SANDIP UNIVERSITY

Courses of Study

2019-20

B.Tech Electrical Engineering

IILP

SANDIP UNIVERSITY

School of Engineering and Technology

B.Tech. (Part Time) Electrical Engineering 2018-19

Semester	Course I				Course II				Course III				Course IV				Course V				Course VI				Course VII				Course VIII	L	T	P	C	Contact Hours
I	TYBS101				TYEE102				TYEE103				TYEE104				TYHS111				Code				Code				Code	14	1	6	18	21
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C						
	3	1	0	**4**	4	0	0	**4**	3	0	2	**4**	3	0	2	**4**	1	0	2	**2**	0	0	0	**0**	0	0	0	**0**						
	BS				PC				PC				PC				HSS																	
	Algebra and Differential Calculus Statistics, Probability				Material Science				Measurement & Instrumentation				Numerical Programming				Communication Skills																	
II	TYBS201				TYEE201				TYEE202				TYEE203				TYES201								Code				Code	15	1	8	20	24
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C						
	3	0	2	**4**	3	0	2	**4**	3	0	2	**4**	3	1	0	**4**	3	0	2	**4**	**0**	0	0	**0**	0	0	0	**0**						
	BS				PC				PC				PC				ES																	
	Applied Physics and Chemistry				Analog & Digital Electronics				Electrical Machine -I				Network Analysis				Fundamentals of Computing & Open Source Technology																	

SANDIP UNIVERSITY

School of Engineering and Technology

Semester	Course I				Course II				Course III				Course IV				Course V				Course VI				L	T	P	C	Contact Hours
III	TYEE301				TYEE302				TYEE303				TYEE304				TYEE311				Code				12	0	6	18	18
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C					
	3	0	2	**4**	3	0	2	**4**	3	0	0	**3**	3	0	2	**4**	0	0	0	**3**	0	0	0	**0**					
	PC				PC				PC				PC				PWSI												
	Electrical Machine -II				Microcontroller Applications				Industrial Electronics				Power Electronics				Internship I												
IV	TYEE401				TYEE402				TYEE403				TYEE404				TYHS401				TYEE411				14	0	10	19	24
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C					
	3	0	0	**3**	3	0	2	**4**	3	0	0	**3**	3	0	2	**4**	2	0	2	**3**	0	0	4	**2**					
	PC				PC				PC				PC				HSS												
	Power System -I				Control System-1				HVDC Transmission				Industrial Drives				Technical Communication				Seminar								

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Semester	Course I	Course II	Course III	Course IV	Course V	Course VI	L	T	P	C	Contact Hours
V	TYEE501	TYEE502	TYEE503	TYEE504	TYEE511	TYEE512	12	0	10	21	22
	L T P C: 3 0 2 **4**	L T P C: 3 0 0 **3**	L T P C: 3 0 0 **3**	L T P C: 3 0 2 **4**	L T P C: 0 0 0 **4**	L T P C: 0 0 6 **3**					
	PC	PC	PC	PC	PWSI	PWSI					
	Computer Aided Machine Design	Control System-II	High Voltage Engineering	Power System - II	Internship II	Mini Project					
VI	TYEE601	TYEE602	TYEEE--	TYEEE--	TYEEO--	TYEE611	15	0	10	20	25
	L T P C: 3 0 2 **4**	L T P C: 3 0 2 **4**	L T P C: 3 0 0 **3**	L T P C: 3 0 0 **3**	L T P C: 3 0 0 **3**	L T P C: 0 0 6 **3**					
	PC	PC	PCE	PCE	OE	PWSI					
	PLC & SCADA Systems	Switchgear & Protection	DEI	DEII	OEI	Project Stage I					

SANDIP UNIVERSITY

School of Engineering and Technology

Semester	Course I				Course II				Course III				Course IV				Course V				Course VI				L	T	P	C	Contact Hours
VII	TYEE701				TYEEE--				TYEEO--				TYEE711				TYEE712				Code				9	0	18	24	27
	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C	L	T	P	C					
	3	0	2	**4**	3	0	0	**3**	3	0	0	**3**	0	0	16	**8**	0	0	0	**6**	0	0	0	**0**					
	PC				PCE				OE				PCE				PWSI												
	Power system Operation and Control				DEIII				OEII				Project Stage II & Viva Voce				Internship III												

Department Elective I					
Energy Studies					
Course Code	Course	L	T	P	C
TYEE603	Energy Management	3	0	0	3
TYEE603	Energy Analysis	3	0	0	3
TYEE603	Energy Markets	3	0	0	3
TYEE603	Energy Storage	3	0	0	3
TYEE603	Renewable Energy Services	3	0	0	3

Department Elective II					
Electrical Applications					
Course Code	Course	L	T	P	C
TYEE604	Electric Vehicles	3	0	0	3
TYEE604	Utilization of Electric Energy	3	0	0	3
TYEE604	Smart Energy	3	0	0	3
TYEE604	Battery Management System	3	0	0	3
TYEE604	Robotics and Automation	3	0	0	3

Department Elective III					
Advanced Electrical Engineering					
Course Code	Course	L	T	P	C
TYEE702	Sustainable Energy Technology	3	0	0	3
TYEE702	Extra High Voltage	3	0	0	3
TYEE702	FACTs Controller	3	0	0	3
TYEE702	Power Quality	3	0	0	3
TYEE702	Smart Grid	3	0	0	3

Year: Second Year **Semester: I**
Course: Algebra and Differential Calculus statistics, Probability **Course Code: TYBS101**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3			Theory		
3	1	-	4	20	20	10			50		100
Max. Time, End Semester Exam (Theory) -3Hrs.									End Semester Exam (Lab) - 2Hrs.		

Prerequisite

1. Basic knowledge of fundamental mathematics.
2. Fundamentals of Power Converter

Course Objectives	
1	To be familiar with linear differential equations of higher order applicable to control systems.
2	To study complex functions, conformal mappings, contour integration applicable to electrostatics, digital filters, signal and image processing.
3	To study differentiation and integration vectors.
4	To be familiarize with Z- transform and their applications.
5	To be thorough with applications to control systems and signal processing.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Linear Differential Equations** :- Solution of linear differential equations of first order, solution of nth order linear differential equations with constant coefficients.	12
	II	**Applications of Linear Differential Equations:** Method of variation of parameters, applications in simple electrical circuit.	
2	I	**Laplace Transform:** Laplace transforms, properties and Theorems on them, Laplace transform of standard functions, inverse Laplace transform.	10
	II	**Laplace transform of standard functions**:Laplace transform of some special functions like - periodic, unit step, unit impulse; applications of Laplace transform for solving differential equations.	
3	I	**Z - Transform:** Introduction and definition of Z - Transform, standard properties of Z - Transform, Z - Transform of standard sequences and their region of convergence.	9
	II	**Inverse Z - Transform:** Inverse Z-transform, solution of difference equations by using Z-Transform.	
4	I	**Vector Differentiation**: Basics of vector differentiation, vector differential operator, gradient, divergence and curl, directional	10

		derivative, solenoidal, irrotational fields, scalar potential.	
	II	**Vector Integration:** Standard vector identities, line integral, Green's Lemma and its applications	
5	I	**Complex Variables:** Functions of complex variables, analytic functions, Cauchy-Riemann equations, Cauchy's integral Theorem	11
	II	**Complex Variables (continued):** Cauchy's integral Theorem, Cauchy's integral formula, residue Theorem, bilinear transformation.	
		Total No. of Hrs	52

Beyond the Syllabus
Introduction of Fourier series and fourier transforms. Solutions of simultaneous linear equations. Gauss divergence theorem and stokes theorem

Course Outcome	
Students should able to	
CO1	solve linear differential equations and apply them on simple electric circuit.
CO2	gain the basic knowledge of Laplace transform and their applicability in solving initial value problems.
CO3	understands the new notion of Z- transform and their usability in solving difference equations.
CO4	solve the problems on vector derivatives and integrations.
CO5	gain the knowledge of complex analysis and its application electrical engineering problem.

RecommendedResources	
Text Books	1. Ervin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley and Sons. 2. S.R.Sakhare, B.S.Waghe, S. M. Bhati, Naveen Mani, Engineering Mathematics- III (Electrical & Instrumentation Branch), Gigatech Publishing House, Pune [ISBN: 978-81-938081-0-8]
Reference Books	1.B. S. Grewal, Higher Engineering Mathematics, 43rd edition, Khanna Publishers.
E-Resources	http://nptel.ac.in/syllabus/108106070/

Year: Second Year **Semester: I**
Course: Material Science **Course Code: TYEE102**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3		Lab	Theory	Lab	
4	0	0	4	20	20	10			50		100
Max. Time, End Semester Exam (Theory) -3Hrs.											

Prerequisite 1. Basic knowledge of fundamental physics.

Course Objectives	
1	To understand the properties of insulating material and dielectric strength.
2	To understand properties and application of insulating material and gases.
3	To understand the concept and properties of conducting material.
4	To understand the properties of magnetic material and their classification.
5	To learn testing of materials as per the IS Standard.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Dielectric Properties of insulating Materials:** Static Field, Parameters of Dielectric material, Introduction to Polar and Non-Polar dielectric materials. Mechanisms of Polarizations, Piezo-Electric & Ferro-Electric Materials, Dielectric loss and loss tangent. Dielectric strength, factors, dielectric loss, dissipation factor.	6
	II	**Dielectric Breakdown:** Introduction, Concept of Primary and Secondary Ionization of Gases, Breakdown Voltage, Breakdown Strength, Factors affecting BD Strengths of Solid, Liquid and Gaseous dielectric materials.	4
2	I	**Insulating Materials:** Properties- thermal, chemical, mechanical & electrical. Classification. **Solid Insulating Materials:** Paper, Press Board, Fibrous Materials, Ceramics, Mica, Asbestos, Resins, Ceramics.	6
	II	**Liquid Insulating Materials:** Transformer Oil, Mineral Insulating Oil, Synthetic Insulating Oil, Varnish. **Insulating Gases:** Air, SF6, Nitrogen, Hydrogen. **Application of Insulating Materials:** Power & Distribution Transformers, Rotating Machines, Cables, and Line Insulators .	4
3	I	**Conducting Materials:** General, Classification of conducting materials, Low resistivity Materials - Copper, Aluminium, steel and its properties, Copper Alloy-brass and bronze, High resistivity materials, Tungsten Constantan, Carbon and nichrome, Superconductivity Materials and application.	4
	II	**Conductor materials** For overhead lines, underground cables,	4

		electrical machines winding, resistor, bus bar. Thermal conductivity of matter, superconductivity. Materials of MHD generator, Fuel cells, Thermoelectric generators, Thermionic conductors.	
4	I	**Magnetic Materials:** Characteristics, Parameters of Magnetic material, B-H curve for different magnetic materials, Factors affecting permeability and hysteresis, Magnetic resonance, loss of magnetism, eddy current loss.	5
	II	**Classification of Magnetic Materials:** Magnetic circuit, Electromagnet, permanent magnet, Diamagnetism, Para-magnetism, Ferromagnetism, Ferri-magnetism, Curie-Weiss law, Ferrites , Ferro-magnetic Materials, Magnetic materials for Electric Devices such as Transformer Core, Core of Rotating Machines, Hard Magnetic Materials.	5
5	I	**Testing of materials as per IS standard** **Testing of Materials:** Explanation of following with objectives, equipment required, circuit diagrams and observations to be taken. 1. Measurement of Dielectric Strength of Solid Insulating Material-IS 2584. 2. Measurement of Dielectric Strength of Liquid Insulating Material – IS 6798. 3. Measurement of Dielectric Strength of Gaseous Insulating Material as per IS.	5
	II	**Material for special purposes:** thermocouples, bimetals and lead, fuse material, soft and hard solder, material used for contacts.	3
		Total No. of Hrs	**46**

Beyond the Syllabus
1.Introduction of specific Materials for Electrical, Electronics, Computers, Instruments, Robotics.
2.Introduction of recent Advances and Emerging Trends in Electrical and Electronic Materials.
3.Introduction of optical Properties of Materials

Course Outcome	
Students should able to	
CO1	Understand dielectric breakdown and dielectric properties of insulating material.
CO2	Application of insulating material in power system equipments and cables
CO3	Understand utilization of conducting material and its application in electrical gadgets.
CO4	Classify various magnetic material.
CO5	Capable to apply various testing techniques by IS standards.

RecommendedResources	
Text Books	1.Gupta and Sharma, "Electrical Engineering Materials", Satya Prakashan 2.S. P. Seth, "A Course in Electrical Engineering Materials", Dhanpat Rai and
Reference Books	1.K. B. Raina & S. K. Bhattacharya, "Electrical Engineering Materials", S.K. Kataria & Sons.
E-Resources	http://nptel.ac.in/courses/122102008/

Year: Second Year **Semester: I**

Course: Measurement & Instrumentation **Course Code: TYEE103**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3		Lab	Theory	Lab	
3	0	2	4	20	20	10		25	50	25	150
Max. Time,End Semester Exam (Theory) -3Hrs.									End Semester Exam (Lab) - 2Hrs.		

Prerequisite	**1. Basic knowledge of fundamental physics** **2. Solution of simultaneous equation.**

Course Objectives	
1	To provide the knowledge of system of units, classification and essentials of measuring instruments.
2	To get the knowledge about the range extension methods for DC & AC instruments.
3	To implement the measuring instruments in real life application.
4	To get the knowledge about various types of energy meter.
5	To get the knowledge about various types of transducers.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction to Electrical Measuring Instruments:** Standards and classification, static and dynamic Characteristics of measuring instruments, Error & Error analysis	6
	II	**Analog Instrument** Definition of analog & digital instruments, Classification of analog instruments, their operating principle, Operating force, Types of supports, Damping, Controlling	3
2	I	**Types of Measuring Instruments (Ammeter & Voltmeter):** Construction, working principle, torque equation, advantages and disadvantages of Permanent Magnet Moving Coil (PMMC) and Moving Iron (MI) (attraction and repulsion).	4
	II	**Introduction to Range Extension:** PMMC ammeters and voltmeters using shunts, multipliers. Universal shunt, universal multiplier.	4
3	I	**Instrument Transformers:** Construction, connection of CT & PT in the circuit, advantages of CT / PT over shunt and multipliers, transformation ratio, turns ratio, nominal ratio, burden, ratio and phase	6

		angle error.(descriptive treatment only) Range extension of voltmeter, ammeter & wattmeter using CT/ PT.	
	II	**Measurement of Resistance:** Measurement of low, medium and high resistance. Wheatstone bridge, Kelvin's double bridge, ammeter-voltmeter method, Megger, loss of charge method.	4
4	I	**Measurement of Power:** Construction, working principle, torque equation, errors and their compensation, advantages and disadvantages of Electrodynamometer type wattmeter, poly-phase wattmeter. Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method.	5
	II	**Measurement of Energy:** Construction, working principle, torque equation, errors and adjustments of single phase conventional (induction type) energy meter. Calibration of energy meter. Block diagram and operation of electronic energy meter. Three phase energy meter.	5
5	I	**Transducers:** Introduction, classification, basic requirements for transducers, Primary & secondary transducers, types of electrical transducers: resistive, inductive, capacitive	3
	II	**Displacement Measurement:** LVDT & RVDT – construction, working, application, null voltage, specifications, advantages & disadvantages, effect of frequency on performance.	5
		Total No. of Hrs	45

Beyond the Syllabus
Introduction of various types of ohmmeter. Introduction of strain gauge. Introduction of sensor.

Course Outcome	
Students should able to	
CO1	Understand various characteristics of electrical measuring instruments and their working.
CO2	Understand the range extension methods for DC & AC instruments.
CO3	Apply measurement techniques for measurement of resistance.
CO4	Understand calibration procedure of energy meter.
CO5	Apply operation of transducer in instrumentation.

List of Experiments	
Sr. No.	**Description**
1	Extension of instrument range: ammeter, voltmeter, watt meter using CT & PT.
2	Measurement of resistance by ammeter voltmeter method
3	Measurement of low resistance using Kelvin's double bridge.
4	Measurement of active & reactive power in three phase circuit using two wattmeter methods (balanced & unbalanced loads).
5	Measurement of active & reactive power in three phase balanced circuit using one wattmeter method with two way switch
6	Calibration of single phase static energy meter at different power factors.

RecommendedResources	
Text Books	1. A K. Sawhney, "A Course in Electrical and Electronic Measurements & Instrumentation", Dhanpat Rai & Co.
Reference Books	1. E. W. Golding & F. C. Widdies, "Electrical Measurements & Measuring Instruments", Wheeler Pub.
E-Resources	http://nptel.ac.in/syllabus/108106070/

Year : Second **Semester: I**

Course: Numerical Programming **Course Code: TYEE104**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3		Lab	Theory	Lab	
3	0	2	4	20	20	10		25	50	25	150
Max. Time,End Semester Exam (Theory) -3Hrs.									End Semester Exam (Lab) - 2Hrs.		

Prerequisite	**Algorithms** **Basic Mathematics**

Course Objectives	
1	To learn and acquire art of programming.
2	To learn basics of C programming
3	To use decision making & looping statements in the programs.
4	To be able to write programs using functions.
5	To be able to write programs using pointers and programs using file handling.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction to C:** History, Structure of a C program, Functions as building blocks, C Program development life cycle. C Preprocessor: Format of Preprocessor directive, Conditional compilation. C Tokens: Keywords, Identifiers, Variables, Constants – character, integer, float, string, escape sequences, Data types – built-in and user defined , Operators and Expressions Operator types (arithmetic, relational, logical, assignment, bitwise, conditional , other operators) , precedence and associativity rules.	7
2	I	**Input , Output & Control Structures**: Character for input and output, String input and output, Formatted input and output. Control Structures: Decision making structures, If, if-else, switch, Loop Control structures, While, do-while, for Nested structures, switch, break, continue.	7
3	I	**Functions & Arrays in C:** Advantages of Functions, User defined functions, Declaration, definition, function call, parameter passing (by value), return keyword, Scope of variables, storage classes, Recursion. **Arrays:** Array declaration, initialization, Types, Passing arrays to functions.	9
4	I	**Structures and Unions:** Creating structures, Accessing structure members (dot Operator), Array of structures, Passing structures to functions, Nested structures, Pointers and structures, Unions, Difference between structures and unions	6

5	I	**Pointers & strings in C Language:** Pointer declaration, initialization, Dereferencing pointers, Pointer arithmetic, Pointer to pointer, Arrays and pointers, Functions and pointers – passing pointers to functions, **Strings**: Declaration and initialization, Standard library functions, Strings and pointers, Array of strings.	9
		Total No. of Hrs	38

Beyond the Syllabus
Electrical application using C Programming

Course Outcome	
Students should able to	
CO1	Understand Basics of C language
CO2	Understand input and output in C Programming for data handling
CO3	Work with functions and arrays used in C language
CO4	Use structure and unions in simple programmes in C language
CO5	Handle pointers and strings

List of Experiments	
Sr. No.	**Description**
1	Write a program in C language to find Transpose of Given Square Matrix
2	Write a program in C language to find addition of ten numbers
3	Write a program in C language for multiplication of two numbers
4	Write a program in C language for factorial of a number
5	Write a program in C language to find Inverse of 3 x 3 Matrix in 10 Lines
6	Write a program in C language to Multiply Two 3 X 3 Matrices
7	Write a program in C language to copy the contents of one file into another file
8	Write a program in C language to prepare a table of size m X n
9	Write a program in C language to use for loop, while loop , do while loop & compare them
10	Write a program in C language to sort the list of Strings

RecommendedResources	
Text Books	1. Understanding C by Yashwant Kanetkar
Reference Books	**1.** Brain W. Kernighan & Dennis M.Ritchie -The C Programme Language 2ndEdi, ANSI features) Prentice Hall. **2.** Byrons, Gottfried.-Programming in C Schaum's Series. **3.** Forouzan and Gilberg : Structured Programming approach using C, Thomson learning publications **4.** Herbert Schildt : Complete C Reference

SANDIP UNIVERSITY

School of Engineering and Technology

Common to All

Year: First Year **Semester:I**

Course: English Communication Skill (HSS) **Course Code: TYHS111**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Orals**	**Lab**	
1	-	2	2	10	20	10	10	50	-	-	100
Max. Time,End Semester Exam									**End Semester Orals –1 Hr.**		

Prerequisite	1. Functional grammar-Parts of speech, Tenses, Sentence pattern 2. Formal letter 3. Fluency in reading and speaking

Course Objectives	
1	To acquire basic language skills (LSRW) to communicate with speakers of English language.
2	To develop their intellectual, personal and professional abilities.
3	To develop skill to communicate fluently.
4	To enhance team building and time management skills.
5	To inculcate employability skills among students.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**English Vocabulary building:** Affixes, Prefixes & Suffixes	3
	II	Word building- Compound words, Standard Abbreviations	2
	III	Antonyms and Synonyms- functional usage	2
	IV	Active & Passive voice	2
2	I	**Writing skills:** Parts of speech	3
	II	Paragraph writing	2
	III	Use of Idioms, Phrases and Proverbs in sentences	2
	IV	Basic sentence pattern	1
	V	Importance of punctuation	1
3	I	**CALL- Computer Assisted Language Laboratory** Listening exercises- Extempore	4
	II	Vocabulary building -Task based Lab Activities	5
	III	Language fluency Linguistic accuracy & Communicative fluency	5
	IV	Listening to varied registers-Role play - Situational Dialogues	2
	V	Pronunciation, Intonation, Stress and Rhythm- Public speaking	4

4	I	**Oral & Written Presentation** Tenses	2
	II	Ice breaking, reporting, Question & answer skill	2
	III	Formal & Informal speech	3
		Total No. of Hrs	45

Beyond the Syllabus
Self Introduction, SWOT/SWOC, Group Discussion

Course Outcome	
Students should able to	
CO1	Students will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
CO2	Students will be able to write formal letters effectively.
CO3	Students will be able to prepare, organize and deliver oral presentation.
CO4	Students will develop reading speed and build academic vocabulary.
CO5	Students will demonstrate behavior and attitudes appropriate to university environment.

List of Experiments	
Sr. No.	**Description**
1	**Module 1** **CALL- Computer Assisted Language Laboratory** Listening exercises- Extempore
2	**Module 2** Vocabulary building -Task based Lab Activities
	Module 3 Language fluency Linguistic accuracy & Communicative fluency
	Module 4 Listening to varied registers-Role play - Situational Dialogues
	Module 5 Pronunciation, Intonation, Stress and Rhythm- Public speaking

RecommendedResources	
Text Books	1. Communication Skills by Sanjay Kumar and PushpaLata, Oxford University Press. 2. Developing Communication Skill by Krishna Mohan, MeeraBanerji, McMillan India Ltd. 3. English for Business Communication by Simon Sweeney, Cambridge University Press. 4. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
Reference Books	1. Ethics in Engineering Practice and Research by Caroline &Whitbeck, Cambridge University Press. 2. Basic Managerial Skills by E. H. McGrath, Eastern Economy Edition, Prentice hall India. 3. Change Your Thoughts; Change Your Life by Wayne Dyer, Hay House India, ISBN-139788189988050. 4. The Power of Your Subconscious Mind by Dr Joseph Murphy MaanuGraphics , ISBN-13 9789381529560. 5. Baltra, A. (1986). "Computer assisted language learning: What is it all about?" Paper presented at a conference at the University of California, Irvine. 6. Jones, C. (1986). It's not so much the program, more what you do with it: The importance of methodology in CALL. "System, 14"(2), p.171-78. 7. Rivers, W. (Ed.). (1987) "Interactive language teaching." NY: Cambridge University Press.
E-Resources	https://www.britishcouncil.in/sites/default/files/esfe_report.pdf https://www.britishcouncil.org/sites/default/files/english-soft-skills-maghreb-research-report.pdf http://nptel.ac.in/courses/109104030/references/references.pdf http://promeng.eu/downloads/training-materials/ebooks/soft-skills/effective-communication-skills.pdf

Year: First Year **Semester: II**

Course: Applied Physics & Applied Chemistry **Course Code:TYBS201**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**		**Lab**	**Theory**	**Lab**	
3	0	2	4	20	20	10		50	50	-	150
Max. Time, End Semester Exam (Theory) -3Hrs.											

Prerequisite	1. Introduction and basic concepts of derivative and integration of functions. 2. Basic concepts andmethods to solve simultaneous equations, quadratic equations.

Course Objectives	
1	To solve System of linear equations using matrix methods.
2	To understand partial differentiation with their applications stationary values arising in engineering optimization problems.
3	To solve ordinary differential equations
4	To understand the basic concepts of statistics and probability

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**LASER** Laser - introduction, difference between ordinary source of light and laser. Properties of laser, Absorption, spontaneous and stimulated emission, population inversion, pumping and types of pumping. Active medium, Components of laser. Three level and four level system, Ruby laser, He-Ne laser, Applications of laser industrial, medical etc. Holography.	8
2	II	**Semiconductor physics** Introduction to formation of energy bands in solids. Classification of solids, electrical conductivity in conductor and semiconductors. Influence of external factors on conductivity (temperature, impurity), Hall effect.	6
3	III	**Superconductivity** : properties of superconductor, Meissner effect, isotope effect, persistent current, critical current density, critical	6

		magnetic field,BCS theory of superconductivity, type-I and type-II superconductors. DC and AC Josephson effect, SQUIDS, application of superconductivity like magnets, transmission line, levitation, etc.).	
4	IV	UNIT-I : WATER TECHNOLOGY Boiler problems- scale, sludge, priming, foaming, caustic embritlment, and corrosion, causes, preventions, and disadvantages. Water softening processes (external and internal treatment methods) – Zeolite process, Ion exchange method, Desalination, Reverse osmosis & Electrodialysis. Phosphate conditioning, colloidal conditioning, calgon conditioning for boiler feed water.	10
5	V	UNIT III: POLYMER Degree of polymerisation, classification of polymers based on sources, composition, structure etc., Types of polymerisation- addition and condensation polymerisation, free radical mechanism of addition polymerisation. compounding of plastics, glass transition temperature and factors affecting it. Important polymers- Preparation, properties and Engineering uses. Thermoplastics, Thermosetting plastics, polythene (LDPE and HDPE), Polycarbonate,Nylon-6,Nylon-66, , Rubber, processing of natural rubber, vulcanization of rubber, synthetic rubber, Natural and synthetic rubber.	10
		Total No. of Hrs	40

Beyond the Syllabus

Course Outcome	
Students should able to	
CO1	Student will able to understand basics involved in lasers.
CO2	Student will able to classify solids, will understands the concepts involved in conductivity.
CO3	Student will be able to understand basic concepts of superconductivity.
CO4	Student will be able to understand impurities in water and their treatment methods.
CO5	Student will be understand preparation, properties and applications of some polymers.

List of Experiments
1. To determine the wavelength of laser by using plane diffraction grating
2. To Determine the sound absorption coefficient
3. To study Hall effect
4. To determine band gap of semiconductor
5. Identify and determination of type and amount of alkalinity in given water sample
6. Performing titration of Strong acid Vs Weak base by using PH Meter
7. Determining Hardness of given water sample By EDTA method
8. Preparation of phenol formaldehyde resin .

RecommendedResources	
Text Books	1. A text book of Engg. Physics by M. N. Avadhalula and P. G. Kshirsagar, S. Chand Pub. 2. Engg. Physics by Abhijit Nayak, S. K. Kataria and sons Pub. 3. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi(2003) 4. A Text book of Engineering Chemistry by Dr S S Dara, Dr S S Umare, S Chand & company Ltd. 5. Engineering Chemistry - Sunita Rattan 6. Engineering Chemistry, K. Shesha Maheshwari, Mridula Chug, Pearson,2018
Reference Books	1. Engineering Physics, malik and singh, Tata Mc Graw Hill . 2. A textbook of engineering Physics, Pillai, sivakami, new age International, limited 3.Corrosion Engineering ,Fontenna & Greene 4. Chemistry, Raymond Chang. (Tata McGraw Hill).
E-Resources	

Year: Second Year **Semester: II**

Course: Analog and Digital Electronics **Course Code: TYEE201**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**		**Lab**	**Theory**	**Lab**	
3	0	2	4	20	20	10		25	50	25	150
Max. Time, End Semester Exam (Theory) -3Hrs.									**End Semester Exam (Lab) - 2Hrs.**		

Prerequisite 1. Knowledge of Fundamental of Electronics.

Objectives	
1	To provide the concept of various components & basic knowledge of designing Analog and digital circuits.
2	Understand and apply IGBT to control system and observe its performance parameter
3	Demonstrate and Analyze Operational Amplifier circuits and their applications
4	To familiarize with gate circuits there applications
5	To demonstrate various counters, flip flops and shift register.

Unit Number	Details	Hours
I	**Introduction:** BJT, DIAC, TRIAC, Diode, FET, MOSFET Transistor – Symbol, Construction, Equivalent Circuit, Operation, Characteristics & Parameters, Applications.	11
II	**IGBT–**Basic Structure and Operation, Static Characteristics, Dynamic Switching Characteristics, Input and Output Characteristics, IGBT Performance Parameters, Gate Drive, Protection, Applications.	8
III	**Operational Amplifiers:** Operational Amplifiers and linear applications: Block diagram, Ideal Op-amp, Equivalent circuit, Open-loop configuration, Transfer characteristics. Op-amp with negative feedback, Frequency response, Op-amp IC 741 specifications, Basic op-amp applications: Adder, Scalar, Subtractor, Difference amplifier, I-V converter, V-I converters, Integrator, Differentiators.	10
IV	**Applications of op-amp:** Op-amp as Sine wave, Triangular wave, Square wave generator. Op-amp as a Schmitt trigger, ZCD, Comparator, Instrumentation Amplifier, Voltage Regulator and components: Series and Shunt Regulator. Regulator ICs 78XX, IC 79XX.	8
V	**Numbering System & Codes:** Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction ,Boolean Algebra and Logic Gates: Standard SOP and POS form, Reduction of Boolean functions using Algebraic method, K -map method (2,3,4 Variable). **Basic Digital Circuits:** Gates, Flip Flops, Counters, Design of Counters, IC	8

	74193 Shift Registers: Shift Register IC 7496, SISO, SIPO, PIPO, PISO, Bidirectional Shift Register, Universal Shift Register.	
	Total	**45**

Sr. No.	Practical Description
1	Study of IC78XX & 79XX.
2	Study of up -down counters (IC 74192/74193) and N - modulo counter. (IC 7490/7493)
3	Study of Op-amp as Schmitt trigger
4	Study of Instrumentation amplifier using three Op-amp, CMR measurement
5	Study of Op-amp as sine, and triangular wave generator
6	Study of IC-555 applications-astable, monostable multivibrator.
7	Study of Single Phase Full-wave bridge rectifier with RL load.
8	Transistor amplifiers: frequency response of BJT, multistage BJT amplifier
9	Study of Single Phase Half-Wave Rectifier.
10	Study of op-amp as a ZCD & Comparator
11	Study of various flip-flops and verification of truth table.
12	Study and verify shift register operation (IC 7495).

Course Outcome	
Students should able to	
CO1	Describe and analyze basic need of digital electronic devices such as BJT, TRIAC, FET, Diode and their applications in control system.
CO2	Apply IGBT in controlling electrical parameter and also capable to describe it's characteristics.
CO3	understand operational amplifier in detail and its application in electrical engineering
CO4	Design and implementation of voltage regulator circuit use of ZCD
CO5	Solve problems related to number systems and Boolean algebra.

Recommended Books	1. Anil K Maini, Varsha Agarwal: Electronic Devices and Circuits, Wiley, 2012. 2. Ramakant A. Gaikwad, "Op-amp and linear Integrated circuits", PHI

Reference Books	1. Anil K. Maini, "Digital Electronics Principles and Integrated Circuits", Wiley India 2. Donald p Leach, Albert Paul Malvino, "Digital principles and Applications", Tata McGraw Hill. 3. Thomas L. Floyd, *"Electronic Devices",* Pearson Education, 9th Edition, 2011.
E-Resources	http://nptel.ac.in/

Tutorial:
Tutorial assessment shall be conducted for the Project, Tutorials, Industrial Visit report and Seminar. Tutorial is continuous assessment based on work done, submission of work in the form of report/journal, timely completion, attendance, and understanding. It should be assessed by subject teacher of the institute. At the end of the semester, the final grade for a Tutorial shall be assigned based on the performance of the student and is to be submitted to the University.

Year: Second Year **Semester: II**

Course: Electrical Machine – I **Course Code: TYEE202**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**		**Lab**	**Theory**	**Lab**	
3	0	2	4	20	20	10		25	50	25	150
Max. Time,End Semester Exam (Theory) -3Hrs.									**End Semester Exam (Lab) - 2Hrs.**		

Prerequisite	**1. Basic knowledge in physics, kinematics, electrical engineering.** **2. Electrolytic processes. Refrigeration and air conditioning.**

Course Objectives	
1	To understand construction, working principle, regulation & efficiency of a single phase Transformer.
2	To understand the testing methods of a single phase Transformer.
3	To understand load sharing and parallel operation of a three phase Transformer.
4	To understand construction & the working principle of DC machines.
5	To study different types of starters and speed control of DC machines.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Basic field Theory:** Principles for operation of single phase and three phase AC & DC machines. (Principle of conduction, induction-self/mutual, RMF, cross field theory/Double field theory).	6
	II	**Single phase Transformer:** Working principle, EMF equation, construction, Ideal transformer, Transformation ratios, classification, No-load & On load performance, Phasor diagram, Equivalent circuit, losses, separation of hysteresis and eddy current losses, efficiency, Condition for maximum efficiency, voltage regulation, Condition for maximum voltage regulation.	3
2	I	**Testing of Single phase Transformer:** Testing of transformer as per Indian standard, Polarity test, Parallel operation of single phase transformers, load test, Open circuit and short circuit tests, determination of equivalent circuit parameters and voltage regulation	6
	II	**Autotransformer:** - construction, working, application	2
3	I	**Three phase Transformer:** Construction, Classification, connections along with voltage phasor diagrams and vector groups, applications, testing, Power transformer, and distribution transformer. Tap changing	10

		transformer, no-load current and inrush current phenomenon, Descriptive treatment of Parallel operation of three phase transformers.	
4	I	**D.C. Machines:-** Construction , principle of operation, classification , method of excitation; EMF equation, Armature winding, Types, Armature reaction and commutation, methods of improving commutation.	4
	II	**D.C. Generator:-** Operation of DC generator, Types & characteristics significance of Back EMF.	3
5	I	D**.C. Motor:-** Operation of DC motors; Voltage Equation, Torque equation; Characteristics and applications of D.C. Motor , Starting of DC motors; speed control of DC motors (Armature & Flux control); losses and efficiency of DC machines; testing of DC machines, direct testing, Application of DC machines.	9
		Total No. of Hrs	45

Beyond the Syllabus
Speed Control of DC Motor using Power Electronics Drives. Motor specifications and its selection based on application

Course Outcome	
Students should able to	
CO1	Apply Basic field theory to Learn Electrical Machines.
CO2	Test the Transformer for Direct and Indirect Tests for Analysis.
CO3	Select transformer according to the requirement of delta or star application
CO4	Classified the DC machine.
CO5	Control the speed of DC Motors using armature voltage control and Flux control for specific Drive Operation.

List of Experiments	
Sr. No.	**Description**
1	To perform O.C. and S.C. test on single phase Transformer.
2	To perform Polarity test on single phase and three phase transformer.
3	To perform Parallel operation of two single phase transformers and study of their load sharing under various conditions of voltage ratios and leakage impedances.
4	To study the Scott connection of transformer and verify different types of connection of three phase transformer.

5	To perform determine of regulation and efficiency of a single or three phase transformer by direct load test.
6	To perform speed control of D.C. Shunt motor and study of starters.
7	To perform brake test on D.C. Shunt motor.
8	To study Load characteristics of D.C. series motor.
9	Hopkinson's test on D.C. shunts machines.
10	Introduction to Matlab (SIM Power) for electrical machines.

RecommendedResources	
Text Books	1. S. K. Bhattacharya, "Electrical Machine", 2e, Tata Mc Graw Hill 2. Ashfaq Husain, "Electrical Machines", Dhanpat Rai & Sons 3. I.J. Nagrath & D.P. Kothari, "Electrical Machines", Tata Mc Graw Hill.
Reference Books	1. P.S.Bimbhra, "Electrical Machines", Khanna Pub.
E-Resources	http://nptel.ac.in/courses/108105017

Year: Second Year **Semester: II**

Course: Network Analysis **Course Code: TYEE203**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
3	1	0	4	20	20	10			50		100
Max. Time,End Semester Exam (Theory) -3Hrs.									End Semester Exam (Lab) - 2Hrs.		

Prerequisite	**1. Basic knowledge of fundamental physics.** **2. Solution of simultaneous equation.**

Course Objectives	
1	To familiarize the basic laws, theorems and the methods of analyzing electrical circuits.
2	To develop analytical qualities in electrical circuits by application of various theorems.
3	To understand the concept of graph theoryand coupled circuit.
4	To understand the behavior of circuits by analyzing the transient response using classical methods and Laplace Transform approach.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Basics of Network:** Types of Energy sources, Network- Linear and Non-Linear, Lumped and Distributed, Bilateral and Unilateral, Time variant and Time-invariant, Circuit elements-R, L and C , Ideal and practical Sources (V & I), Open and short circuit, Interconnection of circuit, Voltage & Current divider rule, KCL and KVL analysis, Nodal & Mesh analysis, Source transformation.	8
2	I	**Network Theorem for AC & DC circuits:** Superposition, Thevenin's and Norton's Theorem, maximum power transfer Theorem, Dependent & independent sources.	8
3	I	**Graph Theory:** Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, Dot convention, coupling coefficient.	7
	II	**Coupled Circuit:** Magnetic coupled circuits, Self Inductance, Mutual Inductance, Inductances in Series & Parallel, Series & parallel resonance.	
4	I	**Analysis of Transient Response in Circuits - Classical Method:**Transient analysis of R-L, R-C and R-L-C circuits using classical method, Time constant, Initial and Final Condition of the network.	8
	II	**Analysis of Transient Response in Circuits - Laplace Transform Approach:** Standard test inputs: Step, Ramp, Impulse, Their Laplace transform, Representation of R, L, C in S domain, transformed	8

		network, Laplace transform solution of Integro-differential equations,transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value Theorem.	
5	I	**Two Port Network and Network Functions:** Network & Transfer functions for one port & two ports, poles and zeros, Restrictions on poles and zeroes, Necessary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, Relationship between parameters, Interconnection of two port networks, Terminated two port Network.	8
		Total No. of Hrs	47

Course Outcome	
Students should able to	
CO1	Analyze circuit systems using direct application of Kirchoff's Current and Voltage Laws along with Ohm's Law.
CO2	Apply theorem to express complex circuits in their simpler equivalent forms.
CO3	Demonstrate graph theory and Coupled circuit.
CO4	Apply basic concept to compute time response of RL, RC and RLC circuits in the time domain. Apply Laplace transforms technique to analyze the RL, RC and RLC circuits

List of Experiments

Sr. No.	**Description**
1	**Module 1** To verify KCL.
2	**Module 2** To verify KVL.
3	**Module 3** To Verify Thevenin Theorem.
4	**Module 4** To Verify Superposition Theorem.
5	**Module 5** To Verify Reciprocity Theorem.
6	**Module 6** To Verify Maximum Power Transfer Theorem.
7	**Module 7** To Determine Open Circuit parameters of a Two Port Network
8	**Module 8** To Determine Short Circuit parameters of a Two Port Network
9	**Module 9** To Determine A, B, C, D parameters of a Two Port Network
10	**Module 10** To Determine h parameters of a Two Port Network
11	**Module 11** To Find Frequency Response of RLC Series Circuit.

RecommendedResources	
Text Books	1. M. E. Van Valkenburg, "Network Analysis", 3e, Prentice Hall of India Private Limited. 2. Ravish R Singh, "Network Analysis and synthesis", 3e, McGraw Hill education (India) Pvt. Ltd.
Reference Books	1. William H. Hayt, Jr. Jack E. Kemmerly, "Engineering Circuit Analysis"," McGraw Hill Publication.
E-Resources	http://nptel.ac.in/courses/108108076/