.	**10**
III	**Introduction to Quantum Mechanics** Wave nature of Particles, Free-particle wave function and wave-packets, probability densities, Expectation values, Uncertainty principle, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, Solution of stationary-state Schrodinger equation for one dimensional problems: particle in a box, linear harmonic oscillator	**10**
IV	**Introduction to Solids and Semiconductors** Free electron theory of metals, Fermi level, density of states in 1, 2 and 3 dimensions, Bloch's theorem for particles in a periodic potential, Origin of energy bands (Qualitative idea); Types of electronic materials: metals, semiconductors, and insulators, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction.	**10**

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1	I. G. Main, "Vibrations and waves in physics", Cambridge University Press, 1993.
2	H. J. Pain, "The physics of vibrations and waves", Wiley, 2006
3	A. Ghatak, "Optics", McGraw Hill Education, 2012
4	HK Malik and AK Singh, Engineering Physics, 2nd ed., Tata McGraw Hill, 2018

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.
2	S. Sharma and J. Sharma, Engineering Physics, Pearson, 2018.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Chalk & Talk
Small Group Instruction.
Making real world connections
Inquiry-based Learning

E- CONTENT USED:

https://youtu.be/I1TBV421ar4
https://youtu.be/Q-oQKSLhLKw

ADDITIONAL TOPICS:

Basics of ray optics
Basics of classical theory and its drawbacks
Photoelectric equation

COURSE OBJECTIVES:

The aim and objective of the course on Optics and Modern Physics is to introduce the students of B.Tech. to the subjects of wave optics, Quantum Mechanics, Solids, and Semiconductors so that they can use these in Engineering as per their requirement.

COURSE OUTCOMES:

S.NO	DESCRIPTION	BT LEVEL
1	Demonstrate understanding of the distinction between mechanical simple harmonic oscillator, damped harmonic oscillator and forced damped harmonic oscillator with the steady state motion.	B.L -1 B.L -4
2	Classify the basic fundamentals of optics and LASERS.	B.L -1 B.L -3
3	Interpret the differential wave equation for the standing waves and longitudinal waves.	B.L-3 B.L-4
4	Analyze the value of need for quantum mechanics, Schrödinger equation, uncertainty principle etc and their various applications.	B.L -1 B.L- 5
5	Formulate & construct engineering problems in optics and modern Physics.	B.L -1 B.L -3
6	Discuss basic idea of doping , p-n junction diode and its V-I characteristics using graphical and mathematical methods	B.L -1 B.L -6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	1	-	-	-	-	-	-	-	-	1	-	-	-
CO2	1	-	-	-	1	-	-	1	-	-	2	1	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	1	-	1		1					1	-	-	-
CO5	1	-	-	-	-	-	-	-	2	-	-	1	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-

OPTICS AND MODERN PHYSICS LAB:

PROGRAMME: ENGINEERING	**DEGREE: BTECH**
COURSE AREA/DOMAIN: OPTICS AND MODREN PHYSICS	**CONTACT HOURS: 0-0-3 hours/Week.**
CORRESPONDING LAB COURSE CODE : BTPH-112-18	**LAB COURSE NAME: : OPTICS AND MODREN PHYSICS LAB**

SYLLABUS:

SECTION-A
1. To study the laser beam characteristics like; wave length using diffraction grating aperture & divergence.
2. Study of diffraction using laser beam and thus to determine the grating element.
3. To study laser interference using Michelson's Interferometer.
4. To determine the numerical aperture of a given optic fibre and hence to find its acceptance angle.
5. To determine attenuation & propagation losses in optical fibres.
6. To determine the grain size of a material using optical microscope.
7. To find the refractive index of a material/glass using spectrometer.
8. To find the refractive index of a liquid using spectrometer..
9. To find the velocity of ultrasound in liquid.
10. To determine the specific rotation of sugar using Laurent's half-shade polarimeter.
11. To study the characteristic of different p-n junction diode - Ge and Si
. 12. To analyze the suitability of a given Zener diode as voltage regulator.
13. To find out the intensity response of a solar cell/Photo diode.
14. To find out the intensity response of a LED.
15. To find out the frequency of AC mains using electric-vibrator
SECTION-B
1. To find the resolving power of the prism.
2. To determine the angle of the given prism..
3. To determine the refractive index of the material of a prism
4. To determine the numerical aperture of a given optic fibre and hence to find its acceptance angle.
5. To calculate the beam divergence and spot size of the given laser beam.
6. To determine the wavelength of a laser using the Michelson interferometer.
7. To revise the concept of interference of light waves in general and thin-film interference in particular.
8. To set up and observe Newton's rings.
9. To determine the wavelength of the given source.
10. To understand the phenomenon Photoelectric effect.
11. To draw kinetic energy of photoelectrons as a function of frequency of incident radiation.
12. To determine the Planck's constant from kinetic energy versus frequency graph.
13. To plot a graph connecting photocurrent and applied potential.
14. To determine the stopping potential from the photocurrent versus applied potential graph

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11 th Edn, 2011, Kitab Mahal
2	Engineering Practical Physics, S. Panigrahi & B. Mallick, 2015, Cengage Learning India Pvt. Ltd
3	Experiments in Modern Physics, A.C. Melissinos, Academic Press, N.Y., 1966.

S.NO	BOOK TITLE SUGGESTED BY FACULTY
1	Practical Physics, C L Arora, S. Chand & Company Ltd

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- First-Hand Experience In Observation
- Making Real World Connections
- Implement Peer-Instruction.

COURSE OBJECTIVES:

The aim and objective of the lab on Optics and Modern Physics lab is to provide students the firsthand experience of verifying various theoretical concepts learnt in theory courses so that they can use these in their branch of Engineering as per their requirement

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
BTPH-104-18	**Higher secondary Education**	**Introduction to Optics and Modern Physics Lab**	**1 & 2**

COURSE OUTCOMES:

S.NO	DESCRIPTION	BT Level (B.L)
1	Understand, explain and use instrumental techniques for intensity pattern analysis	B.L -1 B.L -4
2	Understand and apply the concept of Interference of light, Diffraction of light, Fermi energy and magnetic effect of current.	B.L -1 B.L -3
3	Examine the methods used for estimating and dealing with experimental uncertainties and systematic errors.	B.L-3 B.L-4
4	Apply and demonstrate the theoretical concepts of Engineering Physics.	B.L -1 B.L- 3
5	Apply the theoretical concepts of laser, numerical aperture and photo detectors.	B.L -1 B.L -3
6	Understand and use the principles of operations of optical fibers and semiconductor devices using simple circuits.	B.L -1 B.L -6

CO MAPPING WITH PO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1								1						
CO2	2		1	1								1			
CO3		1										1			
CO4	1			1								2			
CO5	1					1						1			
CO6	1					2						2			

MATHEMATICS -II

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	**DEGREE: BTECH**
COURSE: MATHEMATICS-II	**SEMESTER: 2 CREDITS: 4**
COURSE CODE:BTAM-202-18 **REGULATION: 2021**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: Mathematics	**CONTACT HOURS: 4(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME:NA**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Ordinary Differential Equations** First and higher order Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation, Power series solutions**.**	**13**
II	**Partial Differential Equations** First order First order partial differential equations, solutions of first order linear and non-linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Separation of variables method to simple problems.	**12**
III	Numerical Methods-I Solution of polynomial and transcendental equations – Bisection method, Regula-Falsi method, Newton-Raphson method. Finite differences, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae. Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.	**12**
IV	Numerical Methods-II Ordinary differential equations: Taylor's series, Euler and modified Euler's methods; RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution of twodimensional Laplace equation and Poisson equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.	**13**

Total hours – 50

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1.	W. E. Boyce and R. C. DiPrima, "Elementary Differential Equations and Boundary Value Problems", Wiley India, 2009.
2.	S. L. Ross, "Differential Equations", Wiley India, 1984.
3.	E. A. Coddington, "An Introduction to Ordinary Differential Equations", Prentice Hall India, 1995.
4.	E. L. Ince, "Ordinary Differential Equations", Dover Publications, 1958.
5.	G.F. Simmons and S.G. Krantz, "Differential Equations", McGraw Hill, 2007
6.	N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2008.

	BOOK TITLE SUGGESTED BY FACULTY
1	S. L. Ross, “Differential Equations”, Wiley India, 1984.
2	N.P. Bali and M. Goyal, “A text book of Engineering Mathematics”, Laxmi Publications, 2008.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Small Group Instruction.
- Making real world connections
- Inquiry-based Learning

E- CONTENT USED:

- https://youtu.be/3j0c_FhOt5U
- https://youtu.be/eTp5wq-cSXY

ADDITIONAL TOPICS:

- Linear Equations with Variable Coefficients
- Boundary value problem
- Polynomial interpolation

COURSE OBJECTIVES:

The objective of this course is to familiarize the prospective engineers with techniques in linear algebra, transform calculus and numerical methods. It aims to equip the students with standard concepts and tools of integral transforms, matrices and numerical techniques that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

COURSE OUTCOMES:

Course: MATHEMATICS PAPER-II		
Course Code: BTAM202-18		
	Course Outcomes	**BT Level**
1	Demonstrate the basic theory of linear ODEs and basic types of higher-order linear ODEs for which exact solutions may obtained	2
2	Apply the fundamental concepts of partial differential equations to study the vibration of a string, flow of heat in a rod and plate(steady state).	3
3	Examine the common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.	4
4	simplify numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.	4
5	Evaluate different implicit and explicit methods for heat and wave equations.	5
6	Explain the concept of various methods to solve nth order differential equations.	5

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	3										2			
CO2	2	2	1	1								2			
CO3	3	2										1			
CO4	2	2	2	2								2			
CO5	3	3										1			
CO6	2	3			1							2			

BASIC ELECTRICAL ENGINEERING
COURSE INFORMATION SHEET

PROGRAMME: B.Tech	
COURSE: Basic Electrical Engineering	SEMESTER: 2nd CREDITS: 05
COURSE CODE: BTEE-101-18	COURSE TYPE: Regular
COURSE AREA/ DOMAIN: Basic Electrical	CONTACT HOURS: L T P 3 1 2
CORRESPONDING LAB CODE: BTEE102-18	LAB COURSE NAME: Basic Electrical Engineering Laboratory

Course plan:

UNIT	DETAILS	HOURS
1	**Module 1: DC Circuits** Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton's Theorems. Time-domain analysis of first-order RL and RC circuits.	9
2	**Module 2: AC Circuits** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations series resonance. Parallel resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.	13
3	**Module 3: Electrical Machines** Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.	12
4	**Module 4: Electrical Installations** Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.	5
TOTAL HOURS		39

TEXT/ REFERENCE BOOKS:

T/R	BOOK TITLE/ AUTHORS/ PUBLICATION
T1	D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
T2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
R1	L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011
R2	E. Hughes, "Electrical and Electronics Technology", Pearson, 2010
R3	V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	S.K Sehdev by Unique Publisher
2	J.B gupta by S. Chand Publisher

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

Chalk & Talk
Small Group Instruction.
Making real world connections
Presentatons

RECOMMENDED NPTEL/ MOOCS/SWAYAM COURSES/ VIDEOS

https://www.coursera.org/learn/electric-power-systems (Electric Power System)
https://www.youtube.com/watch?v=U3CubKnkO4c (Transformer 3D Animation)
https://www.youtube.com/watch?v=DsVbaKZZOFQ (three phase induction motor working)
https://www.youtube.com/watch?v=tiKH48EMgKE&list=PLZY3yNTglIyWtOLxTl9ZlAK9zIgPK3H9d (working of alternator)
https://www.youtube.com/watch?v=gW45N2WpD64 (working of DC generator)
https://www.youtube.com/watch?v=QkbnOga09Vg (flip flops)

Web Source References:

1	https://nptel.ac.in/courses/108108076/ (1-39) (Covering Transformer, Machines, power factor etc.)

ADDITIONAL TOPICS:

Providing knowledge about generation, transmission, distribution
Providing additional knowledge on protection of electrical machines, drives and power system

COURSE OBJECTIVES:

Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
Provide working knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
To explain the working principle, construction, applications of DC machines, AC machines & the importance of transformers in transmission and distribution of electric power.
To Gain knowledge about the fundamentals of LT components of switchgear, wiring and earthing

COURSE OUTCOMES:

Course: BASIC ELECTRICAL ENGINEERING		
Course Code: BTEE-101-18		
	Course Outcomes	**BT Level**
1.	Understand & apply Kirchoff's laws, network theorems, time domain analysis for RL & RC series circuit.	2
2.	Understand and analyse phasor diagram and waveforms for purely resistive, purely inductive and purely capacitive as well as series and parallel R-L, R-C & R-L-C circuits and also circuit Resonance	3
3.	Understand concepts of Real, Reactive & apparent power and Power factor. Understand 3- phase supply and star and delta connection and their relationships. Power measurement by wattmeter	4
4.	Understand construction & working principle of 1- phase and 3- phase transformers. Understand Ideal and practical transformer and auto-transformer and its applications as well.	4
5.	Understand generation of rotating magnetic fields. Understand construction and working of 3-phase induction motor, 1-phase induction motor, DC motors& synchronous generators	5
6.	Understand LT Switchgear such as Switch Fuse Unit (SFU), MCB, ELCB, MCCB. Understand about wires, cables, earthing & its importance. Understand about types of batteries & its important Characteristics. Understand basic calculations for energy consumption & power factor improvement	5

CO MAPPING WITH PO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			1							2			
CO2	3	1			1							2		1	1
CO3	3	1			1							2			1
CO4	1		1									2			
CO5	2		1									1			
CO6	2		1			1						2			

COURSE INFORMATION SHEET
BASIC ELECTRICAL ENGINEERING LAB

List of experiments/demonstrations:

- Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

- Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.

- Transformers: Observation of the no-load current waveform on an oscilloscope (non-sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

- Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

- Demonstrate of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
- Torque Speed Characteristic of separately excited dc motor.

- Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.
- Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.

COURSE OUTCOMES:

BASIC OF ELECTRICAL ENGINEERING LAB		
Course Code:BTEE102-18		
	Course Outcomes	**BT Level**
1.	Apply KCL, KVL and ohms law to Simple circuits.	1
2.	Determine the self conducatnce of the coil	2
3.	Performing the operation & tests of transformer and rotating machines	3
4.	Analyse the differences in operation of different DC machine configurations.	4
5.	Experimentally verify the basic circuit theorems	5
6.	Measure power and power factor in ac circuits	6

CO MAPPING WITH PO:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1			1							1		1	1
CO2	2	1			1							1		1	
CO3	2	1			1							1			1
CO4	1		1									1	1	1	
CO5	1		1									1		1	1
CO6	2		1			1						1		1	

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- First-Hand Experience In Observation
- Making Real World Connections
- Implement Peer-Instruction.

ENGINEERING GRAPHICS AND DESIGN

COURSE INFORMATION SHEET

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ENGINEERING GRAPHICS AND DESIGN (THEORY & LAB)	**SEMESTER: 1 CREDITS: 3**
COURSECODE: BTME101-21 **REGULATION: 2021**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ENGINEERING DRAWING	**CONTACT HOURS: 1(L) + 5(P) hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION TO ENGINEERING DRAWING:** Principles of engineering drawing / engineering graphics / technical drawing and their significance –Drawing Instruments: their Standard and uses – symbols and conventions in drawing practice – lettering & numbering – BIS conventions. Types of lines and their uses, Drawing Sheets: sizes and layout, methods of folding drawing sheet, Grades of pencils used, Dimensioning: definition, types and methods of dimensioning, geometrical construction, concept of scales in drawing, types of scales, construction of plane and diagonal scales	**18**
II	**ORTHOGRAPHIC PROJECTIONS:** Relevance of projection, Types of projections, Principles of orthographic projections in reference to quadrants – conventions – first and third angle projections, illustration through simple problems of projection; Projections of points in quadrants. Projections and trace of a line with different possible orientations in a quadrant. Methods to find true length and inclination of a line with principal planes.	**12**
III	**PROJECTIONS OF PLANES AND SOLIDS:** Concept of plane and lamina, Projections of a lamina when; parallel to any reference plane, perpendicular to any reference plane, inclined to reference plane. Traces of planes. Definition of solid, types of solids – conventions-different possible orientations of solid in a quadrant. Projections of solid when; axis parallel to reference plane, perpendicular to reference plane, inclined to one and parallel to other reference plane, parallel to both horizontal and vertical planes.	**18**
IV	**ISOMETRIC PROJECTIONS:** Principles of Isometric Projections-Isometric Scale- Isometric Views or drawing- Conventions. Isometric drawing / projections of solids such as cube, prisms, pyramids, cylinder, and cone.	**12**
V	**Practice using Computer Aided Drafting (CAD) tools**: Hands on training on any CAD software to strengthen the understanding of the engineering drawing wherein the students will be introduced to a number of assignments as mentioned in the syllabus**.**	**12**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	Engineering Drawing- Basant Agarwal, TMH
2	D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi.
3	P.S Gill, "Engineering Drawing", S K Kataria and sons, 18th edition, 2017 reprint
4	Jolhe, Dhananjay (2006), Engineering Drawing: With an Introduction to CAD, Tata Mc Graw Hill, India.
5	N. D. Bhat (2006), Engineering Drawing, Charotar Publications, New Delhi.
6	Venugopal (2010), Engineering Drawing and Graphics, 2nd edition, New Age Publications, New Delhi
7	Trymbaka Murthy (2007), Computer Aided Engineering Drawing, I.K. International Publishers, New Delhi.
8	R.B. Choudary (2005), Engineering graphics with Auto CAD, Anuradha Publishers, New Delhi

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Harwinder Singh, Engineering Drawing and Computer Graphics , Dhanpat Rai Publishing Co.
2	R.K Dhawan, Text Book of Engineering Drawing, S Chand Publication.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

- Chalk & Talk
- Small Group Instruction.
- Making real world connections
- Presentatons

E- content used:

- https://archive.nptel.ac.in/courses/112/102/112102304/

ADDITIONAL TOPICS:

- Intersection of Surfaces/Solids
  - Purpose of intersection of surfaces, Intersection between the two cylinder, two prisms, prism and pyramid, pyramid and pyramid, cylinder and prism, cone and cylinder, sphere and cylinder etc., use of cutting plane and line method.
- Development of Surface
  - Purpose of development, Parallel line, radial line and triangulation method. Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, and development of surface of sphere.

COURSE OBJECTIVES:

1. To understand the basic principles of engineering drawing
2. To have the knowledge of generating the pictorial views

3. To understand the development of surfaces
4. Use CAD tools for making drawings of machine components and assemblies.
5. To have the knowledge of interpretation of dimensions of different quadrant projections.

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COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Prepare and understand drawings	B.L -1
CO2	Use the principles of orthographic projections.	B.L -3
CO3	By studying about projections of solids, students will be able to visualize three dimensional objects and that will enable them to design new products.	B.L-2 B.L -3
CO4	Design and fabricate surfaces of different shapes.	B.L- 6
CO5	Apply Computer-aided design (CAD) software to modeling of parts and assemblies, dimensions, and annotations to drawing.	B.L -3
CO6	Represent and create the objects in three dimensional appearances.	B.L -1 B.L -6

PROGRAME SPECIFIC OUTCOMES:

S.NO	DESCRIPTION
PSO1	Graduates will be able to specify structure and breakdown frameworks that productively create, transmit, appropriate and use electrical force.
PSO2	Graduates will be able to apply present day programming devices for plan, recreation and investigation of electrical frameworks to participate in long lasting learning and to effectively adjust in multi-disciplinary situations.
PSO3	Graduates will be able to generate, effective transmission and dissemination of electric power with unique reference to non-conventional and sustainable power source assets.

CO –PO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO3	-	3	3	3	-	-	-	-	-	-	-	3	1	1	-
CO4	-	-	2	-	-	-	-	-	-	2	-	-	-	-	1
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	1
CO6	-	-	-	-	3	-	-	-	-	-	-	3	-	-	1

3rd SEMESTER

INDEX

SCHEME: B.TECH 3rd SEMESTER

(ELECTRICAL ENGINEERING)

I.K. Gujral Punjab Technical University Revised Scheme for B.Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTEE301-18	Electrical Circuit Analysis	3-1-0	4	4
B	BTEE302-18	Analog Electronics	3-0-0	3	3
C	BTEE303-18	Electrical Machines – I	3-1-0	4	4
D	BTEE304-18	Electromagnetic Fields	3-1-0	4	4
E	BTEE305-18	Engineering Mechanics	0-0-2	2	1
F	BTEE311-18	Analog Electronics Laboratory	1-0-5	5	3
G	BTEE312-18	Electrical Machines – I Laboratory	0-0-2	2	0
H	BTMCXXX-18	Mandatory Course (BTMC-101-18 or BTMC 102-18)	3-0-0	3	S/US
I	BMPD301-18	Mentoring and Professional Development of Students	0-1-0	1	S/US

Total Credits = 19 Hours: 28

COURSE INFORMATION SHEET

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: B.TECH**
COURSE: ELECTRICAL CIRCUITANALYSIS	**SEMESTER : 3RD CREDITS: 3**
COURSE CODE: BTEE-301-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Network Analysis:** Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis. Concept of duality and dual networks. Solution of first and second order differential equations for series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.	14
II	**Electrical circuit and steady state analysis:** Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot convention in coupled circuits, Ideal Transformer. Analysis of electrical circuits using Laplace Transform for standard inputs, transformed network with initial conditions. Frequency response (magnitude and phase plots), series and parallel resonances.	14
III	**Network functions and two port network:** Driving point impedance and admittance, natural response of a network, transfer impedance and admittance, concept of pole and zeros in a network function, Routh Hurwitz criterion ofstability. Two Port Networks: terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks	10

IV	**<u>Network Synthesis and Filters:</u>** Network synthesis techniques for 2-terminal network, Foster and Cauer forms. Filters: Classification of filters, characteristics impedance and propagation constant of pure reactive network, ladder network, T-section, π-section, terminating half section, pass bands and stop bands, Design of constant-K, m-derived filters.	**10**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2	D. Roy Choudhury, "Networks and Systems", New Age International Publications,1998.
3	W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw HillEducation, 2013.
4	C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education,2004.
5	K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Mohan, Sudhakar Sham, Circuits & Network Analysis and Synthesis, Tata Mc Graw Hill.
2	Mahadevan, K. Chitra, " Electrical Circuit Analysis", Second Edition, PHI Learning Pvt.Ltd, 2018.
3	A. Anand Kumar, " Network Analysis And Synthesis", PHI Learning Pvt.Ltd, 2019.
4	Samarjit Gosh, "Network Theory Analysis & Synthesis", PHI Learning Pvt.Ltd, 2015.
5	Abhijit Chakrabarti, "Circuit Theory Analysis And Synthesis", Dhanpat Rai & Co.
6	Iyer T.S.K.V., Circuit Theory, Tata Mc Graw Hill, 2006.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://nptel.ac.in/courses/108/106/108106172/
2. https://www.aldeatdo.com/wp-content/uploads/2019/09/William_Hart_Hayt_Jack_E_Kemmerly_Steven_M_Durbz-lib.org_.pdf
3. https://nptel.ac.in/courses/108/105/108105159/
4. https://nptel.ac.in/courses/108/104/108104139/
5. L- http://nptel.ac.in/

Additional topics:

1. Tellegan's Theorem
2. Review of Laplace Transform

COURSE OBJECTIVES:

Electrical circuits are the integral elements of the power system. Analysis of response of electrical circuits for various inputs is the basic requirement to understand the behavior of the system. The responses for various inputs are in turn helpful to design, implement, operate and control a network effectively. This subject is intended to provide the basic insight into the theory and problems related to electrical circuit analysis.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEE101-18	Basic Electrical Engineering	Fundamental knowledge of Electrical circuits.
BTAM206-18	Basic Mathematics-II	Knowledge to apply integral transforms to solve the mathematical models.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand and express the basic circuit elements, energy sources and fundamentals of electric networks.	1
CO2	Solve the complex electrical circuits using different methods and theorems.	6
CO3	Develop various methodology/ strategies through various domain of analysis to evaluate performance characteristics of electrical networks and analyse their operation.	6
CO4	Analyse the transient and steady-state response of electrical circuits.	4
CO5	Relate the different input and output parameters of two port networks and can realize the networks using admittance and impedance properties.	3
CO6	Design different types of filters and their applications.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	_	_	_	_	1	1	_	_	2	_	1
CO2	3	3	3	2	1	1	1	_	1	1	1	2	1	2	1
CO3	3	3	3	2	2	1	1	_	2	2	1	2	2	2	1
CO4	3	3	2	1	1	1	1	_	2	2	1	2	1	2	1
CO5	3	3	2	1	_	_	1	_	1	1	1	1	1	1	1
CO6	3	3	2	2	1	1	1	1	2	2	2	2	2	2	1

Prepared by

Approved By

HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ANALOG ELECTRONICS	**SEMESTER : 3RD CREDITS: 3**
COURSE CODE: BTEE-302-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRONICS	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-311-18	**LAB COURSE NAME: ANALOG ELECTRONICS LABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Diode and BJT circuits:** P-N junction diode, *V-I* characteristics of a diode; review of half-wave and full-wave rectifiers,Zener diodes, clamping and clipping circuits. **BJT circuits:** Structure and *V-I* characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base andcommon-collector amplifiers.	12
II	**MOSFET circuits:** MOSFET structure and *V-I* characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans- conductance, high frequency equivalent circuit.	10
III	**Differential, multi-stage and operational amplifiers** Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structureof an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth produce.	10
IV	**Linear applications of op-amp** Idealized analysis of op-amp circuits. Specifications. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, voltage regulator, Oscillators: Principle of operation, Wien's bridge and phase shift oscillator.	10

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	A. S. Sedra & K. C. Smith, "Microelectronic Circuits", New York, Oxford UniversityPress, 1998.
2	J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
3	J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
4	P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
5	P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog IntegratedCircuits", John Wiley & Sons, 2001.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Electronic devices and integrated circuit- BP Singh and Rekha Singh, Pearson.
2	Electronic Devices and Circuits, S.Salivahanan,N.Suresh kumar, McGraw Hill.
3	Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.
4	I.J Nagarath, "Electronics Analog & Digital', PHI Privated Limted, Delhi, 2013.
5	Electronic Devices and Circuits,Balbir kumar ,shail b.jain, PHI Privated Limted, Delhi.
6	Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. Integrated Electronics: Analog and Digital circuits and systems by Jacob Milliman and Christos C Halkias http://www.introni.it/pdf/Millman%20Halkias%20-%20Integrated%20Electronics.pdf
2. Principles of Analog Electronics by Giovanni Saggio https://books.google.co.in/books?id=eosAAgAACAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
3. Analog Electronics by Hayrettin Köymen http://www.electronics.teipir.gr/personalpages/papageorgas/download/2/shmeiwseis/ELECTRONIC_COMPONENTS/varistor/Analog_Electronics.pdf
4. Analog Electronics Raymond E. Frey Physics Department University of Oregon https://pages.uoregon.edu/rayfrey/AnalogNotes.pdf
5. Foundations of Analog and Digital Electronic Circuits anantagarwal and jeffrey h. lang https://neurophysics.ucsd.edu/courses/physics_120/Agarwal%20and%20Lang%20(2005)%20Foundations%20of%20Analog%20and%20Digital.pdf

Additional topics:

1. Voltage Multipliers
2. Regulated Power Supply
3. Feedback Amplifiers
4. Different types of Oscillators

COURSE OBJECTIVES:

This course is intended to develop an understanding of small signal amplifier design using linear transistor models; and its analysis at low and high frequencies, including different feedback topologies and oscillators.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTPH104-18	Semiconductor Physics	The fundamental principles and properties of electronic materials and semiconductors
BTEE101-18	Basic Electrical Engineering	Fundamental knowledge of Electrical circuits.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the characteristics of transistors and diodes and choose proper semiconductor devices depending upon the application considering economic and technology up-gradation.	1
CO2	Employ mathematical and graphical analysis considering different practical issues modeling of semiconductor device and analyse the performance parameter of the system.	3
CO3	Design amplifier circuits using BJT's and FET's and observe the amplitude and frequency responses of common amplifier circuits.	6
CO4	Analyse the effect of negative feedback on different parameters of an amplifier and the different types of negative feedback topologies.	4
CO5	Analyse the effect of positive feedback and able to design different Oscillators using transistor's based on the given applications.	4
CO6	Develop the skill to build and troubleshoot Analog circuits.	6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	_	1	1	_	1	1	1	1	1	1	1
CO2	3	3	2	1	_	_	_	_	1	1	1	2	_	2	_
CO3	3	3	2	1	1	1	1	_	1	1	1	2	2	2	_
CO4	3	3	2	1	_	_	_	_	1	1	1	2	2	2	_
CO5	3	3	2	1	_	1	1	_	1	1	1	2	2	2	_
CO6	3	3	2	1	1	1	1	1	1	1	1	2	2	2	_

CO MAPPING WITH PO

Prepared by

Approved By

HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ELECTRICAL MACHINES-I	**SEMESTER : 3RD CREDITS: 3**
COURSE CODE: BTEE-303-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-312-18	**LAB COURSE NAME: ELECTRICAL MACHINES – I LABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Magnetic fields and magnetic circuits** Review of magnetic circuits - MMF, flux, reluctance, inductance; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.	06
II	**DC machines** Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commentator, lap and wave windings, construction of commentator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.	12
III	**DC machine - motoring and generation** Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. *V-I* characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines	12
IV	**Transformers:** Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency, Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses, Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.	12

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2	A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3	M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4	P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	B.L.Theraja & A.K.Theraja, "A Text Book of Electrical Technology", Volume I, S. Chand & Company Ltd.
2	D.P.Kothari, I.J. Nagarath, "Electric Machines" , Tata McGraw Hill Education, 2010
3	A.K. Sahdev, " Electrical Machines", Cambridge University Press, 2018.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://nptel.ac.in/courses/108106071/
2. https://drive.google.com/file/d/0B_jwSWRUH7bwbV83ZVpOd3dvdjA/view
3. https://drive.google.com/file/d/0B_jwSWRUH7bwZGxaREwyTWVzN1k/view
4. https://drive.google.com/file/d/0B_jwSWRUH7bwLUVRNk40X040RjQ/view
5. https://drive.google.com/file/d/0B_jwSWRUH7bwR0xHMFRKelRTZGs/view
6. https://nptel.ac.in/courses/108105017/2
7. https://nptel.ac.in/courses/108105017/4
8. https://nptel.ac.in/courses/108105017/10
9. https://nptel.ac.in/courses/108105017/11
10. https://nptel.ac.in/courses/108105017/17
11. https://nptel.ac.in/courses/108105017/21
12. https://nptel.ac.in/courses/108105017/24
13. https://nptel.ac.in/courses/108/105/108105155/
14. https://nptel.ac.in/courses/108/102/108102146/
15. https://nptel.ac.in/courses/108/105/108105155/
16. https://nptel.ac.in/courses/108/105/108105017/
17. https://nptel.ac.in/courses/108/106/108106071/

Additional topics:

1. Review of starters
2. Different types of Breaking

COURSE OBJECTIVES:

1. To understand the concepts of D.C machines & transformers.
2. To introduce different techniques of speed control of DC machines.
3. To study different types of testing methods.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEE101-18	Basic Electrical Engineering	The basic knowledge magnetic circuits and the working of electrical machines.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the fundamental principles and classification of electromagnetic machines.	1
CO2	Explain the constructional features of DC Generators, DC Motors and Transformers	2
CO3	Analyse the differences in operation of different DC machine configurations.	4
CO4	Analyse different types of transformer connections and its applications.	4
CO5	Identify, formulate and solve problems related to transformers and dc machines.	2,6
CO6	Conduct different methods of testing and assess the performance of different types of electrical machines.	5

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	_	_	1	1	_	1	1	1	1	1	1	1
CO2	3	2	2	1		1	1	_	1	1	1	1	1	2	2
CO3	3	2	2	1	1	1	1	_	1	1	1	2	2	2	1
CO4	3	2	2	1		1	1	_	1	1	1	2	2	2	1
CO5	3	3	2	1		1	1	_	1	1	1	2	2	2	2
CO6	3	3	2	2	1	1	1	1	1	1	1	2	2	2	1

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HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ELECTROMAGNETIC FIELDS	**SEMESTER : 3RD CREDITS: 4**
COURSE CODE: BTEE-304-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRICAL	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Review of Vector Calculus** Vector algebra-addition, subtraction, components of vectors, scalar and vector multiplications, triple products, three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus- differentiation, partial differentiation, integration, vector operator, del, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another.	08
II	**Static Electric Field** Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density. Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.	15
III	**Magnetic Forces, and Inductance** Biot-Savart's law, Ampere's law of force, Ampere's circuital law, Faraday's law, Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, calculations of inductances and mutual inductances for a solenoid and toroid.	10
IV	**Maxwell's Equations in Time Varying Fields and Wave theory** Concept of displacement current and conduction current, Maxwell's equation-differential and integral form, Poynting's theorem, its significance and Poynting's vector, Boundary Conditions. Wave theory: Derivation of wave equation, uniform plane waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane waves in free space and in a homogenous material. Attenuation, phase and propagation constant, intrinsic impedance, Relation between E & H, wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors, Skin effect.	15

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014
2	A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, NewDelhi, 2009.
3	A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
4	G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954
5	W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
6	W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
7	E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press,1966.
8	B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.
9	W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	S.P. Ghosh, Lipika Datta, " Electomagnetic Field Theory", Tata Mc-Graw Hill Publications
2	Saroj K. Dash, Smruti R. Khuntia, " Fundamentals of Electromagnetic Theory", Second Edition, PHI Learning Pvt. Ltd., 2011.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. **Engineering Electromagnetics Sixth Edition William H. Hayt, Jr. John A. Buck** http://alumni.media.mit.edu/~aggelos/papers/EM_Hayt_6th.pdf
2. https://nptel.ac.in/courses/108/104/108104087/
3. https://nptel.ac.in/courses/108/106/108106073/
4. https://nptel.ac.in/courses/108106073/10
5. https://nptel.ac.in/courses/108106073/39
6. https://nptel.ac.in/courses/108106073/16

Additional topics:

1. Method of images and its applications.

COURSE OBJECTIVES:

1. To provide the knowledge about the time varying fields and Maxwell's equations.
2. To provide knowledge about the propagation of electromagnetic wave along different mediums.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTPH103-18	Electromagnetism	The basic knowledge of Maxwell equation and electromagnetic field theory and propagation and reception of electro-magnetic wave systems.
BTAM106-18	Mathematics-I	Knowledge to solve the vector based problems.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Discuss the basic laws of electromagnetism and mathematical concept related to electromagnetic fields.	2
CO2	Analyse the electric and magnetic fields for simple configurations under static and dynamic conditions.	4
CO3	Apply the principles of electrostatics to solve the problems relating to electric field and electric potential, boundary conditions and electric energy density.	3
CO4	Apply the principles of magneto-statics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic density.	3
CO5	Apply Maxwell's equations to the solution of problems relating to transmission lines and uniform plane wave propagation.	3
CO6	Identify, formulates and solves engineering problems related to electromagnetic fields.	1, 6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	_	_	_	_	_	1	1	1	1	1	1	1
CO2	3	2	2	1		_	_	_	1	1	1	1	1	1	1
CO3	3	3	2	1	1	_	_	_	1	1	1	2	1	2	1
CO4	3	3	2	1	1	_	_	_	1	1	1	2	1	2	1
CO5	3	3	2	1		1	1	_	1	1	1	2	2	2	2
CO6	3	3	2	2	1	1	1	1	1	1	1	2	2	2	1

Prepared by

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HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ENGINEERING MECHANICS	**SEMESTER : 3RD CREDITS: 4**
COURSE CODE: BTEE-305-18 **REGULATION: 2018**	**COURSE TYPE:**
COURSE AREA/DOMAIN:	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE :	**LAB COURSE NAME:**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to vectors and tensors and co-ordinate systems:** Introduction to vectors and tensors and coordinate systems; Vector and tensor algebra; Indicalnotation; Symmetric and anti-symmetric tensors; Eigen values and Principal axes.	05
II	**Three-dimensional Rotation:** Three-dimensional rotation: Euler's theorem, Axis-angle formulation and Euler angles; Coordinate transformation of vectors and tensors.	04
III	**Kinematics of Rigid Body :** Kinematics of rigid bodies: Dentition and motion of a rigid body; Rigid bodies as coordinate systems; Angular velocity of a rigid body, and its rate of change; Distinction between two and three-dimensional rotational motion; Integration of angular velocity to find orientation; Motion relative to a rotating rigid body: Five term acceleration formula.	06

IV	**Kinetics of Rigid Bodies:** Kinetics of rigid bodies: Angular momentum about a point; Inertia tensor: Dentition and computation, Principal moments and axes of inertia, Parallel and perpendicular axes theorems; Mass moment of inertia of symmetrical bodies, cylinder, sphere, cone etc., Area moment of inertia and Polar moment of inertia, Forces and moments; Newton-Euler's laws ofrigid body motion.	**05**
V	**Free Body Diagram:** Free body diagrams; Examples on modeling of typical supports and joints and discussion onthe kinematic and kinetic constraints that they impose.	**01**
VI	**General Motion:** Examples and problems. General planar motions. General 3-D motions. Free precession, Gyroscopes, Rolling coin.	**09**
VII	**Bending Moment :** Transverse loading on beams, shear force and bending moment in beams, analysis of cantilevers, simply supported beams and overhanging beams, relationships between loading,shear force and bending moment, shear force and bending moment diagrams.	**05**
VIII	**Torsional Motion:** Torsion of circular shafts, derivation of torsion equation, stress and deformation in circular and hollow shafts.	**02**
IX	**Friction :** Concept of Friction; Laws of Coulomb friction; Angle of Reponse; Coefficient of friction	**03**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	J. L. Meriam and L. G. Kraige, "Engineering Mechanics: Dynamics", Wiley, 2011.
2	M. F. Beatty, "Principles of Engineering Mechanics", Springer Science & BusinessMedia, 1986.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	A.K.Tayal, "Engineering Mechanics", Uma Publications, 14th Edition, 2013.
2	R. K. Bansal "Engineering Mechanics", Laxmi Publication, 8thEdition, 2013.
3	S.Bhavikatti,"ATextBookofEngineeringMechanics",NewAgeInternational,1st Edition,2012.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

https://youtu.be/pYozjv2UqtQ
https://www.youtube.com/channel/UC-FzwMo234RssLkwVbRG1ww
https://youtu.be/Fn9_evbFykY
https://youtu.be/IbhVp9vDJtQ

Additional topics:

Momentum and Force Systems
Kinematics of Particles
Virtual Work
Center of Gravity and Moment of Inertia

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
1	Demonstrate and understanding the concepts of co-ordinate systems	B.L -1 B.L -4
2	Classify and analyze the three-dimensional rotation.	B.L -1 B.L -4
3	Demonstration of the kinematics of rigid bodies.	B.L-2
4	Discover the knowledge of torsional motion and bending moment.	B.L -1 B.L -4
5	To understand the principles of Coulomb (dry) friction.	B.L. -1 B.L. -6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	1	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	1	-	-	1	-	-	1	1	-	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	1	-	1		1					2	-	-
CO5	2	-	-	-	-	-	-	-	1	-	-	1	-	-
CO6	1	-	-	-	-	-	-	-	-	-	-	1	-	-

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HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ANALOG ELECTRONICS LABORATORY	**SEMESTER : 3RD CREDITS: 1**
COURSE CODE: BTEE-311-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRONICS	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	To draw *V-I* characteristics of a PN junction diode (Ge, Si, switching and signal).
2.	To design half wave rectifier.
3.	To design full wave and bridge rectifiers.
4.	To study the transistor characteristics in common base, common collector, and commonemitter configurations.
5.	To study the *V-I* characteristics of a MOSFET.
6.	To design a voltage regulator IC using zener diode and also see the effect of line andload regulation
7.	To design various clippers and clampers using diodes.
8.	To obtain the frequency response of an amplifier and calculate the gain bandwidth ofthe amplifier.
9.	To investigate the emitter follower (Buffer) amplifier and determine A_V,R_i, and R_O
10.	To design and study various type of oscillators, and determine frequency of oscillations.
11.	To design a transistor series voltage regulator with current limits and observe its current feedback characteristics.
12.	To study the characteristics of a complementary symmetry amplifier.
13.	To study the application of an Op-Amp (741) as inverting and non-inverting amplifier.
14.	To use the OP-AMP as summing, scaling and averaging amplifier.
15.	Design differentiator and integrator using OP-AMP and also determine the timeconstant and cut-off frequency.

Manual Avalilable in Lab

Basic Electronics Lab (http://vlabs.iitkgp.ac.in/be/)

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the use and importance of various types of equipments used in the laboratory.	1
CO2	Construct simple electrical circuits on bread-board and analyse their characteristics for different applications.	6
CO3	Measure various parameters to understand circuit behavior and performance under different conditions.	5
CO4	Analyse and solve the varieties of problems and issues coming up in electrical circuit design.	4
CO5	Evaluate the performance of electronic circuits and working small projects employing semiconductor devices.	5
CO6	Design and create electronic circuit meant for different applications.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	_	_	_	_	_	_	_	1	1	1	1	1	1	1
CO2	3	2	2	_	_	1	1	_	1	1	1	1	2	2	2
CO3	3	2	1	1	_	1	1	_	2	2	1	1	1	2	2
CO4	3	3	3	2	2	2	2	1	2	2	2	2	2	2	2
CO5	3	3	3	2	2	2	2	1	2	2	2	2	2	2	2
CO6	3	3	3	2	2	2	2	1	2	2	2	2	2	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ELECTRICAL MACHINES – I LABORATORY	**SEMESTER : 3RD**
COURSE CODE: BTEE-312-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: ELECTRICAL	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	To perform the load test on a single phase transformer
2.	To perform open circuit and short circuit tests on a single phase transformer and hencedraw the equivalent circuit, calculate the voltage regulation and efficiency.
3.	To find the efficiency and voltage regulation of single phase transformer underdifferent loading conditions.
4.	To perform parallel operation of two single phase transformers.
5.	To study the various connections of a three phase transformer.
6.	To perform Scott connections on three phase transformer to get two phase supply.
7.	To study the constructional details of DC machine and to draw sketches of differentcomponents.
8.	To measure armature and field resistance of DC shunt generator and to obtain its opencircuit characteristics.
9.	To obtain load characteristics of DC shunt/series/compound generator.

10.	To study the three point and four point DC motor starters.
11.	To perform Swinburne's test (no load test) to determine various losses of DC shuntmotor.
12.	To visualize the magnetic fields produced by a bar magnet and a current carrying coilusing FEMM/ ANSYS Maxwell.
13.	To visualize the magnetic field produced in an electrical machine using FEMM/ANSYS Maxwell.

Manual Avalilable in Lab

Electrical Machines Virtual Lab (http://em-coep.vlabs.ac.in/), (http://vem-iitg.vlabs.ac.in/)

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the various components and their functions of DC machines.	1
CO2	Perform load and no load tests on single phase transformer and to determine efficiency and voltage regulation.	3
CO3	Determine the performance characteristics of various dc machines.	3
CO4	Analyze the various connections of three phase transformers.	4
CO5	Identify, formulate and solve problems related to transformers and dc machines.	1, 6
CO6	Identify a suitable machine for real time application.	1

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	_	_	_	_	_	_	_	1	1	1	1	1	1	1
CO2	3	2	2	2	_	1	1	_	1	1	1	1	2	2	2
CO3	3	2	1	1	_	1	1	_	2	2	1	1	2	2	2
CO4	3	2	1	1	_	1	1	_	2	2	1	2	2	2	2
CO5	3	3	3	2	_	2	2	_	2	2	2	2	2	2	2
CO6	3	1	_	_	_	2	2	1	2	2	2	2	2	2	2

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INDEX

SCHEME: B.TECH 4TH SEMESTER

(ELECTRICAL ENGINEERING)

I.K. Gujral Punjab Technical University Revised Scheme for B.Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTEE-401-18	Digital Electronics	3-0-0	3	3
B	BTEE402-18	Electrical Machines – II	3-0-0	3	3
C	BTEE403-18	Power Electronics	3-0-0	3	3
D	BTEE404-18	Signals and Systems	3-0-0	3	3
E	BTAM-302-18	Mathematics-III (Probability & Statistics)	3-1-0	4	4
F	BTEE-411-18	Measurements and Instrumentation Lab.	2-0-2	4	3
G	BTEE-412-18	Digital Electronics Laboratory	0-0-2	2	1
H	BTEE-413-18	Electrical Machines – II Laboratory	0-0-2	2	1
I	BTEE-414-18	Power Electronics Laboratory	0-0-2	2	1
J	BTMC-XXX-18	Mandatory Course (BTMC-101-18 or BTMC 102-18)	3-0-0	3	S/US
K	BMPD-401-18	Mentoring and Professional Development of Students	0-1-0	1	S/US

Total Credits = 22 Hours: 30

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: DIGITAL ELECTRONICS	**SEMESTER : 4TH CREDITS: 3**
COURSE CODE: BTEE-401-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRONICS	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-412-18	**LAB COURSE NAME: DIGITAL ELECTRONICSLABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Fundamentals of Digital Systems and logic families:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.	10
II	**Combinational Digital Circuits:** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.	10

III	**Sequential circuits and systems:** A 1-bit memory, the circuit properties of Bi-stable latch, the clocked SR flip flop, J- K-T and D- types flipflops, applications of flipflops, shift registers, applications of shift registers, serial o parallel converter, parallel to serial converter, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	**12**
IV	**A/D and D/A Converters:** Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit ,analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using Voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs, concept of memories.	**10**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2	M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3	A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	B. Somnathan Nair, "Digital Electronics & Logic Design", Prentice Hall India, 2006

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. Digital electronics by Atul P. Godse& Deepali A. Godse https://books.google.co.in/books?id=bftp5ZG8v5kC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
2. Digital electronics by D. K. Kaushik https://www.researchgate.net/publication/264005171_Digital_Electronics

3. https://nptel.ac.in/courses/117103064/11
4. https://nptel.ac.in/courses/108105113/1
5. https://nptel.ac.in/courses/108105113/26
6. https://nptel.ac.in/courses/108105113/31
7. https://nptel.ac.in/courses/108105113/32
8. https://nptel.ac.in/courses/108/105/108105113/
9. http://nptel.ac.in/courses/117105080/1
10. http://nptel.ac.in/courses/117105080/2
11. http://nptel.ac.in/courses/117105080/5

Additional topics:

1. Number System

COURSE OBJECTIVES:

1. To provide knowledge about basics of digital electronics.
2. To impart knowledge about designing of digital circuits.
3. Students will use schematics and symbolic algebra to represent digital gates in the creation of solutions to design problems.

COURSE PRE-REQUISITES: NIL

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Know the fundamental concepts and techniques to create logic gates in order to perform Boolean logic.	1
CO2	Understand the characteristics of digital IC's and digital logic families.	1
CO3	Design and implement various Combinational logic circuits using various mappings and mathematical methods.	6
CO4	Design and implement various Sequential logic circuits using various mappings and mathematical methods.	6
CO5	Apply the knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.	3

CO6	Identify and prevent various hazards and timing problems in a digital design within the realm of economic, performance, efficiency, user friendly and environmental constraints.	2

CO MAPPING WITH PO

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1		_	_	_	1	1	1	1	1	1	_
CO2	3	2	1	1		_	_	_	1	1	1	1	1	1	_
CO3	3	3	2	1	1	1	1	_	1	1	1	2	2	2	_
CO4	3	3	2	1	1	1	1	_	1	1	1	2	2	2	_
CO5	3	3	2	1	_	1	1	_	1	1	1	2	2	2	_
CO6	3	3	2	1	1	1	1	1	1	1	1	2	2	2	_

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ELECTRICAL MACHINES – II	**SEMESTER : 4TH CREDITS: 3**
COURSE CODE:BTEE-402-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-412-18	**LAB COURSE NAME: ELECTRICAL MACHINES – IILABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Fundamentals of AC machine windings:** Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding - concentrated and distributed, Sinusoidally distributed winding, winding distribution factor	08
II	**Pulsating and revolving magnetic fields:** Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.	10
III	**Induction Machines:** Concept of rotating magnetic field, Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and maximum torque, power flow diagram, Equivalent circuit. Phasor diagram, Losses and efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, brakingand speed control for induction motors. Generator operation. Self-excitation. Doubly-fed induction machines. Single phase induction motors: Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and	12

	applications	
IV	**Synchronous machines:** Constructional features, cylindrical rotor and salient pole synchronous machine - generated EMF, coil span and distribution factor, equivalent circuit and phasor diagram, armature reaction at different power factor loads, voltage regulation by synchronous impedance and zero power factor method, concept of short circuit ratio, Operating characteristics of synchronous machines, V- curves and inverter-V curves. Hunting. Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.	**10**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2	M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3	P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4	I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5	A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6	P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons,2007.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	B.L.Theraja & A.K.Theraja, "A Text Book of Electrical Technology", Volume II, S. Chand & Company Ltd.
2	D.P.Kothari, I.J. Nagarath, "Electric Machines" , Tata McGraw Hill Education, 2010
3	A.K. Sahdev, " Electrical Machines", Cambridge University Press, 2018.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://gndec.ac.in/~librarian/web%20courses/IIT-MADRAS/Elec_Mach2/SynchronousMachines.pdf
2. https://nptel.ac.in/courses/108106072/
3. https://digital-library.theiet.org/content/books
4. https://nptel.ac.in/courses/108/102/108102146/
5. https://nptel.ac.in/courses/108/106/108106072/
6. https://www.youtube.com/watch?v=fbwZkhaF0dk
7. https://www.youtube.com/watch?v=RX5Xj1keQIc&list=PLPpCFgQP7QKFrkYIYaZt0idq7ocZq9AYU

Additional topics:

1. Circle Diagram

COURSE OBJECTIVES:

1. To impart knowledge of the constructional features and principle of operation of three-phase and single-phase machines.
2. To impart knowledge about methods of starting and speed control of induction motors.

COURSE PRE-REQUISITES:

The fundamental knowledge of Engineering Physics, Mathematics

The fundamental knowledge of Electromagnetic field theory, fundamental of machine operation

Information about different magnetic materials, insulation, etc.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Identify different types of armature windings and winding factors for calculating induced EMF.	1
CO2	Relate spatially displaced armature windings for the generation of various magnetic fields in AC machines.	2
CO3	Know the construction and principle of operation of different kinds of rotating AC machines	1
CO4	Analyse theoretically, the performance characteristics for different electrical machines and obtain simple equivalent circuit for the machine.	4
CO5	Explain the double revolving, cross field theory for working of the single phase induction motor.	4
CO6	Interpret parallel operation of alternators and determine various sequence reactance of synchronous machines.	3

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	_	_	_	_	1	1	_	1	1	1	1
CO2	3	2	1	1	_	1	1	_	1	1	_	2	2	2	2
CO3	3	2	1	1	_	1	1	_	1	1	1	2	2	2	2
CO4	3	2	1	1	_	1	1	_	1	1	1	2	2	2	2
CO5	3	2	1	1	_	_	_	_	1	1	_	2	2	2	2
CO6	3	2	2	1	_	1	1	_	1	1	1	2	2	2	2

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER ELECTRONICS	**SEMESTER : 4 TH CREDITS: 3**
COURSE CODE: BTEE-403-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-414-	**LAB COURSE NAME: POWER**

18	**ELECTRONICS LABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Power switching devices:** Diode, Thyristor, MOSFET, IGBT: *V-I* characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET and IGBT.	**08**
II	**Thyristor rectifiers:** Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R- load and highly inductive load; Input current wave shape and power factor.	**10**
III	**DC-DC buck converter:** Elementary chopper with an active switch and diode, concepts of duty ratio and average Voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage. DC-DC boost converter: Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.	**12**
IV	**Single-phase voltage source inverter (12 Hours)** Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage. Three-phase voltage source inverter: Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltagesover a sub-cycle, three-phase sinusoidal modulation	**12**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India, 2009.
2	N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.
3	R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007.
4.	L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
5.	P. S. Bimbhra, Power Electronics”, Khanna Publisher

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.
2	, " Principles of Electronics", S. Chand Publications,

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. Power Electronics Handbook By Muhammad H. Rashid http://site.iugaza.edu.ps/malramlawi/files/RASHID_Power_Electronics_Handbook.pdf
2. Power Electronics Principles & applications by Joseph vithayathil https://books.google.co.in/books?id=LX5GKpQz2CgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
3. https://in.mathworks.com/help/physmod/sps/ug/simpowersystems-blocklibraries.html?requestedDomain=true
4. http://digital-library.theiet.org/content/journals/iet-pel
5. http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?reload=true&punumber=63
6. https://nptel.ac.in/courses/108105066/4
7. https://nptel.ac.in/courses/108105066/5
8. https://nptel.ac.in/courses/108108077/
9. https://nptel.ac.in/courses/108101038/
10. https://nptel.ac.in/courses/108/102/108102145/
11. https://nptel.ac.in/courses/108/105/108105066/

Additional topics:
BUCK-BOOST Chopper

COURSE OBJECTIVES:

1. To make the students aware about the power electronic devices and construction, operation and characteristics of most popular member of thyristor family i.e. SCR.
2. To acquaint them with basic concepts of operation of different types of convertors.
3. To impart knowledge about application of converters to motor drives.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTPH104-18	Semiconductor Physics	The fundamental principles and properties of electronic materials and semiconductors
BTEE101-18	Basic Electrical Engineering	Fundamental knowledge of Electrical circuits.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the implementation of power switches graphically and mathematically.	1
CO2	Design different types of phase-controlled single phase and three phase converters along with necessary protective circuits for application in different domains of engineering	6
CO3	Discuss the operation, function and interaction between various components and subsystems used in choppers.	2
CO4	Discuss the operation, function and interaction between various components and subsystems used in single phase and three phase voltage Inverters.	2
CO5	Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.	4, 6
CO6	Recognize the role power electronics play in the improvement of energy usage efficiency and the applications of power electronics in emerging areas.	1

CO WITH PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	_	_	_	_	_	1	1	_	_	1	1	1
CO2	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2
CO3	3	2	2	2	_	1	1		1	1	1	2	2	2	2
CO4	3	2	2	2	_	1	1		1	1	1	2	2	2	2
CO5	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO6	3	2	_	_	_	1	1	_	1	1	_	_	1	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: SIGNALS AND SYSTEMS	**SEMESTER : 4 TH CREDITS: 3**
COURSE CODE: BTEE-404-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: ELECTRICAL & ELECTRONICS ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Signals and Systems:** Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Somespecial signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift- invariance, causality, stability, realizability. Examples.	12
II	**Behavior of continuous and discrete-time LTI systems:** Impulse response and step response, convolution, input-output behavior with periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State- space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequencyresponse and its relation to the impulse response.	12

III	**Fourier, Laplace and z- Transforms:** Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zerosof system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, polesand zeros of systems and sequences, z-domain analysis.	**10**
IV	**Sampling and Reconstruction**: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	**08**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	V. Oppenheim, A.S. Willsky & S.H. Nawab, "Signals and systems", Prentice Hall, 1997.
2	G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, andApplications", Pearson, 2006.
3	P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4.	S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
5.	A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", PrenticeHall,2009.
6	M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007
7	P. Lathi, "Linear Systems and Signals", Oxford University Press, 2009.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	S. Salivahanan, A. Vallavaraj, C. Ganapriya, "Digital Signal Processing", Tata McGraw-Hill Education,2007.
2	A. Nagoor Kani, "Signals & Systems", Tata McGraw Hill Education,2020.
3	A. Anand Kumar. "Signals & Systems", PHI Learning Private Limited.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**

4. **Class test and Quiz**

E- content:

1. Signals and Systems by Richard Baraniuk http://www.eng.ucy.ac.cy/cpitris/courses/ece623/notes/SignalsAndSystems.pdf
2. **Signals and Systems by** Alan V. Oppenheim, S. Hamid Nawab https://web.itu.edu.tr/hulyayalcin/Signal_Processing_Books/Oppenheim_Signals_and_Systems.pdf
3. **Review of Signal and system by S. C. Dutta Roy, EE Deptt IIT Delhi** https://nptel.ac.in/courses/108102042/
4. http://nptel.ac.in/courses/117106114/
5. https://www.tutorialspoint.com/signals_and_systems
6. https://nptel.ac.in/courses/108/101/108101174/
7. https://nptel.ac.in/courses/108/106/108106163/
8. https://nptel.ac.in/courses/108/104/108104100/

Additional topics:
Review of Laplace Transform

COURSE OBJECTIVES:

This course trains students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing (including audio, image and video processing), communication theory, and system theory, control and robotics.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEE101-18	Basic Electrical Engineering	Fundamental knowledge of Electrical circuits.
BTAM206-18	Basic Mathematics-II	Knowledge to apply integral transforms to solve the mathematical models.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand mathematical description and representation of continuous and discrete time signals and systems.	1
CO2	Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.	6
CO3	Develop and analyze state space models of LTI systems.	4, 6
CO4	Analyse the continuous and discrete time signals and system using different transform domain techniques.	4
CO5	Conceptualize the effect of sampling a continuous time signal.	3

CO6	Explain the different applications of Signals and systems.	4

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: Mathematics-III (Probability and Statistics)	**SEMESTER:4 CREDITS: 4**
COURSE CODE: BTAM302-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: Mathematics-III (Probability and Statistics)	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS
I	Measures of Central tendency: Moments, skewness and Kurtosis, Variance, Probability, conditional probability, Discrete and Continuous random variables, Expectations of Discrete and Continuous random variables.	10
II	Probability distributions: Binomial, Poisson and normal , Poisson approximation to the binomial distribution, evaluation of statistical parameters for these three distribution, Bivariatedistributions and their properties.	10
III	Correlation and regression for bivariate data, Rank correlation, Curve fitting by the method of least square, fitting of straight lines , second degree parabolas and more general curve.	10
IV	Test of significances: Sampling and standard error, Tests of significance for large samples and small samples (t-distribution, F-distribution), Chi-square test for goodness of fit and independence of attributes.	10

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	S.P. Gupta, Statistical Methods, Sultan Chand & Sons, 33^{rd} Edition, 2005.
2	S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand& sons, 2014.
3	S. Ross, A First Course in Probability, 6^{th} Edition, Pearons Education India, 2002.
4.	N.P Bali and Mukesh Goyal, A text book of Engineering Mathematics , LaxmiPublications, Reprint, 2010.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Robert V. Hogg, Joseph W. Mekean and Allen T. Craig, Introduction to MathematicsStatistics,7^{th} Edition, Pearsons, 2012.
2	Probability and Statistics: By Morris H. De Groot

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. Lecture and discussion/ questioning

2.Seminars and presentation

3.Assignments

4.Class test and Quiz

E- content:

1 https://youtu.be/pkpe4aMGRg8
2 https://youtu.be/L0zWnBrjhng

Additional topics:

Approaches of probability.
Basics of correlation and regression.
Basics of Expectation and variance

COURSE OBJECTIVES:

The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTPH-104-18	**Higher secondary Education**	**Mathematical course on differential equations**

COURSE OUTCOMES:

S.NO	DESCRIPTION	B.T. Level
CO1	Understand basics knowledge of measure of central tendency, skewness, kurtosis and moments and their applications in engineering fields.	B.L -2 B.L -4
CO2	Interpret the student with expectations of discrete and continuous random variable..	B.L -2 B.L -3
CO3	Develop probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation..	B.L-3 B.L-4
CO4	Outline basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering.	B.L -2 B.L- 5
CO5	Construct To fit the given data into curves by various methods which forms an important application in engineering ..	B.L -2 B.L -3
CO6	Analyze the tests of significance for large samples and small samples t-distribution, F-distribution, Chi-square test such that students are able to solve the problems related to them.	B.L -2 B.L -6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	-	-	-	1	-	-	1	-	-	2	1	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	1	-	1		1					1	-	-	-
CO5	2	-	-	-	-	-	-	-	2	-	-	1	-	-	-
CO6	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: MEASUREMENTS & INSTRUMENTATION LABORATORY	**SEMESTER : 4th**
COURSE CODE: BTEE-411-18 **REGULATION: 2018**	**CREDITS: 3**
COURSE AREA/DOMAIN: ELECTRICAL	**CONTACT HOURS:2L + 2(P)hours/Week.**

SYLLABUS:

Sl.NO.	**Lectures/Demonstrations**
1	Concepts relating to Measurements: True value, Accuracy, Precision, Resolution, Drift, Hysteresis, Dead-band, Sensitivity.
2	Errors in Measurements. Basic statistical analysis applied to measurements: Mean, Standard Deviation, Six-sigma estimation, C_p, C_{pk}.
3	Errors in Measurements. Basic statistical analysis applied to measurements: Mean, Standard Deviation, Six-sigma estimation, C_p, C_{pk}.
4	Sensors and Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors.
5	Current and Voltage Measurements. Shunts, Potential Dividers. Instrument Transformers, Hall Sensors.
6	Measurements of R, L and C.
7	Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers.
8	Digital Storage Oscilloscope.

SL.NO	**List of Experiments**
1.	Measurement of a batch of resistors and estimating statistical parameters.
2.	Measurement of L using a bridge technique as well as LCR meter.
3.	Measurement of C using a bridge technique as well as LCR meter.
4.	Measurement of Low Resistance using Kelvin's double bridge.
5.	Measurement of High resistance and Insulation resistance using Megger.
6.	Usage of DSO for steady state periodic waveforms produced by a function generator. Selection of trigger source and trigger level, selection of time-scale and voltage scale. Bandwidth of

	measurement and sampling rate.
7.	Download of one-cycle data of a periodic waveform from a DSO and use values tocompute the RMS values using a C program.
8.	Usage of DSO to capture transients like a step change in R-L-C circuit.
9.	Current Measurement using Shunt, CT, and Hall Sensor.
10.	Measurement of frequency using Wein's Bridge.
11.	To find 'Q' of an inductance coil and verify its value using Q- meter.
12.	Plotting of Hysteresis loop for a magnetic material using flux meter.

Manual Avalilable in Lab

1. http://vlabs.iitkgp.ernet.in/asnm/index.html#

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Acquire hand on experience about different measurement devices and its working principles.	1
CO2	Design and validate DC and AC bridges to find unknown values of the components.	6
CO3	Analyse the dynamic response and calibration of few instruments.	4
CO4	Measure voltage, current, power, Energy, frequency, phase angle etc.. and also to plot hysteresis loop for magnetic circuits.	5
CO5	Analyse and design simple circuits to enhance the ratings of the measuring instrument.	4
CO6	Solve the varieties of problems and issues coming up in the field of electrical measurement.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	_	_	_	_	_	_	_	1	1	1	1	1	1	1
CO2	3	2	2	2	_	1	1	_	1	1	1	1	2	2	2
CO3	3	2	1	1	_	1	1	_	2	2	1	1	2	2	2
CO4	3	2	1	1	_	1	1	_	2	2	1	2	2	2	2
CO5	3	3	3	2	_	2	2	_	2	2	2	2	2	2	2
CO6	3	1	_	_	_	2	2	1	2	2	2	2	2	2	2

Prepared by

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HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: DIGITAL ELECTRONICS LABORATORY	**SEMESTER : 4Th**
COURSE CODE: BTEE-412-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: ELECTRONICS ENGINEERING	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	Design a delay circuit using 555 timer and study the monostable, bistable and astable operations using 555.
2.	Verification of the truth tables of TTL gates viz;7400,7402, 7404, 7408,7432,7486. Design and fabrication and realization of all gates using NAND/NOR gates.
3.	Verification of truth table of Mutiplexer(74150)/Demultiplexer(74154)
4.	Design and verification of truth tables of half-adder, full-adder and subtractor circuits using gates 7483 and 7486(controlled inverter).
5.	To study the operation of Arithmetic Logic Unit IC 74181.
6.	Design fabrication and testing of Monostable multivibrator of t = 0.1ms approx. using 74121/123.testing for both

	positive and negative edge triggering, variation in pulse width and retriggering. Free running mutivibrator at 1KHz and 1Hz using 555 with 50% duty cycle. Verify the timing from theoretical calculations.
7.	Design and test S-R flip-flop using NOR/NAND gates.
8.	Design, fabricate and test a switch debouncer using 7400.
9.	Verify the truth table of a JK flip flop using IC 7476,
10.	Verify the truth table of a D flip flop using IC 7474 and study its operation in the toggle and asynchronous mode.
11.	Operate the counters 7490, 7493 and 74193(Up/Down counting mode). Verify the frequency division at each stage. Using a frequency clock (say 1 Hz) displaythe count of LED's.
12.	Verify the truth table of decoder driver7447/7448. Hence operate a 7 segment LED display through a counter using a low frequency clock. Repeat the above with the BCDto Decimal decoder 7442.

Manual Avalilable in Lab

` Digital Electronics Lab (http://vlabs.iitkgp.ac.in/dec/)

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Demonstrate the working of logic families and logic gates	3
CO2	Implement the Boolean algebra, coding-decoding, multiplexing, demultiplexing etc.	3
CO3	Design and implement various Combinational and Sequential logic circuits using various mappings and mathematical methods.	6
CO4	Identify and prevent various hazards and timing problems in a digital design within the realm of economic, performance, efficiency, user friendly and environmental constraints.	1
CO5	Analyse the basic requirements for a design application and propose a cost effective solution.	4
CO6	Develop skills to build and troubleshoot digital circuits for the real world applications.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	_	_	_	_	_	_	_	_	_	_	1	1	_
CO2	3	2	2	1	_	1	1	_	1	1	_	1	_	1	_
CO3	3	2	2	2	_	1	1	_	1	2	2	2	1	1	_
CO4	3	2	1	1	_	1	1	_	1	2	1	2	2	2	_
CO5	3	2	2	_	_	2	2	1	1	1	2	1	1	1	_
CO6	3	2	2	2	1	2	2	1	1	2	2	2	2	2	_

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ELECTRICAL MACHINES-II LABORATORY	**SEMESTER : 4Th**
COURSE CODE: BTEE-413-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	To perform load-test on three-phase Induction motor and to plot torque versus speedcharacteristics. a) To perform no-load and blocked–rotor tests on three-phase Induction motor toobtain equivalent circuit. b) To develop an algorithm (Matlab/C/C++) for speed torque characteristics usingcalculated equivalent circuit parameters.
2.	To study the speed control of three-phase Induction motor by Kramer's Concept.
3.	To study the speed control of three-phase Induction motor by cascading of two induction motors, i.e. by feeding the slip power of one motor into the other motor.
4.	To study star- delta starters physically and c) to draw electrical connection diagram d) to start the three-phase Induction motor using it. e) to reverse the direction of three-phase Induction motor
5.	To start a three-phase slip –ring induction motor by inserting different levels of resistance in the rotor circuit and plot torque –speed characteristics.
6.	To perform no-load and blocked–rotor test on single-phase Induction motor and to determine the parameters of equivalent circuit drawn on the basis of double revolvingfield theory.
7.	To perform no load and short circuit. Test on three-phase alternator and draw open andshort circuit characteristics.
8.	To find voltage regulation of an alternator by zero power factor (ZPF.) method.
9.	To study effect of variation of field current upon the stator current and power factor with synchronous motor running at no load and draw Voltage and inverted Voltage curves of motor.
10.	Parallel operation of three phase alternators using (i) Dark lamp method (ii) Two-Bright and one dark lamp method
11.	To study synchroscope physically and parallel operation of three-phase alternators using synchroscope.
12.	Starting of synchronous motors using: (i) Auxiliary motor (ii) Using Damper windings

Manual Avalilable in Lab

Electrical Machines Virtual Lab (http://em-coep.vlabs.ac.in/), (http://vem-iitg.vlabs.ac.in/)

http://vlabs.iitb.ac.in/vlab/labsee.html

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Construct equivalent circuits of Induction Motors by routine tests.	6
CO2	Comprehend the requirement of starting and speed control methods of Induction motors in the various applications of industry.	3
CO3	Construct equivalent circuits of synchronous motor and generator.	6
CO4	Apply knowledge to show utility of alternator, synchronous motors and synchronous condenser for various applications in power system.	3
CO5	Construct characteristic curves for Induction and Synchronous machines,	6
CO6	Demonstrate the concept of parallel operation of three phase alternators.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	_	_	_	_	1	2	1	_	1	1	1
CO2	3	2	2	2	_	1	1	_	1	2	1	1	1	1	1
CO3	3	2	2	2	_	_	_	_	1	2	1	1	1	1	1
CO4	3	2	2	2	_	1	1	2	1	2	2	2	2	2	2
CO5	3	2	2	2	_	1	1	_	1	1	1	1	1	1	1
CO6	3	2	2	2	2	1	1	_	1	1	1	1	1	1	1

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER ELECTRONICS LABORATORY	**SEMESTER : 4Th**
COURSE CODE: BTEE-414-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: POWER ELECTRONICS	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	To plot V-I characteristics and study the effect of gate triggering on turning on ofSCR.
2.	To study the effect of free-wheeling diode on power factor for single phase half-wave rectifier with R-L load.
3.	To plot waveforms for output voltage and current, for single phase full-wave, fully controlled bridge rectifier, for resistive and resistive cum inductive loads.
4.	Study of the microprocessor-based firing control of a bridge converter.
5.	To study three phase fully controlled bridge converter and plot waveforms of output voltage, for different firing angles.
6.	To study Jones chopper or any chopper circuit to check the performance.
7.	Thyristorised speed control of a D.C. Motor.
8.	Speed Control of induction motor using thyristors.
9.	Study of series inverter circuit and to check its performance.
10.	Study of a single-phase cycloconverter.
11.	To check the performance of a McMurray half-bridge inverter.

Manual Avalilable in Lab

1. http://vlabs.iitb.ac.in/vlabsdev/labs/mit_bootcamp/power_electronics/labs/index.php

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Apply and deduce the concepts of Power Electronics through laboratory experimental work.	3
CO2	Estimate and Interpret the V-I characteristics of various Power Electronic Devices.	5
CO3	Examine and design the working of various power electronic converter circuit and analyse the performance.	3
CO4	Perform speed contol of different motors using thyristors.	2
CO5	Correlate theoretical and practical analysis of AC-DC, DC_AC converters and also converter fed AC & DC drives.	4
CO6	Connect the circuit to perform experiments, measure, analyze the observed data to come to a conclusion.	4

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	_	2	2	_	2	2	2	1	1	1	1
CO2	3	2	2	2	_	2	2	_	2	2	1	1	2	2	2
CO3	3	2	3	2	_	2	2	2	2	2	1	2	2	2	2
CO4	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO5	3	2	2	2	_	2	2	_	2	2	1	2	1	1	1
CO6	3	2	2	2	2	2	2	1	2	2	2	2	2	2	2

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INDEX

SCHEME: B.TECH 5th SEMESTER

(Electrical Engineering)

I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Slot	Course No.	Subject	L-T-P	Hours	Credits
A	BTEE-501-18	Power Systems – I (Apparatus & Modelling)	3-1-0	4	4
B	BTEE-502-18	Control Systems	3-1-0	4	4
C	BTEE503-18	Microprocessors	3-1-0	4	4
D	BTEE601X-18	Programme Elective-1	3-0-0	3	3
F	EVS-101-18	Environmental Studies	2-0-0	2	S/US
G	BTEE511-18	Power Systems-I Laboratory	0-0-2	2	1
H	BTEE512-18	Control Systems Laboratory	0-0-2	2	1
I	BTEE513-18	Microprocessors Laboratory	0-0-2	2	1
J	BMPD501-18	Mentoring and Professional Development of Students	0-1-0	1	S/US

Total Credits = 18 Hours: 24

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER SYSTEMS-I (APPARATUS AND MODELING)	**SEMESTER : 5TH CREDITS: 4**
COURSE CODE: BTEE-501-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: POWER SYSTEMS	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-511-18	**LAB COURSE NAME: POWER SYSTEMS-ILABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Basic Concepts:** Evolution of Power Systems and Present-Day Scenario. Structure of a power system: BulkPower Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Review of Three-phase systems. Analysis ofsimple three-phase circuits. Power Transfer in AC circuits and Reactive Power	04
II	**Power System Components:** Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Travelling-wave Equations. Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines. Synchronous Machines: Steady-state performance characteristics. Operation when connectedto infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.	15
III	**Over-voltages and Insulation Requirements:** Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination. Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams.	04
IV	**Fault Analysis and Protection Systems:** Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents. Neutral Grounding. Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection) and their application.	10
V	**Introduction to DC Transmission & Renewable Energy Systems:** DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC) based dc link, Real Power Flow control in a dc link. Comparison of ac and dc transmission. Solar PV systems: I-V and P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines.	09

T/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION

1	.S. Dhillon I.J. Nagrath and D.P. Kothari, Power System Engineering, 3rd Edition,McGraw Hill Education (India) Private Ltd., 2019
2	D.P. Kothari and J. S. Dhillon, Power System Optimization, 2nd edition, Prentice Hall of India Pvt. Ltd.,New Delhi, 2011, ISBN -978-81-203-4085-5.
3	J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education,1994.
4	O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
5	A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
6	D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw HillEducation, 2003.
7	B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric PowerSystems", Wiley, 2012.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	R.K. Rajput, " Power System Engineering", Laxmi Publications, 2009.
2	B.R. Gupta, "Power System Analysis", S.Chand Publications, 2008.
3	J.B Gupta, " A Course in Power Systems", S.K.Kataria & Sons, 2009.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

https://www.youtube.com/watch?v=SWw_5uA7AWU&list=PLyplIEjyr_NvFdFoscHmuSNMMXbhLyY_f

Additional topics: NIL

COURSE OBJECTIVES:

This course deals with the generation and distribution of Electric Power. Also this course gives emphasis on the economic aspects of Generating and Distributing Electric Power.

COURSE PRE-REQUISITES:

1. Electrical Machines

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Familiar with the components and the mechanical design aspects of evolution in transmission and distribution system.	1
CO2	Analyse performance and efficiency of transmission lines via different techniques by computing transmission line parameters.	4
CO3	Develop per unit system models of synchronous machines, transformers, transmission lines and static loads for power system studies.	6
CO4	Explain the generation of over-voltages and insulation coordination.	3
CO5	Evaluate fault currents for different types of faults and also analyse their protection schemes	4
CO6	Recognize the need to continuously follow the advancements in technology and incorporating them in the present system to improve efficiency.	1

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	_	1	1	_	1	2	1	1	2	1	1
CO2	3	3	2	2	_	1	1	_	2	2	1	2	2	1	2
CO3	3	3	2	2	_	1	1	_	2	2	1	2	2	1	2
CO4	3	2	1	1	_	1	1	_	1	2	1	1	1	1	2
CO5	3	2	1	1	_	1	1	1	1	2	1	1	1	1	2
CO6	3	2	1	1	2	1	1	1	1	2	1	2	1	2	2

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: CONTROL SYSTEMS	**SEMESTER : 5TH CREDITS: 4**
COURSE CODE: BTEE-502-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: CONTROL ENGINEERING	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : BTEE-512-18	**LAB COURSE NAME:** CONTROL SYSTEMS LABORATORY

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to control problem:** Industrial Control examples. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback. Block diagram algebra.	04
II	**Time Response Analysis:** Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique.Construction of Root-loci.	10
III	**Frequency-response analysis:** Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loopfrequency response.	06
IV	**Introduction to Controller Design:** Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design.	10

V	**State variable Analysis:** Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.	**06**
VI	**Introduction to Optimal Control and Nonlinear Control:** Performance Indices. Regulator problem, Tracking Problem. Nonlinear system–Basic concepts.	**05**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2	B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3	K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
4	I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International,2009.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	B.S.Manke, "Control System Design: An Introduction", Mercury Learning & Information, 2017.
2	Control System Engineering, D. Roy Chowdhuri, PHI, 2005.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://nptel.ac.in/courses/108/106/108106098/
2. https://nptel.ac.in/courses/108/101/108101037/
3. https://nptel.ac.in/courses/108/102/108102043/
4. https://nptel.ac.in/courses/108/102/108102044/

Additional topics: NIL

COURSE OBJECTIVES:

1.To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response.

2 To assess the system performance using time domain analysis and methods for improving it.

3 To assess the system performance using frequency domain analysis and techniques for improving the performance.

4 To design various controllers and compensators to improve system performance.

COURSE PRE-REQUISITES:

Basic Concepts of electrical circuit.

Basic Concepts of Laplace transform .

Basic Concept of frequency response.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Know and express the basic elements and structures of different control systems.	1
CO2	Develop transfer function model of mechanical, electrical, thermal, fluid system and different control system components like servomotors, synchros, potentiometer, tacho-generators etc.	6
CO3	Apply Routh-Hurwitz criterion, Root Locus, Bode Plot and Nyquist Plot to determine the domain of stability of linear time-invariant systems	3
CO4	Determine the steady-state response, errors of stable control systems and design compensators to achieve the desired performance	3
CO5	Know the different control components & their applications and can express control system models on state space models.	1
CO6	Apply the principles of control system engineering to real world electrical and electronics problems and applications.	3

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	_	_	_	1	1	_	_	_	_	1	1	1	1
CO2	3	3	2	2	_	1	1	_	1	2	_	2	2	2	1
CO3	3	3	2	2	_	1	1	_	1	2	_	2	2	2	1
CO4	3	3	2	1	_	1	_	_	1	2	_	2	2	2	1
CO5	3	3	1	1	_	1	1	_	1	2	_	2	2	2	1
CO6	3	2	1	1	1	1	1	_	1	2	1	2	2	2	1

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: MICROPROCESSORS	**SEMESTER : 5TH CREDITS: 4**
COURSE CODE: BTEE-503-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: INTERGRATED CIRCUITS	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE BTEE-513-18:	**LAB COURSE NAME: MICROPROCESSORS LABORATORY**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Fundamentals of Microprocessors:** Digital Computers: General architecture and brief description of elements, programming system, Buses and CPU Timings. Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, memory, data transfer schemes, architecture advancements of microprocessors, typical microprocessor development system, higher lever languages.	03
II	**The 8085 Architecture:** Microprocessor architecture and its operations, Pin configuration, internal architecture. Timing& Signals: control and status, interrupt: ALU, machine cycles, Instruction format, op-codes, mnemonics, number. of bytes, Instruction Set of 8085: Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.RTL, variants, number. of machine cycles and T states, addressing modes. Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assembler directives.	10
III	**The 8086 Architecture:** 8086 Microprocessors: Architecture: Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation, Operating Modes Instruction Set of 8086 Addressing Modes: Instruction format: Discussion on instruction Set: Groups: data transfer, arithmetic, logic string, branch control transfer, processor control. Interrupts: Hardware and software interrupts, responses and types.	09
IV	**Fundamental of Programming:** Development of algorithms, flowcharts in terms of structures ,(series, parallel, if-then-else etc.) Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs) .	09
V	**Peripheral memory and I/O Interfacing:** Interfacing devices, Interfacing of Memory, Programmed I/O, Interrupt Driven I/O, memory I/O, 8255- Programmable peripheral interface, 8253/8254 Programmable timer/counter. 8259programmable Interrupt Controller, 8251- USART	08

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	Gaonkar, Ramesh S, "Microprocessor Architecture, programming and applications withthe 8085" Pen ram International Publishing 5th Ed.
2	Uffenbeck, John, "Microcomputers and Microprocessors" PHI/ 3rd Edition.
3	Ray, A.K. & Burchandi, K.M., "Advanced Microprocessors and Peripherals: Architecture,Programaming and Interfacing" Tata Mc. Graw Hill.
4	Krishna Kant, "Microprocessors and Microcontrollers" PHI Learning.
5	Brey, Barry B. "INTEL Microprocessors" Prentice Hall (India)
6	ADitya P Mathur, "Introduction to Microprocessor" Tata Mc Graw Hill
7	M. Rafiquzzaman, "Microprocessors- Theory and applications" PH
8	B. Ram, "Advanced Microprocessor & Interfacing" Tata McGraw Hill
9	Renu Singh & B.P.Singh, "Microprocessor and Interfacing and applications" New Age International
10	N. Senthil Kumar, "Microprocessors and Microcontroller", Oxford University Press.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Sunil Mathur, Jeebananda Panda, " Microprocessors & Microcontrollers", PHI Learning Pvt Ltd, 2016.
2	Douglas V Hall, "Microprocessors and interfacing – Programming & Hardware" TMH
3	R.S. Gaonkar ,"Microprocessors and interfacing", TMH, 2013.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://books.google.co.in/books/about/Microprocessor_and_Microcontroller.html?id=Wcf-CwAAQBAJ&redir_esc=y
2. https://books.google.co.in/books/about/Microprocessors_and_Microcontroller.html?id=OVYGy4NhymMC
3. https://www.freebookcentre.net/Electronics/MicroProcessors-Books.html
4. https://books.google.co.in/books/about/MICROPROCESSORS_AND_MICROCONTROLLERS.html?id=viEaDAAAQBAJ&redir_esc=y
5. https://nptel.ac.in/courses/106/108/106108100/
6. https://nptel.ac.in/courses/108/105/108105102/
7. https://www.edx.org/learn/microcontrollers
8. https://edge.edx.org/courses/course-v1:BITSX+F241+2015-16_Semester_II/313201f255574e04b94a47c1fb845e87/
9. https://nptel.ac.in/courses/108/103/108103157/
10. https://nptel.ac.in/courses/108/105/108105102/
11. https://nptel.ac.in/courses/108/107/108107029/

Additional topics: NIL

COURSE OBJECTIVES:

This course deals with the systematic study of the Architecture and programming issues of 8 bit 8085-microprocessor and interfacing with other peripheral ICs and co-processor. In addition, a 16-bit microprocessors and other chips (8255, 8251, 8253 and 8257) are introduced. The aim of this course is to give the students basic knowledge of the microprocessors (8085 and 8086) needed to develop the systems using it.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEE-401-18	Digital Electronics	Knowledge of registers, Memories, flipflops etc.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the architecture & functionalities of different building block of 8085 & 8086microprocessor.	1
CO2	Design and develop assembly language code to solve problems.	6
CO3	Analyse and illustrate the timing, trouble shooting and system connections of Microprocessor.	4
CO4	Interface and interact the microprocessor with different peripherals and devices.	2
CO5	Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.	4
CO6	Design circuits for various applications using Microprocessor.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	_	_	_	_	_	2	_	1	1	1	1
CO2	3	2	2	1	2	2	2		2	2	2	2	2	2	2
CO3	3	2	2	2	2	2	2	_	_	2	_	2	2	2	2
CO4	3	2	2	1	1	_	_	_	1	1	2	1	2	2	2
CO5	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO6	3	2	2	2	2	2	2	_	2	2	2	2	2	2	2

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HOD

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: SWITCHGEAR AND PROTECTION	**SEMESTER : 5TH CREDITS: 3**
COURSE CODE: BTEE-504B-18 **REGULATION: 2018**	**COURSE TYPE: PROGRAM ELECTIVE-1**
COURSE AREA/DOMAIN: POWER SYSTEM	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Electrical Switchgear:** Fundamentals and Types of Circuit Breakers, Gaseous Discha rges and Ionization Process in a Gaseous Insulating Medium, decay Process, Quenching of AC Arc, Arc Interruption Theories, Fuse-types, Rating, Selection, theory and characteristics, application, Factors Affecting RRRV, Re-Striking Voltage and Recovery Voltage, Resistance Switching, Quenching of DC Arc, High-Voltage AC Circuit Breakers, High-Voltage DC (HVDC) Circuit Breakers, Isolators.	06
II	**Protective Relaying System:** Basics terminology and operating principle of Relays, Functions of Protective Relay Schemes, Basic Tripping Circuit with System Transducers, Zones of Protection, Requirements of a Protective System, Relay Operating Criteria, Main and Back-Up Protection. Relays: Introduction, classification, constructional features; and Characteristics of Electromagnetic, Induction, Thermal, Overcurrent relays, Directional relays, Distance relays, Differential, Negative sequence relay, introduction to static and up-based relays. Static Relays: Introduction, Basic Elements & Classification of Static Relays, Advantages andlimitations of Static Relays.	08
III	**Power Apparatus Protection:** Generator Protection: Generators faults, Differential Protection, Inter-Turn Fault Protection, Stator Earth-Fault Protection, Rotor Earth-Fault Protection, Negative Phase Sequence Protection (Protection Against Unbalanced Loading), Field Failure Protection (Protection Against Loss of Excitation), Overload Protection, Overvoltage Protection, Reverse Power Protection, Under-Frequency Protection. Transformer Protection: Faults in Transformers, Gas-Operated Relays, Overcurrent Protection, Restricted Earth-Fault Protection, Differential Protection, Protection Against Over fluxing, Protection of Grounding Transformers, Protection Against Overheating.	10
IV	**Protection of Feeders and Transmission line:** Protection of Feeders: Basic Radial Feeder, Methods of Discrimination, Time and current protection, different pilot wire protection of feeders, current balance differential protection, Differential and Distance protection of feeders, choice between Impedance, **Reactance and Mho relays:** Protection of Transmission Lines: Overcurrent Relays, Rules for Setting the IDMT Relays, Distance Relays: Stepped Distance Characteristics of a Distance Relay,	12

	Elementary idea about carrier current protection of lines, Quantities to be Fed to Distance Relays.	
V	**Bus Zone, Over voltage and Earthing Protection:** Bus-zone protection: Introduction, Bus-bar arrangements, Bus-zones faults, Protection Requirements, Fault-bus and backup protection of bus-bars, Non-Unit Protection by Back-up Relays, Unit Protection Schemes. Protection against over voltage and earthing: Ground wires, Rod gap, Impulse gap, Valve type and Metal Oxide Arresters, Line Arrester/Surge Absorber. Ungrounded neutral system, Grounded neutral system and Selection of Neutral Grounding.	**08**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	B. A. Oza, Nirmal Kumar, C. Nair, R. P. Mehta, V. H. Makwana, Power System Protection & Switchgear, 1st Edition, Mc Graw Hill
2	Badri Ram, D. N. Vishwakarma, Power System Protection and Switchgear, Mc GrawHill
3	Power System Protection and Switchgear by Wiley, John Wiley & Sons Canada, Limited
4	Sunil S. Rao, Switchgear and Protection, 8th Edition, Khanna Book Publications
5	Handbook on switchgears, Bharat Heavy Electrical Limited

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	R.K. Rajput, " A Textbook of Power System Engineering", Laxmi Publications (P) Ltd.
2	J.B Gupta, " Switchgear & Protection", S.K Kataria & Sons Publications, 2015.
3	Y.G. Paithankar & S.R. Bhide, "Fundamentals of Power System Protection", PHI Learning, Pvt Ltd, 2010.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://nptel.ac.in/courses/108/101/108101039/
2. https://nptel.ac.in/courses/108/107/108107167/
3. https://nptel.ac.in/courses/108/105/108105167/

Additional topics: NIL

COURSE OBJECTIVES:

1. To understand the need of protection of electric equipment and their protection schemes.
2. To understand operations & characteristics of various electromagnetic and static relays.
3. To understand the operations of various types of circuit breakers and their ratings.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION

BTEE-501-18	Power Systems – I (Apparatus & Modeling)	Basic knowledge of Power Transmission and Distribution

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the various abnormal conditions that could occur in power system.	1
CO2	Attain the knowledge of various types of existing circuit breakers, their design and constructional details.	1
CO3	Discuss the operation of different kinds of protection for generator and transformer, and apply them in real power system.	2
CO4	Identify the suitable protection systems for feeder and transmission line and apply them in real power system.	1
CO5	Analyse the protection requirement and apply the protection scheme required for the bus zone.	4
CO6	Apply the various protection schemes against overvoltage and earthing.	3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	_	1	1	_	1	2	_	_	1	1	1
CO2	3	1	1	1	_	1	1	_	1	2	_	_	1	1	1
CO3	3	1	1	1	_	1	1	_	1	2	_	1	1	1	1
CO4	3	1	1	1	_	1	1	_	1	2	1	1	1	1	1
CO5	3	2	1	1	_	2	2	_	1	2	1	2	1	1	1
CO6	3	2	1	1	_	2	2	_	1	2	1	2	1	1	1

CO MAPPING WITH PO

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER SYSTEMS – I LABORATORY	**SEMESTER : 5Th**
COURSE CODE: BTEE-511-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: POWER SYSTEM	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

A) Hardware Based:

SL.NO	List of Experiments
1.	To measure negative sequence and zero sequence reactance of Synchronous Machines
2	Fault analysis for line-to-line (L-L), Line-to-Ground (L-G) and double line to ground fault.
3	To study the performance of a transmission line and compute its ABCD parameters.
4	To study the earth resistance using three spikes.
5	To study the IDMT over current relay and determine the time current characteristics.
6	To study percentage differential relay
7	To study Impedance, MHO and Reactance type distance relays.
8.	To study operation of oil testing set.

B) Simulation Based Experiments (using MATLAB or any other software):

SL.NO	List of Experiments
1	To obtain steady state, transient and sub-transient short circuit currents in an alternator.
2	To perform symmetrical fault analysis in a power system.
3	To perform unsymmetrical fault analysis in a power system

Manual Available in Lab

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Analyze the performance of transmission lines and relays.	4
CO2	Measure negative sequence and zero sequence reactance of Synchronous Machines.	5
CO3	Analyze different types of short-circuit faults which occur in power systems	4
CO4	Use simulation tools to perform comprehensive short circuit studies and other fault analysis in power systems.	6
CO5	Analyse and solve the varieties of problems and issues coming up in the field of Power system.	4,6
CO6	Design a protection system for an item of electrical plant.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	_	2	2	_	2	2	1	2	1	1	1
CO2	3	2	2	2	_	2	2	_	2	2	_	2	1	1	1
CO3	3	2	2	2	_	2	2	_	2	2	_	2	1	2	1
CO4	3	2	2	2	3	2	2	_	2	2	_	2	1	2	1
CO5	3	2	2	2	2	2	2	_	2	2	2	2	1	2	1
CO6	3	2	2	2	2	2	2	_	2	2	2	2	1	2	1

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: CONTROL SYSTEMS LABORATORY	**SEMESTER : 5Th**
COURSE CODE: BTEE-512-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: CONTROL ENGINEERING	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	**List of Experiments**

1.	To study the characteristics of potentiometers and to use 2- potentiometers as an errordetector in a control system.
2	To study the synchro Transmitter-Receiver set and to use it as an error detector.
3	To study the Speed – Torque characteristics of an AC Servo Motor and to explore itsapplications.
4	To study the Speed – Torque characteristics of an DC Servo Motor and explore itsapplications.
5	To study the variations of time lag by changing the time constant using controlengineering trainer.
6	To simulate a third order differential equations using an analog computer and calculatetime response specifications
7	To obtain the transfer function of a D.C. motor – D.C. Generator set using TransferFunction Trainer
8.	To study the speed control of an A.C. Servo Motor using a closed loop and an openloop systems a) To study the operation of a position sensor and study the conversion of positionin to corresponding voltage b) To study an PI control action and show its usefulness for minimizing steadystate error of time response.
9.	To measure Force / Displacement using Strain Gauge in a wheat stone bridge
10.	To design a Lag compensator and test its performance characteristics.
11.	To design a Lead-compensator and test its performance characteristics.
12.	To design a Lead-Lag compensator and test its performance characteristics.

Manual Available in Lab

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Relate the applications of machines & electronic devices with control systems.	2
CO2	Evaluate the characteristics of a given AC and DC Servo motor.	5
CO3	Estimate the time response of given control system model.	5
CO4	Formulate transfer function for the given control system problems.	6
CO5	Design a lead, lag and leadlag compensator and to obtain the characteristics by experiment.	6
CO6	Apply and deduce the principles of control system engineering through laboratory	3,4

	experiment.	

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	_	_	_	_	_	_	_	2	_	2	1	1	1
CO2	3	2	2	2		1	1		2	2	1	1	1	1	1
CO3	3	2	2	2	2	2	2	_	2	2	_	1	1	1	1
CO4	3	2	2	2	2	2	2	_	2	2	_	2	2	2	2
CO5	3	2	3	2	2	2	2	_	2	2	2	2	2	2	2
CO6	3	2	2	2	2	2	2	2	2	2	2	1	2	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: MICROPROCESSORS LABORATORY	**SEMESTER : 5Th**
COURSE CODE: BTEE-513-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN: INTEGRATED CIRCUIT	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	To study 8085 based microprocessor system
2	To study 8086 and 8086A based microprocessor system.
3	To study Pentium Processor.
4	To develop and run a program for finding out the largest/smallest number from a given set ofnumbers.
5	To develop and run a program for arranging in ascending/descending order of a set of numbers
6	To perform multiplication/division of given numbers
7	To perform conversion of temperature from 0 F to 0 C and vice-versa
8.	To perform computation of square root of a given number
9.	To perform floating point mathematical operations (addition, subtraction, multiplication anddivision) 10. To obtain interfacing of RAM chip to 8085/8086 based system.
10.	To obtain interfacing of keyboard controller, 8279
11.	To obtain interfacing of PPI, 8255
12.	To obtain interfacing of USART, 8251
13.	To perform microprocessor-based stepper motor operation through 8085 kit
14.	To perform microprocessor-based traffic light control
15.	To perform microprocessor-based temperature control of hot water.

Manual Avalilable in Lab

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the architecture & functionalities of different building block of 8085 & 8086 microprocessor.	1
CO2	Design and develop assembly language code to solve problems.	6
CO3	Analyse and illustrate the timing, trouble shooting and system connections of Microprocessor.	4
CO4	Interface and interact the microprocessor with different peripherals and devices	2
CO5	Evaluate assembly language programs and download the machine code that will provide solutions real-world control problems.	4
CO6	Design circuits for various applications using Microprocessor.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	_	_	_	_	_	2	_	1	1	1	1
CO2	3	2	2	1	2	2	2	_	2	2	2	2	2	2	2
CO3	3	2	2	2	2	2	2	_	_	2	_	2	2	2	2
CO4	3	2	2	1	1	_	_	_	1	1	2	1	2	2	2
CO5	3	2	2	2	2	2	2	_	2	2	2	2	2	2	2
CO6	3	2	2	2	2	2	2	_	2	2	2	2	2	2	2

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INDEX
SCHEME: B.TECH 6th SEMESTER
(Electrical Engineering)
I.K.G Punjab Technical University Revised Scheme for B. Tech Syllabus 2018

Sr. No	Course code	Course Title	L-T-P	Hours/ Week	Credits
1	BTEE601-18	Power System-II (Operation and Control)	3-1-0	4	4
2	BTEE602-18	Power Generation and Economics	3-1-0	4	4
3	BTEE603X-18	Programme Elective-2	3-0-0	3	3
4	BTEE604-18	Programme Elective-3	3-0-0	3	3
5	OXXXXX-18	Open Elective-1	3-0-0	3	3
6	HSMCXXX-18	Humanities & Social Sciences including Mgt	3-0-0	3	3
7	BTEE611-18	Electronic Design Laboratory	1-0-2	3	2
8	BTEE612-18	Power Systems-II Laboratory	0-0-2	2	1

9	BTEE621-18	Project-1	0-0-6	6	3
10	BMPD601-18	Mentoring and Professional Development of Students	0-1-0	1	S/US

Total Credits = 26 Hours = 32

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER SYSTEM-II (OPERATION & CONTROL)	**SEMESTER : 6th CREDITS: 4**
COURSE CODE: BTEE-601-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN:	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Power Flow Analysis:** Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of non- linear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Computational Issues in Large-scale Power Systems.	08
II	**Stability Constraints in synchronous grids :** Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve. Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault. Analysis using numerical integration of swing equations (using methods like Forward Euler, Runge-Kutta 4^{th} order methods), as well as the Equal Area Criterion. Impact of stability constraints on Power System Operation.	10
III	**Control of Frequency and Voltage:** Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control. Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Automatic Voltage Regulators. Shunt Compensators, Static VAR compensators and STATCOMs. Power flow control using embedded dc links, phase shifters.	08
IV	**Monitoring and Control:** Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement Units and Wide-Area Measurement Systems. State-estimation. System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System. Contingency Analysis. Preventive Control and Emergency Control.	08
V1	**Modern Power System Management:** Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole-sale competition, Retail Competition), Demand Side-management, Transmission and Distributions charges, Ancillary Services. Regulatory framework.	08

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	J. Grainger and W. D. Stevenson, Power System Analysis, McGraw Hill Education,1994.
2	O. I. Elgerd, Electric Energy Systems Theory, McGraw Hill Education, 1995.
3	A. R. Bergen and V. Vittal, Power System Analysis, Pearson Education Inc., 1999.
4	D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, McGraw Hill Education,2003.
5	B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, Electric Power Systems, Wiley, 2012.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Chakrabarti & Haldar, "Power System Analysis: Operation and Control", Prentice Hall of India, 2004 Edition.
2	Kundur, P., 'Power System Stability and Control', McGraw-Hill International, 1 st Edition, 1994

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://nptel.ac.in/courses/108/106/108106022/
2. https://nptel.ac.in/courses/108/104/108104051/
3. https://nptel.ac.in/courses/108/105/108105067/
4. https://nptel.ac.in/courses/108/106/108106026/
5. https://nptel.ac.in/courses/108/101/108101004/

Additional topics: NIL

COURSE OBJECTIVES:

- To understand real power control and operation.
- To know the importance of frequency control.
- To analyze different methods to control reactive power.
- To understand real time control of power systems.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEE-501-18	Power Systems – I (Apparatus & Modelling)	

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the structure of power stem and its components.	1
CO2	Apply numerical methods to perform load flow studies and fault analysis by using bus admittance matrix.	3
CO3	Analyse the impact of stability constraints on power system operation.	4
CO4	Assess the different methods of control and compensation to choose the best option so that social and environmental problems are minimized and recognize the need to continuously follow the advancements in technology.	5
CO5	Apply the concept of computer control of power systems and data acquisition in real time control of power systems.	3
CO6	Incorporate modern power system management in the present system to improve efficiency and increase the flexibility and quality of operation.	3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	_	1	1	_	1	2	_	1	1	1	2
CO2	3	3	2	2	_	1	1	_	1	2	_	2	1	1	2
CO3	3	3	2	2	_	2	2	_	1	2	_	2	1	1	2
CO4	3	2	2	2	_	2	2	_	2	2	2	2	2	2	2
CO5	3	2	2	2	3	2	2	_	2	2	1	2	2	2	2
CO6	3	2	2	2	3	2	2	_	2	2	1	2	2	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER GENERATION AND ECONOMICS	**SEMESTER : 6th CREDITS: 4**
COURSE CODE: BTEE-602-18 **REGULATION: 2018**	**COURSE TYPE: CORE**
COURSE AREA/DOMAIN: POWER SYSTEM	**CONTACT HOURS: 3(L) + 1 (T) hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Loads and Load curves:** Electrical energy sources, organization of power sector in India, single line diagram of thermal, hydro and nuclear power stations. Classification of power plants in base load and peak load plants. Types of load (fixed voltage loads, resistive loads, Inductive motor loads, Mechanical load), effectof load on supply voltage, Maximum demand, Group diversity factor, Peak diversity factor, Types of load, chronological load curves, load-duration Curve, mass curves, load factor, capacity factor, utilization factor, base load and peak load plants, load forecasting.	08
II	**Power Plant Economics and Tariff :** Capital cost of plants, annual fixed cost, operating costs and effect of load factor on cost of energy, depreciation. Objectives of tariff making, different types of tariff (domestic, commercial, agricultural and industrial loads). Need for power factor improvement, power factor improvement using capacitors, determination of economic power factor.	10
III	**Selection of plant, Cogeneration:** Plant location, plant size, number and size of units in plants, economic comparison of alternatives based on annual cost, rate of return, present worth and capitalized cost methods. Definition and scope of cogeneration, Topping and Bottoming Cycles, Benefits, cogeneration technologies.	08

IV	Economics of Steam plants: Methods of loading turbo-generators, input- output curve, heat rate, incremental cost, method of Lagrangian multiplier, effect of transmission losses, co-ordination equations, and iterative procedure to solve co-ordination equations.	**08**
V1	**Hydro-thermal co-ordination**: Advantages of combined working of Run-off River plant and steam plant, reservoir hydro plants and thermal plants, long-term operational aspects, scheduling methods.	**08**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	M.V. Deshpande, Power Plant Engineering, Tata McGraw Hill (2004).
2	M.M. EI-Wakit, Power Plant Engineering, McGraw Hill, USA 8. Rajput R.K., Power Plant Engineering, Luxmi Publications.
3	P.C. Sharma, Power Plant Engineering, Kataria and Sons.
4	B.G.A. Skrotzki and W.A. Vapot, Power Station Engineering and Economy, TataMcGraw-Hill.
5	S.C. Arora and S. Dom Kundwar, A course in Power Plant Engineering, Dhanpat Rai.
6	P.K. Nag, Power Plant Engineering, Tata McGraw Hill.
7	B.R. Gupta, Generation of Electrical Energy, S. Chand (1998).
8	I.J. Nagrath and D.P. Kothari, Power System Analysis Tata McGraw-Hill Publication.
9	A. Chakrabarti, M.L. Soni, P.V. Gupta and U.S. Bhatanagar, A Textbook on Power System Engineering, Dhanpat Rai and Co.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	V.K. Mehta & Rohit Mehta, "Principles of Power System", S. Chand Publication

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. http://www.fayoum.edu.eg/stfsys/stfFiles//243//2512//Ch%204%20%20Principles%20of%20Power%20system.pdf
2. https://byjus.com/physics/conventional-and-nonconventional-sources-of-energy/
3. https://nptel.ac.in/courses/121/106/121106014/

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

4. http://www.ignou.ac.in/upload/Unit-7-58

Additional topics:
Review of Power Plants

COURSE OBJECTIVES:

1. To familiarize the students with different types of loads and load curves.
2. To apprise them with different types of costs involved in power plant and tariffs imposed on the electricity consumers
3. To impart knowledge about selection and economic operation of steam plants.
4. To impart knowledge about hydrothermal coordination.

COURSE PRE-REQUISITES:

Power Plant Engineering

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Know the performance of different energy sources and organization of power sector.	1
CO2	Describe the different types of loads and related terminology.	2
CO3	Analyse the various costs involved in power plants to calculate the generation cost of power.	4
CO4	Asses the different tariff plans imposed on different categories of customers and the methods to improve power factor.	5
CO5	Select power plants based on various economic alternative comparison methods and other physical factors.	2
CO6	Analyse the engineering issues in scheduling of thermal and combined hydro and thermal power plants, cogeneration plants along with their environmental aspects	4

CO MAPPING WITH PO

CO1	3	2	2	2	_	1	1	_	1	2	_	1	1	1	2
CO2	3	3	2	2	_	1	1	_	1	2	_	2	1	1	2
CO3	3	3	2	2	_	2	2	_	1	2	_	2	1	1	2
CO4	3	2	2	2	_	2	2	_	2	2	2	2	2	2	2
CO5	3	2	2	2	3	2	2	_	2	2	1	2	2	2	2
CO6	3	2	2	2	3	2	2	_	2	2	1	2	2	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: WIND AND SOLAR ENERGY SYSTEMS	**SEMESTER : 6th CREDITS: 3**

COURSE CODE: BTEE-603D-18 **REGULATION: 2018**	**COURSE TYPE: PROGRAMME ELECTIVE-2**
COURSE AREA/DOMAIN: RENEWABLE ENERGY SOURCES	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power- cumulative distribution functions.	**05**
II	**Wind generator topologies**: Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations,Converter Control.	**12**
III	**The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solarday length, Estimation of solar energy availability.	**06**
IV	**Solar energy Technologies:** Solar photovoltaic Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. Solar thermal power generation: Technologies, Parabolic trough, central receivers, parabolicdish, Fresnel, solar pond, elementary analysis.	**12**
V1	**Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV	**07**

	and wind systems.	

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	T. Ackermann, Wind Power in Power Systems, John Wiley and Sons Ltd., 2005.
2	G. M. Masters, Renewable and Efficient Electric Power Systems, John Wiley and Sons, 2004.
3	S. P. Sukhatme, Solar Energy: Principles of Thermal Collection & Storage, McGraw Hill,1984.
4	H. Siegfried and R. Waddington, Grid integration of wind energy conversion systems, John Wiley and Sons Ltd., 2006.
5	G. N. Tiwari and M. K. Ghosal, Renewable Energy Applications, Narosa Publications, 2004.
6	J. A. Duffie and W. A. Beckman, Solar Engineering of Thermal Processes, John Wiley & Sons,1991.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Daniel, Hunt. V Wind Power, A Hand Book of WECS, Van Nostrend Co., Newyork, 2nd Edition, 1998
2	Mukund R Patel, "Wind and Solar Power Systems", CRC Press, 1st Edition, 1999
3	G D Rai, "Non- Conventional Energy Resources", Khanna Publishers, 1 st Edition, 2002.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. https://www.NPTEL video lectures.
2. https://www.books.askvenkat.com/engineering-textbooks
3. https://www.electrical4u.com.

Additional topics: NIL

COURSE OBJECTIVES:

1. The fundamental concepts of power generation and gain enough knowledge about the wind and solar energy sources.
2. The construction, principle of operation of various equipments used in power generation
3. The key aspects in the design and operation of photovoltaic along with solar thermal power energy systems.
4. 4The various factors affecting the power quality issues in integration of renewable energy resources

COURSE PRE-REQUISITES:

1. Power Electronics

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the global energy scenario and the consequent growth of the power generation from renewable energy sources.	1
CO2	Explain and apply the concepts behind the wind and solar energy conversion.	2
CO3	Apply the knowledge of electrical machines to generate electrical power from wind.	3
CO4	Integrate power electronic converters with renewable energy sources and also develop MPPT techniques for PV systems.	6
CO5	Analyse the issues related to the grid integration of solar and wind energy systems.	4
CO6	Design and develop hybrid energy systems.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	_	1	1	_	1	2	_	1	1	1	2
CO2	3	3	2	2	_	1	1	_	1	2	_	2	1	1	2
CO3	3	3	2	2	_	2	2	_	1	2	_	2	1	1	2
CO4	3	2	2	2	_	2	2	_	2	2	2	2	2	2	2
CO5	3	2	2	2	3	2	2	_	2	2	1	2	2	2	2
CO6	3	2	2	2	3	2	2	_	2	2	1	2	2	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: HIGH VOLTAGE ENGINEERING	**SEMESTER : 6th CREDITS: 3**
COURSE CODE: BTEE-604A-18 **REGULATION: 2018**	**COURSE TYPE: PROGRAMME ELECTIVE-3**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Breakdown in Insulating materials:** Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge.	08
II	**Breakdown in liquid and solid:** Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.	09

III	**Generation of High Voltages:** Generation of high voltages, generation of high D C and AC voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.	**09**
IV	**Measurements of High Voltages and Currents:** Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.	**08**
V1	**Lightning and Switching Over-voltages:** Charge formation in clouds, stepped leader, Dart leader, Lightning Surges. Switching over-voltages, Protection against over-voltages, Surge diverters, Surge modifiers.	**08**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	M. S. Naidu and V. Kamaraju, High VoltageEngineering, McGraw Hill Education,2013.
2	C. L. Wadhwa, High Voltage Engineering, New Age International Publishers, 2007.
3	D. V. Razevig (Translated by Dr. M. P. Chourasia), High Voltage EngineeringFundamentals, Khanna Publishers, 1993.
4	Kuffel, W. S. Zaengl and J. Kuffel, High Voltage Engineering Fundamentals, Newnes Publication, 2000.
5	R. Arora and W. Mosch High Voltage and Electrical Insulation Engineering, John Wiley& Sons, 2011.
6	Various IS standards for HV Laboratory Techniques and Testing

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl,by Elsevier.
2	High Voltage Insulation Engineering by Ravindra Arora, Wolfgang New Age Internationals (P) Ltd.
3	High voltage Engineering, Theory and Practice , Mazen Abdel Salam, Hussein Anis, Ahdan EI-Morshedy, Roshdy Radwan, Marcel Dekker.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. http://digital-library.theiet.org/content/journals/hve
2. http://ieeexplore.ieee.org/xpl/aboutJournal.jsp?punumber=7494695
3. https://www.sciencedirect.com/science/article/pii/S0016003213900442
4. https://www.iospress.nl/book/high-voltage-engineering/
5. https://journals.indexcopernicus.com/search/details?id=34045

Additional topics: NIL

COURSE OBJECTIVES:

This course is to know about the fundamentals and practices of insulating materials and their applications in electrical and electronics engineering, breakdown phenomenon in insulating material (solid, liquid, and gases), generation and measurement of high D.C., A.C. and impulse voltages and currents, overvoltage phenomenon in electrical power system and insulation coordination, high voltage testing techniques.

COURSE PRE-REQUISITES:

The knowledge of following subjects is essential to understand the subject:

1. Fundamentals of Electromagnetics
2. Electric Power systems
3. Electrical Measurements

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.	1
CO2	Acquire knowledge about H. V. testing of equipment and insulating materials, as per the standards.	1

CO3	Apply the concepts of generation and measurement of D. C., A.C., & Impulse voltages in real world applications	3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	_	1	1	_	1	1	_	1	1	1	1
CO2	3	1	1	1	_	1	1	_	1	1	_	1	1	1	1
CO3	3	2	2	2	_	2	2	_	2	2	_	2	2	2	2
CO4	3	3	2	2	_	2	2	_	2	2	_	2	2	2	1
CO5	3	2	2	2	_	2	2	_	2	2	_	2	2	2	1
CO6	3	2	2	2	_	2	2	_	2	2	_	2	2	2	1

CO4	Formulate, design, simulate, generate and measure high voltages and currents in high voltage laboratory.	6
CO5	Analyse the design of equipment used for high voltages and the testing methods using such equipment.	4
CO6	Explain the condition of over-voltages arise in a power system and protection against these over-voltages.	2

CO MAPPING WITH PO

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: ANALOG CIRCUITS	**SEMESTER : 6th CREDITS: 3**
COURSE CODE: BTEC-401-18 **REGULATION: 2018**	**COURSE TYPE: OPEN ELECTIVE**
COURSE AREA/DOMAIN: ELECTRONICS ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS

I	**Diode and Transistor Amplifier Circuits:** Diode Circuits, Amplifiers types: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier; biasing schemes for BJT and FET amplifiers; bias stability; transistor configurations: CE/CS, CB/CG, CC/CD and their features; small-signal analysis; low-frequency transistor models; amplifier analysis: current gain, voltage gain, input resistance and output resistance; amplifier design procedure; low frequency analysis of multistage amplifiers. High frequency transistor models.	**12**
II	**Feedback Amplifiers**: Feedback topologies: Voltage series, current series, voltage shunt and current shunt feedback; effect of feedback on gain, bandwidth, input & output impedances; concept of stability, gain margin and phase margin.	**10**
III	**Oscillators:** Introduction, Types of Oscillators, Barkhausen criterion, RC-phaseshift, Wien bridge, Hartley, Colpitts, Clapp oscillators and Non-sinusoidal oscillators.	**10**
IV	**Power Amplifiers:** Class A, B, AB and C power amplifiers, their efficiency and distortions; frequency response: single stage, multistage amplifiers and cascade amplifier.	**10**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	J Millman & A Grabel, Microelectronics, McGraw Hill
2	J Millman& C Halkias, Integrated Electronics, Tata McGraw Hill
3	A Ramakant, Gayakwad, Op-Amps And Linear Integrated Circuits, PHI
4	P Horowitz & W Hill, The Art of Electronics, Cambridge University Press
5	AS Sedra & KC Smith, Microelectronic Circuits, Saunder's College Publishi

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Electronic devices and integrated circuit- BP Singh and Rekha Singh, Pearson.
2	Electronic Devices and Circuits, S.Salivahanan,N.Suresh kumar, McGraw Hill.
3	Electronic Devices and Circuits Theory, Boylsted, Prentice Hall Publications.

4	I.J Nagarath, "Electronics Analog & Digital', PHI Privated Limted, Delhi, 2013.
5	Electronic Devices and Circuits,Balbir kumar ,shail b.jain, PHI Privated Limted, Delhi.
6	Electronic Devices and Circuits, G.S.N. Raju, I.K. International Publications, New Delhi, 2006.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. Integrated Electronics: Analog and Digital circuits and systems by Jacob Milliman and Christos C Halkias http://www.introni.it/pdf/Millman%20Halkias%20-%20Integrated%20Electronics.pdf
2. Principles of Analog Electronics by Giovanni Saggio https://books.google.co.in/books?id=eosAAgAACAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
3. Analog Electronics by Hayrettin Köymen http://www.electronics.teipir.gr/personalpages/papageorgas/download/2/shmeiwseis/ELECTRONIC_COMPONENTS/varistor/Analog_Electronics.pdf
4. Analog Electronics Raymond E. Frey Physics Department University of Oregon https://pages.uoregon.edu/rayfrey/AnalogNotes.pdf
5. Foundations of Analog and Digital Electronic Circuits anantagarwal and jeffrey h. lang https://neurophysics.ucsd.edu/courses/physics_120/Agarwal%20and%20Lang%20(2005)%20Foundations%20of%20Analog%20and%20Digital.pdf

Additional topics:

1. Voltage Multipliers
2. Regulated Power Supply

COURSE OBJECTIVES:

This course is intended to develop an understanding of small signal amplifier design using linear transistor models; and its analysis at low and high frequencies, including different feedback topologies and oscillators.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTPH104-18	Semiconductor Physics	The fundamental principles and properties of electronic materials and semiconductors
BTEE101-18	Basic Electrical Engineering	Fundamental knowledge of Electrical circuits.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the characteristics of transistors and diodes and choose proper semiconductor devices depending upon the application considering economic and technology up-gradation.	1
CO2	Employ mathematical and graphical analysis considering different practical issues modeling of semiconductor device and analyse the performance parameter of the system.	3
CO3	Design amplifier circuits using BJT's and FET's and observe the amplitude and frequency responses of common amplifier circuits.	6

CO4	Analyse the effect of negative feedback on different parameters of an amplifier and the different types of negative feedback topologies.	4
CO5	Analyse the effect of positive feedback and able to design different Oscillators using transistor's based on the given applications.	4
CO6	Develop the skill to build and troubleshoot Analog circuits.	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	_	1	1	_	1	1	1	1	1	1	1
CO2	3	3	2	1	_	_	_	_	1	1	1	2	_	2	_
CO3	3	3	2	1	1	1	1	_	1	1	1	2	2	2	_
CO4	3	3	2	1	_	_	_	_	1	1	1	2	2	2	_
CO5	3	3	2	1	_	1	1	_	1	1	1	2	2	2	_
CO6	3	3	2	1	1	1	1	1	1	1	1	2	2	2	_

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER SYSTEMS – II LABORATORY	**SEMESTER : 6Th**
COURSE CODE: BTEE-612-18 **REGULATION: 2018**	**CREDITS: 1**
COURSE AREA/DOMAIN:	**CONTACT HOURS: 2(P)hours/Week.**

SYLLABUS:

SL.NO	List of Experiments
1.	Short circuit calculations and calculations of circuit breaker ratings for a powersystem network.
2.	a) Y-bus formation using Matlab/PSCAD/Power world. b) Z-bus formulation using Matlab/PSCAD/Power world.
3.	Load flow analysis by Gauss Seidal method.
4.	Load flow analysis by Newton Raphson method
5.	To obtain power system stability on High Voltage Alternating current (HVAC) system with the help of Flexible Alternating Current Transmission Systems (FACTS) devices using Matlab/PSCAD/Power world.
6.	Optimal Capacitor placement on a system having variable reactive power and low voltage profile.

7.	To obtain relay co-ordination on a power system.
8.	To find synchronous reactances (Transient, sub-transient) during fault analysis.
9.	To study the characteristics of a distance relay.
10.	To study and design a synchronous machine for stability study using swing equation using Matlab/PSCAD/Power world.

Manual Avalilable in Lab

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Analyse a network under both balanced and unbalanced fault conditions and interpret the results.	4
CO2	Apply load flow analysis to an electrical power network and interpret the results of the analysis.	3
CO3	Demonstrate an awareness of the methods used for voltage regulation in electrical power networks.	5
CO4	Design a protection system for an item of electrical plant.	6
CO5	Use simulation tools to perform comprehensive short circuit studies, load flow studies and optimal power flow studies.	6
CO6	Analyse and solve the varieties of problems and issues coming up in the field of Power system.	4,6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	_	2	2	_	2	1	2	2	1	1	1
CO2	3	2	2	1	1	1	2	_	2	2	2	2	1	2	1
CO3	3	2	2	2	2	2	1	_	1	2	1	2	1	1	1
CO4	3	2	2	2	1	1	2	_	2	2	2	_	2	2	2

CO5	3	2	2	2	2	1	1	_	2	1		2	2	2	2
CO6	3	2	2	2	2	2	2	_	2	2	2	2	2	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: Project-1	**SEMESTER : 6Th**
COURSE CODE: BTEE-621-18 **REGULATION: 2018**	**CREDITS: 3**
COURSE AREA/DOMAIN:	**CONTACT HOURS: 9(P)hours/Week.**

Guidelines

A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.
The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.
The progress of the project to be evaluated (internal) in 8th/9th week of the semester.
A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.
The project report and the project to be submitted in the department at the time of external evaluation.

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Persue their interest in Electrical Engineering through design, research, theoretical and Practical approach.	2

CO2	Identify the topic of interest and complete the preliminary work of undertaking different case studies.	1
CO3	Analyze the problem, formulation and solution of the selected project	4
CO4	Understand the engineering, finance and management principles.	1
CO5	Demonstrate ethical and professional sustainability while working in a team and communicate effectively for the benefit of the society	5
CO6	Develop solutions for contemporary problems using modern tools for sustainable development.	5

CO MAPPING WITH PO

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2	2	2	2	_	2	_	2	2	2	2	2
CO2	3	2	2	2	2	1	1	_	1	2	_	1	2	1	1
CO3	3	2	2	2	2	2	2	2	1	1	2	2	2	2	2
CO4	3	2	2	2	2	_	_	_	2	1	1	2	1	1	1
CO5	3	2	2	_	2	2	_	_	2	2	2	2	2	2	2
CO6	3	2	2	_	2	2	2	_		2	3	1	1	1	1

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Semester VII/VIII [Fourth year]			**Branch: Electrical Engineering**				
BTEE-721-18 **One Semester Training**	**Marks**					**Total Marks**	**Credits**
	Internal				**External**		
	Mid- semester		End-semester				
Evaluation by	***Institute***	***Industry***	***Institute***	***Industry***	***External Examiner***		
Software Training & Project	50	25	50	25	200	500	16
Industrial Training & Project	50	25	50	25			
Total	**300**				**200**	**500**	**16**

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: TRAINING	**SEMESTER : 7Th**
COURSE CODE: BTEE-721-18 **REGULATION: 2018**	**CREDITS: 16**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 9(P)hours/Week.**

SOFTWARE TRAINING & PROJECT

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Define various software application domains and remember different process model used in software development.	2
CO2	Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.	1
CO3	Design the desired model and demonstrate the use of software and userinterface design principles.	4
CO4	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.	1
CO5	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.	5
CO6	Design engineering solutions to complex problems utilizing as system approach.	5

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	1	_	_	2	2	_	2	1	1	1
CO2	2	2	2	2	3	1	1	_	1	1	1	2	1	1	1
CO3	3	2	2	2	2	2	2	_	2	2	1	2	2	2	2
CO4	3	2	2	2	2	2	2	1	2	2	2	2	2	2	2
CO5	3	2	2	2	2	2	2	_	2	2	2	2	1	1	1
CO6	3	2	2	2	2	2	2	_	2	2	2	2	3	3	3

INDUSTRIAL TRAINING & PROJECT

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Apply important principles of science and engineering.	2
CO2	Recognize, express and model problems and find engineering solution based on a systems tactic.	1
CO3	Practice research in the selected fields of engineering.	4
CO4	Analyse the significance of sustainability and cost-effectiveness in design and improvements of engineering solution.	1
CO5	Evaluate the severity and consequences of the problems in the organisation and to take steps to address the problem.	5
CO6	Implement the project requiring individual and team work skills	5

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	_	_	_	2	2	2	_	2	1	1	2	1	1	1
CO2	3	2	2	2	2	2	2	1	2	2	2	2	2	2	2
CO3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	3	2	2	2	2	2	2	1	2	1	2	2	2	2	2
CO5	_	_	_	_	_	2	2	2	2	2	2	2	1	1	1
CO6	3	2	2	_	2	2	2	2	3	2	3	2	2	1	2

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Semester VII/VIII [Fourth year]					Branch: Electrical Engineering					
Sr. No.	**Course code**	**Course Title**	**L**	**T**	**P**	**Hours / Week**	**Internal Marks**	**External Marks**	**Total Marks**	**Credits**
1	BTEE-701X-18	Programme Elective-4	3	0	0	3	40	60	100	3
2	BTEE-702X-18	Programme Elective-5	3	0	0	3	40	60	100	3
3	BTOE-703X-18	Programme Elective-6	3	0	0	3	40	60	100	3
4	OXX-XXX-18	Open Elective-2	3	0	0	3	40	60	100	3
5	OXX-XXX-18	Open Elective-3	3	0	0	3	40	60	100	3
6	HSMC-XXX-18	Humanities & Social Sciences including Mgt.	3	0	0	3	40	60	100	3
7	BTEE-721-18	Project-2	0	0	12	12	120	80	200	6
8	BMPD-701-18	Mentoring and ProfessionalDevelopment of Students	-	1	0	1	50	-	50	S/US
Total			**18**	**1**	**12**	**31**	**410**	**440**	**850**	**24**

PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: POWER QUALITY AND FACTS	**SEMESTER : 8th CREDITS: 3**
COURSE CODE: BTEE-701C-18 **REGULATION: 2018**	**COURSE TYPE: PROGRAMME ELECTIVE-4**
COURSE AREA/DOMAIN: ELECTRICAL POWER QUALITY	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction :** Introduction to power quality, voltage quality. Overview of power quality, Power quality phenomenaand classification of power quality issues.	04
II	**Power Quality Measures and Standards:** THDTIF-DIN-message weights-flicker factor transient phenomena-occurrence of power qualityproblems-power acceptability curves-IEEE guides, EMC standards and recommended practices.	06

III	**Harmonic device modeling :** Harmonics background, basic concepts, Fourier analysis. Harmonics-individual and total harmonic distortion-RMS value of harmonic waveform-triplex harmonic-important harmonic introducing devices-Transformer, Three-phase power converters arcing devices-saturable devices. Harmonic distortion due to fluorescent lamps. Effect of power system harmonics on power system equipment andloads.	**10**
IV	**Fundamentals of transmission system :** Fundamentals of AC power transmission, transmission problems and needs, emergence of FACTS- FACTS control considerations, FACTS controllers.	**08**
V1	**Shunt Compensation & Series Compensation :** Principles of shunt compensation: Variable impedance type and switching converter type-StaticSynchronous Compensator (STATCOM) configuration, characteristics and control. Design principles of static series compensation: Series compensation using GCSC, TCSC and TSSC,applications, Static Synchronous Series Compensator (SSSC).	**14**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	R. C. Dugan, S. Santoso, M. F. McGranaghan, and H. W. Beaty, "Electrical Power System Quality",McGraw Hill, 2003.
2	A. Ghosh, and G. Ledwich, "Power Quality Enhancement Using Custom Power Devices", KluwerAcademic Publishers, 2012.
3	C. Sankaran, "Power Quality", CRC Press, 2002.
4	S. Sivanagaraju, and S. Satyanarayana, "Electric Power Transmission and Distribution Pearson Education", Dorling Kindersley Pvt. Ltd., Pearson Education, 2009.
5	G. Narain, N. Hingorani, and L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", Wiley, 2000.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Math H.J. Bollen, "Understanding Power Quality Problems", A John Wiley & Sons, INC., Publication.
2	FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1st Edition, 2007.
3	Kabilan Ramachandran, "Concept of Facts- Flexible AC Transmission System", Laxmi Publications.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

1. Web course on "Power Quality in distribution systems" by Dr. Mahesh Kumar Professor Department of Electrical Engineering Indian Institute of Technology Madras, available on NPTEL at https://nptel.ac.in/courses/108/106/108106025/

2. Video course on "FACTS Devices" by Prof.Avik Bhattacharya,IIT Roorkee, available on NPTEL at https://nptel.ac.in/courses/108/107/108107114/

Additional topics: NIL

COURSE OBJECTIVES:

This course deals with the various Power Quality disturbances and their effects . It helps to analyze different National and International standards related to power quality. If also gives the knowledge of various FACTS devices which are used for proper operation of existing AC system more flexible in normal and abnormal conditions.

COURSE PRE-REQUISITES:

Power Electronics and Power Systems

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the various power quality disturbances and its detrimental effects.	1
CO2	Evaluate various power quality attributes.	5
CO3	Analyse harmonics in power system and its effects.	4

CO4	Explain the importance of compensation in transmission lines and the need of FACTS devices.	4

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	_	1	1	_	1	1	1	1	1	1	1
CO2	3	2	2	2	_	2	2	_	2	2	2	2	2	2	2
CO3	3	2	2	2	_	2	2	_	2	2	2	2	2	2	2
CO4	3	2	2	1	_	1	1	_	1	2	1	1	1	1	1
CO5	3	2	2	1	_	1	1	_	1	2	1	2	2	2	2
CO6	3	2	2	2	_	2	2	_	2	2	2	2	2	2	2

CO5	Interpret the design principle and control characteristics o1f different compensators used in ac power transmission.	2
CO6	Identify the configuration of facts controllers required for given application.	1

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: MICROCONTROLLER AND PLC	**SEMESTER : 8th CREDITS: 3**
COURSE CODE: BTEE-702B-18 **REGULATION: 2018**	**COURSE TYPE: PROGRAMME ELECTIVE-5**
COURSE AREA/DOMAIN:	**CONTACT HOURS: 3(L)hours/Week.**

CORRESPONDING LAB COURSE CODE : NIL	LAB COURSE NAME: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Introduction (8 Hours) Microprocessor, Micro-controllers and their comparison. The 8051 Architecture: Introduction, 8051 micro-controller hardware, input/output, pins, ports and circuits, external memory, counters and timers,serial data input/ output, interrupts.	08
II	8051 Assembly Language Programming (8 Hours) The mechanics of programming, assembly language programming process, programming tools and techniques, instruction set (data moving, logical operations, arithmetic operations, jump and call instructions).	08
III	8051 Microcontroller Design (8 Hours) Micro-controller specification, external memory and memory space decoding, reset and clock circuits, expanding input and output (I/O), memory mapped I/O, memory address decoding, memory access times, testing the design, timing subroutines, lookup tables for the 8051, serial data transmission.	08
IV	Microcontroller Applications (8 Hours) Interfacing keyboards, displays, Digital-to-Analog (D/A) and Analog-to-Digital (A/D), multiple interrupts, serial data communications, introduction to the use of assemblers and simulators EmbeddedSystems: Introduction to PLDs and FPGA- architecture, technology and design issues, implementationof 8051 core.	08
V	Programmable Logic Controllers (PLC) (8 Hours) Introduction, operation of PLC, difference between PLC and Hardwired system, difference between PLC and Computer, relay logic and ladder logic, ladder commands and examples of PLC ladder diagramrealization, PLC timers, PLC counters, PLC classification	08

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	K. J. Ayala, “The 8051 Micro Controller-Architecture, Programming and Application”, Penram International Publication, 2000.

2	J. B. Peatman, "Design with PIC Micro Controller", Prentice Hall of India, 1998.
3	A. K. Ray, and K. M. Bhurchandi, "Advanced Microprocessors and Peripherals; Architecture,Programming and Interfacing", Tata McGraw Hill, 3rd edition, 2013.
4	M. A. Mazidi, and J. G. Mazidi, "The 8051 Micro-controller and Embedded System", PearsonEducation, 2007.
5	V. Udayashankara, and M. S. Mallikarjunaswamy, "8051 Microcontroller Hardware, Software andApplications", TataMcGraw Hill Education Pvt. Ltd., 2010.
6	S. Bhanot, "Process Control", Oxford Higher Education, 2007.
7	J. D. Otter, and J. Dan, "Programmable Logic Controller", P.H. International, Inc, 1988.
8	J. F. Hooper, "Introduction to PLCs", Carolina Academic Press, 2006.

T/R	**BOOK TITLE SUGGESTED BY FACULTY**
1	Programmable Logic Controllers: Programming Methods and Applications, 1e, by HACKWORTH, Pearson Education

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

www.automation.com **> articles**

Additional topics:

PLC Programming using Ladder Language

COURSE OBJECTIVES:

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEE-702B-18	MICROCONTROLLER AND PLC	Knowledge of Microprocessors

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the architectural difference between Microprocessor and Microcontroller	1
CO2	Develop skills in assembly Language programming of 8085	6
CO3	comprehend the application of MC 8051	5
CO4	Develop skills to configure and use different peripherals in a digital system.	6
CO5	Effectively write basic and intermediate level PLC programs	3
CO6	compile and debug a Program in PLC	6

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	0	2	1	0	2	1	3	3
CO2	3	3	3	3	3	3	3	0	2	3	0	2	2	3	3

CO3	3	3	3	3	3	3	1	0	2	1	0	2	1	2	2
CO4	3	3	3	3	3	3	3	0	2	1	0	2	1	2	2
CO5	3	3	3	3	3	3	3	0	3	3	3	2	2	3	3
CO6	3	3	3	3	3	3	3	0	2	2	0	2	3	3	3

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: INDUSTRIAL ELECTRICAL SYSTEMS	**SEMESTER : 8th CREDITS: 3**
COURSE CODE: BTEE-703A-18 **REGULATION: 2018**	**COURSE TYPE: PROGRAMME ELECTIVE-6**
COURSE AREA/DOMAIN: ELECTRICAL ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**
CORRESPONDING LAB COURSE CODE : NIL	**LAB COURSE NAME: NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Electrical System Components:** LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, Single Line Diagram (SLD) of a wiring system, contactor, isolator, relays, MPCB, electric shock and electrical safety practices	08
II	**Residential and Commercial Electrical Systems:** Types of residential and commercial wiring systems, general rules and guidelines for installation, loadcalculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.	08
III	**Illumination Systems:** Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for residential and commercial premises, flood lighting.	06
IV	**Industrial Electrical Systems I:** HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, cable and switchgear selection, lightning protection, earthing design, power factor correction- kVAR calculations, type of compensation, Introduction to	08

	PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.	
V	**Industrial Electrical Systems II:** DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS andBattery banks, Selection of UPS and battery banks. Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel metering and Introduction to SCADA system for distribution automation.	**12**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	S. L. Uppal, and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna Publishers, 2008.
2	K. B. Raina, "Electrical Design, Estimating & Costing", New Age International, 2007.
3	S. Singh, and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
4	H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.
5	Web site for IS Standards.

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**

3. **Assignments**
4. **Class test and Quiz**

E- content: NPTEL Courses

Additional topics:

COURSE OBJECTIVES:

To give a basic knowledge on residential, commercial and wiring systems. To understand the energy saving in illumination system. To gives a comprehensive idea on UPS, Elevators and industrial electrical systems.

COURSE PRE-REQUISITES:

Basic Electrical Circuit, Switchgear and protection

COURSE OUTCOMES:

S.NO	DESCRIPTION	Bloom's Level (B.L)
CO1	Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD	1
CO2	Explain the role & importance of various components used in industrial electrical systems.	3
CO3	Analyze and select the proper size of various electrical system components.	4
CO4	Evaluate different types of lighting designs and applications	5
CO5	Perform calculations on photometric performance of light sources and luminaries for lighting design.	5
CO6	Implement various control and automation method in Electrical systems.	6

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	_	_	_	1	1	_	1	_	2	1	1	_	1
CO2	3	1	_	_	_	1	1	_	1	1	_	1	1	_	1
CO3	3	2	2	2	_	2	2	_	2		2	1	1	_	1
CO4	3	2	2	2	_	2	2	_	2		2	1	1	_	1
CO5	3	3	2	2	_	2	2	_	2		2	1	1	_	1
CO6	3	1	2	2	2	2	2	_	2		2	2	1	2	2

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: WIRELESS COMMUNICATION	**SEMESTER : 8th CREDITS: 3**
COURSE CODE: BTEC-601-18 **REGULATION: 2018**	**COURSE TYPE: OPEN ELECTIVE- 2**
COURSE AREA/DOMAIN: ELECTRONICS ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Elements of Cellular Radio Systems Design:** Basic cellular system, Performance criteria, Components and Operation of cellular systems, Planning a cellular system, Analog & Digital cellular systems, Concept of frequency reuse channels, Co-channel interference, Reduction factor, desired C/I for a normal case in an omni directional antenna system, Cell splitting.	**8**

II	**Digital Communication through fading multipath channels:** Fading channels and their characteristics- Channel modeling, Digital signaling over a frequency non selective slowly fading channel. Concept of diversity branches and signal paths. Combining methods: Selective diversity combining, Switched combining, Maximal ratio combining, Equalgain combining.	**8**
III	**Multiple Access Techniques for Wireless Communications:** Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Packet Radio Protocols; Pure ALOHA, Slotted ALOHA.	**8**
IV	**Wireless Systems & Standards:** AMPS and ETACS, United states digital cellular (IS- 54 & IS 136), IEEE Standards, Global system for Mobile (GSM): Services, Features, System Architecture and Channel Types, Frame Structure for GSM, Speech Processing in GSM, GPRS/EDGE specifications and features. 3G systems: UMTS & CDMA 2000 standards and specifications. CDMA Digital standard (IS 95): Frequency and Channel specifications, ForwardCDMA Channel, Reverse CDMA Channel, Wireless Cable Television.	**10**
V	**Evolution of Communication Generations:** Introduction to Bluetooth, Zigbee, LTE-Advance systems, 4G & 5G Mobile techniques and Emerging technologies.	**8**

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	T.S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson Education Asia, 2010.
2	William C Y Lee, Mobile Cellular Telecommunications, 2nd Edition, MGH, 2004.
3	Raj Pandya, ―Mobile and Personal Communication systems and services‖, Prentice Hall of India, 2001.
4	Wireless and Digital Communications; Dr. Kamilo Feher (PHI), 1998

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	T.S. Rappaport, Wireless Communications: Principles and Practice, 2nd Edition, Pearson

	EducationAsia, 2010.
2	Wireless Communication Networks by William Stallings

DELIVERY/INSTRUCTIONAL METHODOLOGIES/ TEACHING PEDAGOGY:

1. **Lecture and discussion/ questioning**
2. **Seminars and presentation**
3. **Assignments**
4. **Class test and Quiz**

E- content:

- NPTEL Courses

Additional topics:

- NS-2 Software

COURSE OBJECTIVES:

This is one of the fundamental courses meant to understand the important concepts related to Wirelesscommunication using suitable mathematical models.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEC-601-18	**Wireless communication**	**Basic knowledge of communication concepts**

COURSE OUTCOMES:

S.No	Description	BT Level
CO1	Understand the basic elements of Cellular Radio Systems and its design.	2
CO2	Analyse the concepts Digital communication through fading multipath channels	4
CO3	Explain various Multiple Access techniques for Wireless communication	4
CO4	Compare different technologies used for wireless communication systems	4
CO5	Analyse the functions of wireless communication system and evolution of different wireless communication systems and standards.	4
CO6	Discuss the emerging technologies in wireless communication.	5

CO MAPPING WITH PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	2	1	0	0	0	0	2	1	1	1
CO2	3	2	3	1	1	2	1	0	0	0	0	2	2	2	2
CO3	3	2	2	1	2	2	1	0	0	0	0	2	1	1	1
CO4	3	2	3	1	1	2	1	0	0	0	0	2	1	1	1
CO5	3	3	3	1	3	2	1	0	0	0	0	2	2	2	2
CO6	3	1	3	1	1	2	1	0	0	0	0	2	1	1	1

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PROGRAMME: ELECTRICAL ENGINEERING	**DEGREE: BTECH**
COURSE: SATELLITE COMMUNICATION	**SEMESTER : 8th CREDITS: 3**

COURSE CODE: BTEC-906B-18 **REGULATION: 2018**	**COURSE TYPE: OPEN ELECTIVE- 3**
COURSE AREA/DOMAIN: ELECTRONICS ENGINEERING	**CONTACT HOURS: 3(L)hours/Week.**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction to Satellite Communication:** Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication, Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.	8
II	**Satellite sub-systems:** Study of Architecture and Roles of various sub-systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC & M), Altitude and orbit control system (AOCS), Communication sub-system, power sub-systems etc.	8
III	**Typical Phenomena in Satellite Communication:** Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA), Packet Radio Protocols; Pure ALOHA, Slotted ALOHA.	8
IV	**Satellite Link Design:** AMPS and ETACS, United states digital cellular (IS- 54 & IS 136), IEEE Standards, Global system for Mobile (GSM): Services, Features, System Architecture and Channel Types, Frame Structure for GSM, Speech Processing in GSM, GPRS/EDGE specifications and features. 3G systems: UMTS & CDMA 2000 standards and specifications. CDMA Digital standard (IS 95): Frequency and Channel specifications, ForwardCDMA Channel, Reverse CDMA Channel, Wireless Cable Television.	10
V	**VSAT Satellite Systems**: Introduction to Bluetooth, Zigbee, LTE-Advance systems, 4G & 5G Mobile techniques and Emerging technologies.	8

TEXT/REFERENCE BOOKS:

S.NO	BOOK TITLE/AUTHORS/PUBLICATION
1	Trimothy Pratt, Charles W. Bostian, ―Satellite Communications‖, John Wiley & Sons, 1986.
2	Dr. D.C. Aggarwal, ―Satellite Communications, Khanna Publishers, 2001.
3	Dennis Roddy, ―Satellite Communications‖, McGraw Hill, 1996.

T/R	BOOK TITLE SUGGESTED BY FACULTY
1	Dr. D.C. Aggarwal, ―Satellite Communications, Khanna Publishers, 2001.

E- content:

- NPTEL Course

Additional topics:

- Designing of Satellite Antenna

COURSE OBJECTIVES:

This is one of the fundamental courses meant to understand the important concepts related to Wireless communication using suitable mathematical models.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION
BTEC-906B-18	**Satellite Communication**	**Basic knowledge of communication concepts**

COURSE OUTCOMES:

S.No	Description	BT Level
CO1	Understand the functioning of wireless communication system and orbital mechanics.	2
CO2	Visualize the architecture of satellite systems as a means of high speed, high range communication system.	2
CO3	State various aspects related to satellite systems such as orbital equations, sub-systems in a satellite, link budget, modulation and multiple access schemes.	2
CO4	Analyse the typical Phenomena in Satellite Communication and the technical challenges.	4
CO5	Analyse the general Link Design equation and the concepts related to it.	4
CO6	Discuss the architecture of VSAT system and its applications.	5

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