Department: Electrical Engineering

Rev: Course Structure/00/2021-22

Class: S.Y. B.Tech

Semester: III

Course Code	Type of Course	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
EE301	BSC	Engineering Mathematics-III	3	1	-	4	10	10	30	50	100	4
EE302	ESC	Network Analysis	4	-	-	4	10	10	30	50	100	4
EE303	PCC	Measurement & Instrumentation	3	-	-	3	10	10	30	50	100	3
EE304	PCC	Renewable Energy Sources	4	-	-	4	10	10	30	50	100	4
EE305	PCC	Analog & Digital Electronics	3	-	-	3	10	10	30	50	100	3
EE306	ESC	Network Analysis Laboratory	-	-	2	2	15	15	-	20	50	1
EE307	PCC	Measurement & Instrumentation Laboratory	-	-	2	2	15	15	-	20	50	1
MDC01	MC	Constitution of India	1	-	-	1	25	25	-	-	50	Audit
HSM01	HSMC	Aptitude Skills-I	1	-	-	1	25	25	-	-	50	1
HSM02	HSMC	Language Skills-I	-	-	2	2	25	25	-	-	50	Audit
PRJ02	PROJ	Mini Project	-	-	2	2	25	25	-	-	50	Audit
			19	**1**	**8**	**28**	**185**	**185**	**150**	**290**	**800**	**21**

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Engineering Mathematics-III

EE301	BSC	Engineering Mathematics-III	3-1-0	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks
Tutorial: 1hr/week	CA-II: 10 Marks
	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Engineering Mathematics-I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the definition & properties of Laplace Transform to evaluate the integral & to find Laplace transform of elementary functions and special functions like periodic function, Dirac-delta function & unit step function.
CO2	Apply the knowledge of Laplace transformation to find solution of linear differentiation equations with constant coefficient.
CO3	Solve partial differential equations & use of separation of variable method to solve heat and Laplace equations.
CO4	Develop the concept of Fourier series expansion of different periodic functions so as to use them in harmonic analysis.
CO5	Solve problems related to Fourier transform and inverse Fourier transform.
CO6	Solve finite difference equation using Z- transform.

Course Contents:

Unit 1: Laplace Transform Definition – conditions for existence ; Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of derivatives ; Evaluation of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.	[8]

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Unit 2: Inverse Laplace Transform Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.	[7]
Unit 3: Partial Differential Equations and Their Applications Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation ($\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$), and two dimensional heat flow equation (i.e., Laplace equation: $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$).	[8]
Unit 4: Fourier Series Definition, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, expansions of odd and even periodic functions and half range series.	[7]
Unit 5: Fourier Transforms Fourier Transforms, Fourier Sine and Cosine Transforms, Complex form of Fourier Integral, Finite Fourier Sine and Cosine Transform.	[6]
Unit 6: Z Transform Definition, properties of z transform, Z Transform of basic sequences, Z transform of some standard discrete function inverse Z transform.	[6]

Text Books:

1. P. N. Wartikar & J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune.
2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.

Reference Books:

1. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publishing Company Ltd.
2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
5. Peter O' Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore.

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Network Analysis

EE302	ESC	Network Analysis	4-0-0	4 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 4 hrs/week Tutorial: -- Practical: --	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering, Engineering Mathematics-I, II.

Course Outcomes:

At the end of the course, the students will be able to:

CO1	**Solve** network equation with various techniques to find electrical parameters.
CO2	**Apply** various theorems to electrical networks for finding electrical parameters.
CO3	**Solve** the transient responses by using different conditions for DC and AC excitations.
CO4	Apply concepts of electric network topology to **solve** problems in circuits.
CO5	**Solve** electrical networks using Basic Laws to find two port network parameters (Z, Y, ABCD, h).
CO6	**Solve** Selectivity, Bandwidth & Q-factor of the circuit in series & parallel resonance of circuit.

Course Contents:

Unit 1: Basic Concepts Introduction, Sources, Circuit Elements, Mutual inductance and dot convention, Source transformations, Network reduction using Star – Delta transformation, Loop and nodal analysis with linearly dependent and independent sources for DC and AC networks.	[8]
Unit 2: Network Theorems Superposition, Thevinin's and Norton's theorems, Maximum Power transfer theorem, Millman's theorems, Reciprocity Theorem, Compensation Theorem, Tellegen's theorem.	[7]

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Unit 3: Transient Analysis Behavior of circuit elements under switching condition and their Representation, Evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.	[8]
Unit 4: Network Topology Basic Terminology: Graph, Types of Graphs, Tree, Co-tree, Matrices Associated with Network Graphs: Incidence Matrix, Fundamental Loop Matrix, Fundamental Cutset Matrix with examples.	[5]
Unit-5: Two Port Network Parameters Concept of complex frequency, Transform impedance & transform admittance Definition and classification of Two port network parameters: Z, Y, h and Transmission parameters, relationship between parameters sets, Interconnections of Two-Port Network, condition for symmetry and reciprocity, numerical problems.	[8]
Unit 6: Resonance Introduction, Series Resonance: Variation of Current and Voltage with Frequency, Selectivity, Bandwidth, Circuit Magnification Factor. Parallel Resonance: Selectivity and Bandwidth, Circuit Magnification Factor, Maximum Impedance Conditions with C, L and f Variable, Current in Anti-Resonant Circuit, The General Case-Resistance Present in both Branches.	[6]

Text Books:

1. M.E. Van Valkenberg, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Charles K Alexander and Mathew N O Sadiku, "Fundamentals of Electric Circuits", TMH, 3rd Edition, 2009.

Reference Books:

1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", TMH, 7th Edition, 2010.
2. J. David Irwin and R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8th Edition, 2006.
3. Roy Choudhury, "Networks and Systems", 2nd Edition, New Age International Publications, 2006.
4. Joseph A. Edminister, Mahmood Maqvi, "Theory and Problems of Electric Circuits", Schaum's Outline Series.
5. Robert L Boylestad, "Introductory Circuit Analysis", Pearson Publications.

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Measurement & Instrumentation

EE303	PCC	Measurement & Instrumentation	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks
Tutorial:- -	CA-II: 10 Marks
Practical: -	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain Construction, Working & characteristics of measuring instruments.
CO2	Illustrate the different methods of power & energy measurement.
CO3	Illustrate the Measurement of resistance, inductance & capacitance.
CO4	Demonstrate construction & working principle of transducers.
CO5	Explain the digital meters.
CO6	Estimate electrical parameters with help of electrical devices

Course Contents:

Unit 1: Characteristics of measuring instruments Static & dynamic characteristics of measuring instruments, Errors & its types, Classification of instruments, Standards, torque in measuring instruments, Construction & working principle advantages and disadvantages of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) and Dynamometer type instruments, shunt and multipliers for range extension of MI Instruments	[6]
Unit 2: Measurement of Power and Energy Measurement of active & reactive power in electrical circuit, Construction, working principle, torque equation of single phase conventional (induction type) energy meter, Calibration of energy meter, digital Energy Meter, block diagram and operation of electronic energy meter.	[6]
Unit 3: Measurement of Resistance, Inductance and Capacitance Measurement of low, medium and high resistance, Wheatstone Bridge, Kelvin's Double	[8]

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Bridge, Ammeter-Voltmeter method, Megger, Earth tester for earth resistance measurement, inductance measurement: Maxwell's inductance Bridge, Maxwell's inductance capacitance bridge, Hay's Bridge, Anderson's Bridge, Schering Bridge and Wien's Bridge.	
Unit 4: Transducers Transducers: Definition - Classification of transducers general characteristics— Selection of transducers — Resistive, capacitive & inductive Transducers — Piezoelectric, Hall effect, optical and digital transducers — Elements of data acquisition system — Smart Sensors-Thermal Imagers.	[6]
Unit 5: Digital Meters Digital instruments - pros and cons, working of digital voltmeters. Automatization in digital meters-mechanism of automatic zeroing, polarity indication and auto ranging. Digital frequency meter, time interval measurement, digital LCR meter, digital multimeters, Digital Tachometer, microprocessor-based instruments.	[6]
Unit 6: Storage & Display Devices DSO, CRO, Power Analyzer, Wave Analyzer & Harmonic Distortion, Spectrum Analyzer, Instrument Transformers: Construction, connection of CT & PT in the circuit, advantages of CT / PT, LED, LCD & Dot matrix display — Data Loggers.	[6]
Text Books: 1. Electrical & Electronic Measurement by R K Rajput. 2. Measurement & Instrumentation by S Chand	
Reference Books: 1. Electrical and Electronic Measurements and Instrumentation, by A. K. Sawhney and Puneet Sawhney 2. Electrical and Electronic Measurements and Instrumentation by V.K.Mehta 3. Electronic Instrumentation by H.S Kalsi 4. Electrical Measurement by U. A. Bakshi, A.V. Bakshi, K. A. Bakshi	

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Renewable Energy Sources

EE304	PCC	Renewable Energy Sources	4-0-0	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 4hrs./week Tutorial: --- Practical: ---	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Engineering Physics, Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the overview of renewable energy resources and its key factors
CO2	Explain the field applications of solar energy
CO3	Explain the concepts of solar photovoltaic
CO4	Explain the concepts of wind energy
CO5	Explain the wind machines and generating systems
CO6	Explain the concepts of hybrid power systems

Course Contents:

Unit 1: Renewable Energy Overview: Introduction, Global Scenario for Renewable Energy, Indian Scenario for Renewable Energy, Reserves of Energy Resources, Environmental Aspects of Energy Utilization, Future Prospects for Renewable Energy, Types of Renewable Energy Sources, Potential of Renewable Energy Sources, Renewable Electricity.	[6]
Unit 2: Solar Energy: Introduction, Solar Constant, Solar Radiation at Earth's Surface, Solar Radiation Geometry - Numerical, Solar Radiation Measurements, Solar Radiation Data, Estimation of Average Solar Radiation - Numerical, Solar Radiation on Tilted Surfaces, Solar Flat Plate Collectors, Concentrating Collectors, Applications of Solar Energy – Solar Air Heaters, Solar Dryers, Storage of Solar Energy, Solar Water Heaters, Solar Water Distillation, Solar Still, Solar Cooker, Solar Green House.	[7]

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Unit 3: Solar Photovoltaic: Introduction, Solar Cell Characteristics, Losses in Solar Cells, Modeling of Solar Cell, Solar PV Modules, Mismatch in PV Module, Hotspot in PV Module, Bypass Diode in PV Module, Design of PV Module, PV Module Power Output, IV Curve for PV Module, BOS of PV Module, Batteries for Solar PV, Battery Charge Controllers, DC to DC Converters, DC to AC Converters, Supporting Structures for Mounting the PV Panels, MPPT, Different Algorithms for MPPT, Types of PV Systems, Performance Analysis of Solar Cell, Working of Solar Cell Power Plant.	[8]
Unit 4: Wind Energy: Introduction, Principle of wind energy conversion – Nature of wind, Power in the wind, Forces on the Blade, Wind Energy Conversion & Numerical, Site Selection Considerations, Basic Components of WECS (Wind Energy Conversion System), Classification of WEC Systems, Advantages & Disadvantages of WECS,	[7]
Unit 5: Wind Machines: Introduction, Types of Wind Machines- Horizontal Axial Machines, Design Considerations of Horizontal Axis Machines, Vertical Axial Machines, Analysis of Aerodynamic Forces acting on the Blade, Performance of Wind Machines, Generating Systems- Schemes for Electric Generation, Generator Control, Load Control, Energy Storage, Applications of Wind Energy, Interconnected System, Safety Systems, Environmental Aspects.	[8]
Unit 6: Hybrid Power Systems: Introduction, Need for Hybrid Systems, Range of Hybrid Systems, Types of Hybrid Systems, Diesel-PV Systems, Wind-PV Systems, Micro Hydel-PV Systems, Biomass-Diesel Systems, Electric Vehicles, Hybrid Electric Vehicles.	[6]
Text Books: 1. S. S. Thipse: Non-Conventional and Renewable Energy Sources, Narosa Publishers 2. A. N. Mathur: Non-Conventional Resources of Energy. 2010 3. V. V. N. Kishore: Renewable Energy Engineering and Technology, TERI. 2006	
Reference Book 1. G. D. Rai: Non-Conventional Energy Sources, Khanna Publishers	

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Analog and Digital Electronics

EE305	PCC	Analog and Digital Electronics	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3hrs./week Tutorial: --- Practical: ---	CA-I: 10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electronics

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the characteristics of diodes and its applications
CO2	Examine the operation of bipolar junction transistor
CO3	Examine the operation of transistor amplifiers
CO4	Examine the logic gates using Boolean algebra
CO5	Design the combinational logic circuits
CO6	Design the sequential logic circuits

Course Contents:

Unit 1. Semiconductor Diodes and applications: Semiconductor physics and diode characteristics, Types of diodes – Zener diode, Schottky diode, LED, PIN diode, Tunnel diode & Photodiode. Diode Circuits- Clippers, Clampers & Multipliers.	[5]
Unit 2. Bipolar Junction Transistor: BJT structure and operation. Transistor configurations - CE, CB & CC. Transistor biasing – DC operating point, bias stabilization, biasing circuits, bias compensation, Transistor as a switch. MOSFTE - NMOS, PMOS & CMOS. Device modeling.	[6]
Unit 3. Transistor Amplifiers: Small signal low frequency amplifier- Transistor as an amplifier, CE, CB & CC Amplifier, Voltage amplifiers - Gain of a transistor, Multistage amplifiers, effect of coupling, bypass and spurious shunting capacitor on frequency response. Power amplifiers – Classification, comparison of amplifier classes, analysis of class A amplifier.	[7]

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Unit 4. Boolean Algebra and Logic Gates: Boolean operations and expressions, Laws and rules of Boolean algebra, DeMorgan's theorems. Boolean analysis of logic circuirs, simplification using Boolean algebra, K map – SOP & POS minimization. Logic Gates- AND, OR, NAND, NOR, Ex-OR & Ex-NOR gates	[6]
Unit 5. Combinational Logic Circuits: Basic combinational logic circuits & their implementation, Universal gates, binary adders, comparators, decoders, encoders, code converters, multiplexers, demultiplexers, parity generators.	[5]
Unit 6. Flop-Flops, Counters and Shift Registers: Latches, Types of Flip-Flops- SR Flip-Flop, JK Flip-Flop, D Flip-Flop, T Flip-Flop. Counters – Asynchronous counters, Synchronous counters, Up/Down counters, cascaded counters. Shift registers – SISO, SIPO, PISO & PIPO+	[7]

Text Book:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Tenth Edition, Pearson
2. Charles K. Alexander, Matthew N. O. Sadiku, "Fundamentals of Electric Circuits", Sixth Edition, Mc Graw Hill Publication
3. Jacob Millman, Christos L. Halkias, "Integrated Electronics", Second Edition, Mc Graw Hill Publication
4. A.Anand Kumar," Fundamentals of Digital Circuits", Fourth Edition, PHI publication
5. Floyd and Jain, "Digital Fundamentals", Eighth Edition, Pearson Education.

Reference Books:

- Paul Horowitz, Winfield Hill, " The art of Electronics", Third Edition, Cambridge University Press

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Network Analysis Laboratory

EE306	ESC	Network Analysis Laboratory	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Lecture: -- Tutorial: -- Practical: 2hr/week	CA-I: 15 Marks CA-II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basic Electrical Engineering, Engineering Mathematics-I, II.

Course Outcomes: At the end of the course students will be able to -

CO1	**Apply** various theorems to electrical networks for finding electrical parameters and verify them through experiments.
CO2	**Solve** the transient responses by using different conditions for DC and AC excitations.
CO3	**Solve** electrical networks using Basic Laws to find two port network parameters (Z, Y, ABCD, h).
CO4	**Solve** Selectivity, Bandwidth & Q-factor of the circuit in series & parallel resonance of circuit and show the effect of resonance.

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List of Experiments:

At least minimum 8 experiments should be performed from the following list.

1. Verification of Superposition theorem
2. Verification of Thevinin's theorem
3. Verification of Reciprocity theorem
4. Verification of maximum power transfer theorem
5. Transient analysis of RL circuit supplied by DC Voltage source
6. Transient analysis of RC circuit supplied by DC Voltage source
7. Determination of z and y parameters of the two port networks
8. Determination of ABCD and h parameters of the two port networks
9. Study of Series Resonant Circuit
10. Study of Parallel Resonant Circuit
11. Simulation of AC Circuits.
12. Simulation of DC Circuits.

Text Books:

1. M.E. Van Valkenberg, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Charles K Alexander and Mathew N O Sadiku, "Fundamentals of Electric Circuits", TMH, 3rd Edition, 2009.

Reference Books:

1. Hayt, Kemmerly and Durbin, "Engineering Circuit Analysis", TMH, 7th Edition, 2010.
2. J. David Irwin and R. Mark Nelms, "Basic Engineering Circuit Analysis", John Wiley, 8th Edition, 2006.
3. Roy Choudhury, "Networks and Systems", 2nd Edition, New Age International Publications, 2006.
4. Joseph A. Edminister, Mahmood Maqvi, "Theory and Problems of Electric Circuits", Schaum's Outline Series.
5. Robert L Boylestad, "Introductory Circuit Analysis", Pearson Publications.

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Measurement & Instrumentation Laboratory

EE307	PCC	Measurement & Instrumentation Laboratory	0-0-2	1 Credit

Teaching Scheme	Evaluation Scheme
Lecture: -- Tutorial: -- Practical: 2hr/week	CA-I: 15 Marks CA-II: 15 Marks End Semester Exam: 20 Marks

Pre-Requisites: Basic Electrical Engineering

List of Experiments:

Minimum 8 experiments should be performed from the following list.

1. Measurement of active power in three phase's circuit using two wattmeter methods.
2. Measurement of reactive power in three phase circuit
3. Calibration of dynamometer type of wattmeter
4. Calibration single phase energy meter.
5. Measurement of low resistance using Kelvin double bridge.
6. Measurement of medium resistance using Wheatstone bridge.
7. Measurement of inductance by using ac bridges / by using virtual lab
8. Measurement of capacitance by using Schering Bridge / by using virtual lab
9. Measurement of displacement.
10. Measurement of Strain.
11. Measurement of speed.
12. Study of piezo electric transducer.
13. Measurement of Current, Voltage, pf, Active power, Reactive power by using power analyzer.

Text Books:

1. Electrical & Electronic Measurement by R K Rajput.
2. Measurement & Instrumentation by S Chand

Reference Books:

1. Electrical and Electronic Measurements and Instrumentation, by A. K. Sawhney and Puneet Sawhney
2. Electrical and Electronic Measurements and Instrumentation by V.K.Mehta
3. Electronic Instrumentation by H.S Kalsi.
4. Electrical Measurement by U. A. Bakshi, A.V. Bakshi, K. A. Bakshi.

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Constitution of India

MDC01	MC	Constitution of India	1-0-0	Audit

Teaching Scheme	Evaluation Scheme
Lecture: --1hr/week Tutorial: -- Practical:	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Nil

At the end of the course students will be able to

CO1	Define the meaning and features of Indian constitution.
CO2	Interpret right to life and fundamental rights to certain freedom under article 19 and 21.
CO3	Outline the federal structure of power and directive principles of state policy.

Course Contents:

Unit 1: Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India	[2]
Unit 2: Salient features and characteristics of the Constitution of India, Scheme of the fundamental rights , The scheme of the Fundamental Duties and its legal status	[2]
Unit 3: The Directive Principles of State Policy – Its importance and implementation , Federal structure and distribution of legislative and financial powers between the Union and the States , Parliamentary Form of Government in India – The constitution powers and status of the President of India	[2]
Unit 4: Amendment of the Constitutional Powers and Procedure , The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency,	[2]

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President Rule, Financial Emergency	
Unit 5: Local Self Government – Constitutional Scheme in India , Scheme of the Fundamental Right to Equality	[2]
Unit 6: Scheme of the Fundamental Right to certain Freedom under Article 19 , Scope of the Right to Life and Personal Liberty under Article 21.	[2]
Books: 1. Constitution of India Published by Government of India Ministry of Law and Justice (Legislative Department), 2020 2. Textbook on The Constitution of India by S R Bhansali 3. Constitution of India by Bakshi P M, January 2014	

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Aptitude Skills-I

HMS01	HSMC	Aptitude Skills-I	1-0-0	1 Credit

Teaching Scheme:	Examination Scheme:
Lecture: 1 hrs/week Tutorial: NA Practical: NA	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Communication Skills

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand speed math techniques to solve aptitude problems
CO2	Summarize number systems in detail.
CO3	Explain basic aptitude techniques related to Percentage, Average, Ratio Proportion and Fraction
CO4	Understand speed, time and distance concepts
CO5	Summarize the concepts of Business aptitude using basic aptitude
CO6	Solve the aptitude problems on Geometry and Venn Diagram

Course Contents:

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots	[1]
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	[2]
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership	[3]
Unit 4: Speed- Time- Distance Speed, Time, and Distance, Trains, Boats, Streams, Races	[2]
Unit 5: Business Aptitude Profit & Loss, Simple Interest, Compound Interest	[2]
Unit 6: Geometry and Venn Diagram	[2]

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2D and 3D Mensuration, Venn diagram	

Text Books:

1. Arun Shrama - Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. Chand Publisher; 2016 edition
3. RS Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publisher; 2016 edition

Reference Books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar

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Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Language Skill- I

HMS02	HSMC	Language Skills- I	0-0-2	Audit

Teaching Scheme	Examination Scheme
Lecture: NA Tutorial: NA Practical: 2 hrs/week	CA-I: 25 Marks CA-II: 25 Marks

Pre-Requisites: Communication Skills

Languages (Any One)

C Programming (Technical Language) (24Hrs)

Syllabus for C Programming

Course Outcomes: At the end of the course, students will be able to:

1	Explain fundamentals & essentials of C programming.
2	Illustrate Types, Operators and Expressions.
3	Make use of Decision Making and Looping Statements
4	Make use of Arrays in C programming.

Course Contents:

Unit 1: Basics of C Editing, Compiling, Error Checking, executing, testing and debugging of Programs, Flowcharts, Algorithms, Structure of C Program.	[6]
Unit 2: Types, Operators and Expressions Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation	[6]
Unit 3: Decision Making and Looping Statements Statements and Blocks. If-else, else-if switch, loops while and for, do-while break and	[6]

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continue go to and Labels.	
Unit 4: Arrays Initializing arrays, Initializing character arrays ,two dimensional and multidimensional arrays.	**[6]**

Text Books

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Peasrson Publication

Reference Books

1. C: The Complete Reference, McGraw Hill Education; 4th edition (1 July 2017)
2. C Programming in easy steps, 5th Edition, In Easy Steps Limited
3. The C Programming Language, Second Edition, By Pearson Education India (1 January 2015)

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Japanese Language Course I (24Hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the history and scripts used in Japanese
CO2	Translate simple English words into Japanese
CO3	Express themselves by using simple sentences and responses to questions.
CO4	Demonstrate Japanese scripts through oral and written communication.

Course Contents:

Unit 1: Introduction Brief history of Japan, Japanese Language, Introduction of three scripts in Japanese, viz. Hiragana, Katakana, and Kanji, Days of the week, Basic Numerals, and months of the year,	[6]
Unit 2: Simple Word forming Demonstratives in Japanese, Writing simple words in Hiragana, Writing all types of words, and simple sentences in Hiragana, Verbs in Japanese,	[6]
Unit 3: Simple sentence forming Introduction of Katakana, Formation of simple sentences involving asking and answering questions, Basic Conversational skills. Asking and answering questions based on the topics studied, Introduction of few simple Kanji, and their use in sentences based on the pattern "---ni--- gaarimasu".	[6]
Unit 4: Simple interactions Translations from, and into Japanese, Reading an unseen paragraph, and answering questions based thereon, General revision	[6]
Text Book: 1. Nihongo Shoho I (Japan Foundation Publ.) 2. GENKI I: An Integrated Course in Elementary Japanese (English and Japanese Edition) 3. Japanese for Busy People I: Kana Version (Japanese for Busy People Series) 3rd Edition	
Reference Book: 1. Minna No Nihongo I (3A Corporation, Japan) 2. Japanese from Zero! 1: Proven Techniques to Learn Japanese for Students and Professionals 6th Edition by George Trombl	

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Foreign Languages (Any One)

German Language Course I (24Hrs)

Course Outcomes: At the end of the course, students will be able to:

1	Summarize the simple German words used for daily used words
2	Translate simple English words into German
3	Express themselves by using simple sentences and responses to questions.
4	Demonstrate German scripts through oral and written communication.

Course Contents:

Unit 1: Introduction Introduction of the language, Greetings, Introduce oneself, speaking about yourself and others, numbers, E-mail address, Alphabets, speaking about countries and languages, Speaking about Hobbies, to have an informal appointment, learning weekdays, months and seasons	[6]
Unit 2: Simple Word forming Speaking about professions, work and wartimes, learning to fill up a profile in German, Learning to name the famous places, buildings in a city, learning definite/ indefinite and negative articles in German, to name the modes of transportation, To learn to describe the way, to understand the texts with international words.	[6]
Unit 3: Simple sentence forming To speak about food, to plan a shopping, conversation with the shopkeeper, Conversation about the food, about likes and dislikes, to understand the "w" questions, To understand the watch timings , giving information about time, speaking about the families, to plan a date	[6]
Unit 4: Simple interactions Learning about punctuality in Germany and how to excuse for delay, telephonic conversation about the appointments, to plan something together, speaking about birthday, to understand invitation and to write an invitation, to order and to pay in restaurant, to speak about own experiences, to understand particular information from the texts, to understand about different events and events related information in Radio	[6]

Text Books

1. Netzwerk Arbetisbuch A1 Goyal Publisher.
2. "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time" by Ed Swick

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3. "German Made Simple: Learn to Speak and Understand German Quickly and Easily" by Eugene Jackson and Adolph Geiger

Reference Books

1. "Hammer's German Grammar and Usage" (Fifth Edition) by Professor Martin Durrell
2. "Learn German with Stories: Café in Berlin" by André Klein

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Mini Project -II

PRJ02	PROJ	Mini Project -II	0-0-2	Audit

Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	Continuous Assessment –I: 25 Marks Continuous Assessment –II: 25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

1	Identify the problems related to technical, social importance.
2	Convert open-ended problem statements into the statement of work
3	Identify the literature gap with the help of available literature and survey
4	Inculcate problem-solving skills and critically analyze the options available to solve the problem.
5	Conceive the importance of documentation and report writing

An engineering graduate must pay attention to societal concerns to alleviate some of the real-life societal challenges by delivering reasonable technology solutions. The mini project concept is based on the same theme. The mini project attempts to discover societal problems and develop answers utilizing science and technology for the betterment of society or human life. This will assist students in understanding the product/project development process, best practices and encouraging their creativity to tackle real-world problems. While developing the application/product, students will learn effective team building, designing, budgeting, planning, engineering skills and processes, and safety norms and standards. Students will recognize the need for documentation and professional ethics.

Guidelines

1. Every student shall undertake the Minor Project in semester III and continue for semester IV.
2. A group of a minimum of 3 and a maximum of 5 students shall be allotted for each mini project.
3. The students have to identify the problem by a discussion with various stakeholders, site visits, expert opinions and various research articles in consultation with the project guide.
4. Collect sufficient data and survey to establish the criticality of the problem to be solved.
5. Apply various tools for project planning and design.

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6. Critically analyze various solutions/techniques to solve real-world problems.
7. Select and justify one of the solutions identified based on the feasibility, affordability, ease of use and environmental concern.
8. Learn and apply standards of engineering ethics and professional behavior

The committee of senior faculty members and a guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members.

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Department: Electrical Engineering

Rev: Course Structure/00/2021-22

Class: S.Y. B.Tech.

Semester: IV

Course Code	Type of Course	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
EE401	PCC	DC Machines & Transformers	4	-	-	4	10	10	30	50	100	4
EE402	PCC	Control Systems	3		-	3	10	10	30	50	100	3
EE403	PCC	Signals & Systems	4	-	-	4	10	10	30	50	100	4
EE404	PCC	Power System	3	-	-	3	10	10	30	50	100	3
EE405	PEC	Elective-I	3	-	-	3	10	10	30	50	100	3
EE406	PCC	DC Machines & Transformers Laboratory	-	-	2	2	15	15	-	20	50	1
EE407	PCC	Control Systems Laboratory	-	-	2	2	15	15	-	20	50	1
EE408	PCC	Power System Laboratory	-	-	2	2	15	15	-	20	50	1
MDC02	MC	Environmental Sciences	2	-	-	2	25	25	-	-	50	Audit
HMS03	HSMC	Aptitude Skills-II	1	-	-	1	25	25	-	-	50	Audit
HMS04	HSMC	Language Skills-II			2	2	25	25	-	-	50	1
PRJ03	PROJ	Mini Project-III	--	--	2	2	25	25	-	-	50	1
IFT01	PROJ	Industrial Training/ Field Training-I	-	-	-	-	-	-	-	50	50	Audit
Total			**19**	**1**	**10**	**30**	**220**	**220**	**150**	**310**	**900**	**22**

Elective-I: A. Electrical Engineering Materials

B. Industrial Safety

C. Electrical Estimation and Costing

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DC Machines & Transformers

EE401	PCC	DC Machines & Transformer	4-0-0	4 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3 hrs/week Tutorial: 1 hr/week Practical: --	CA-I:10 Marks CA-II:10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain single phase transformer.
CO2	Explain three phase transformer.
CO3	Design various parts of transformers.
CO4	Determine performance characteristics & breaking of DC Motor.
CO5	Design various parts of DC Motor.
CO6	Classify special purpose machines for different applications.

Contents:

Unit 1: Single Phase Transformer: Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams, power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, excitation phenomenon in transformers, switching transients, Auto transformers, Variable frequency transformer, voltage and current transformers, welding transformers, Pulse transformer and applications.	[6]
Unit 2: Three Phase Transformers: Constructional features of three phase transformers, cooling methodology, Standard and special transformer connections, Phase conversion, Parallel operation of three phase	[7]

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transformers, three winding transformers and its equivalent circuit, on load tap changing of transformers, Modern trends in transformers.	
Unit 3: Design of Transformers: Output equation of transformer, Relation between Core Area & Weight of iron & copper, Design for minimum cost, Design for minimum loss or maximum efficiency, variation of Output & losses in transformer with linear Dimensions, Design of Core (rectangular core, Square & stepped Cores), Variation of Core Diameter, Selection of core areas & type of core, Choice of Flux Density, design of winding, Windows Space Factor, Windows Dimensions, Overall Dimensions, Simplified Steps for transformer Design. Resistance of Winding, Mechanical Forces, No load currents, No load current of 1ph transformer, No load current of 3ph transformer, Design of Tank with Tubes, Core Design, Winding Design, Window Area.	[6]
Unit 4: D.C. Machine: Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and Selection of DC Motors, Starting of DC Motors, Speed Control, Losses and Efficiency, Condition for Maximum Efficiency, Braking of DC Motors, Effect of saturation and armature reaction on losses; Applications, Construction, working principle & applications of D.C. Machine	[6]
Unit 5: Design of DC Machines: Introduction & Applications, classification, Constructional Details, Stator, Armature, Commutator, Brush Gear, Design output Equation, Interdependence of specific & Electric loadings, Selection of no of poles, Core Length, Armature diameter, Length of air gap, No of Armature coils, No of Armature Slots, Cross Section of Armature Conductors, Insulation of armature winding, Slots Dimensions, Poles Design (Area of poles, Height of Poles), length of Inter poles, Losses & Efficiency (Rotational Losses, Losses Stray load losses, Efficiency). Design of commutator and brush gear.	[6]
Unit 6: Special Machines: Construction, working principle & applications of stepper motors, Brushless DC motors, variable-reluctance machines, Permanent Magnet DC Motors, Servo motor.	[5]

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Text Books:

1) Bhattacharya S. K, "Electrical Machines",(Tata McGraw Hill Publications)
2) Kothari Nagrath, "Electrical Machines", (Tata McGraw Hill Publications)
3) M. N. Bandopadhyay, "Electrical Machines", (Tata McGraw Hill Publications)

Reference Books:

1) Fitzerland, "Electrical Machines", (Tata McGraw Hill Publications)
2) A Course in Electrical Machine Design, A.K.Sawhney, Dhanpat Rai & sons New Delhi
3) Principles of Electrical Machine Design, R. K. Agarwal, S. K. Katariya and sons.
4) A Text Book of Electrical Engineering Drawings, K.L. Narang, Satya Prakashan, New Delhi.
5) Electrical Machine Design Data Book, A Shanmugasundaram, G. Gangadharan, R. Palani, 3rd Edition, Wiely Eastern Ltd., New Delhi.

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Control Systems

EE402	PCC	Control Systems	3-0-0	3 Credits

Teaching Scheme	Evaluation Scheme
Lecture: 3hrs/week Tutorial: -- Practical: --	CA1:10 Marks CA2: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Evaluate the transfer function of the system using block diagram reduction techniques and signal flow graph method
CO2	Determine the system response in both time-domain.
CO3	Determine stability by applying Routh-Hurwitz criteria and Root Locus method
CO4	Determine the stability and response by constructing Polar, Nyquist& Bode plot
CO5	Evaluate the effect of P, PI, PD and PID controllers on system.
CO6	Explain control system models using state space models

Course Contents:

Unit 1: Introduction to Control System Importance of Control Systems, Classification of control systems, Open loop system, closed loop system, Applications, Mathematical representation and Transfer function of mechanical, electrical systems, Block diagram representation and reduction, Signal flow graph, Mason's gain formula	[8]
Unit 2: Time Domain Analysis Time Response, Steady state analysis, Transient response analysis, Transient response Specifications, Feedback characteristics of Control System	[7]
Unit 3: Stability Analysis Concept of stability, Routh-Hurwitz stability criteria, Special cases of Routh's criteria, Root Locus method, Effect of pole-zero addition on root locus	[6]

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Unit 4: Frequency Domain Analysis Correlation between time domain and frequency domain specification, Polar plot, Nyquist plot, Bode plot	[8]
Unit 5: PID Controller Introduction to P, I & D controller, Individual effect on overall system performance, PI, PID controller and effect on overall system performance	[5]
Unit 6: State Space Analysis Representation of system in state space, converting transfer function model in to state space model, Non uniqueness of state space model, State space representation, Solution of state equations, State Transition Matrix, Controllability and Observability Test.	[7]

Text Books:

1. I. J. Nagrath, M. Gopal, "Control System Engineering", New Age International Publishers – 5th Edition,2008
2. M. Gopal, Control System: Principles and Design, Tata Mc Graw-Hill Publication
3. K. Ogata, Modern Control Engineering, Eastern Economy, 5th Edition 2011.

Reference Books:

1. Katsuhiko Ogata," Modern Control Engineering", Prentice Hall, 2010
2. B. C. Kuo, Automatic Control System, Wiley Publication 8th Edition.
3. Norman S. Nise, Control System Engineering, John Wiley and Sons, 6th Edition, 2014.
4. M.Gopal, Digital Control and State Variable Methods, Tata Mc Graw Hill, 3rd Edition.

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Signals and Systems

EE403	PCC	Signals and Systems	4-0-0	4 Credits

Teaching Scheme	Examination Scheme
Lecture: 4 hrs/week Tutorial: --	CA-I:10 Marks CA-II:10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50 Marks

Pre-Requisites: Engineering Maths-I, Engineering Maths-II, Engineering Maths-III

Course Outcomes: At the end of the course, students will be able to:

CO1	Analyze different signals.
CO2	Determine the properties of CT and DT systems.
CO3	Determine Impulse response of CT and DT system using convolution principle
CO4	Analyze systems using Fourier Series and Fourier Transform.
CO5	Analyze DT systems using Z-Transforms.

Course Contents:

Unit 1: Introduction to signals Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic, energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.	[6]
Unit 2: Classification of Systems Definition of System, example of communication system classification of system such as Linear-nonlinear, Time variant-invariant, causal-noncausal, static-dynamic, stable-unstable, invertible, Block diagram representation of systems 1st and 2nd order representation.	[6]
Unit 3: Time domain representation of LTI System: Impulse response, convolution sum, convolution integral. Computation of convolution sum and convolution integral using graphical method for unit step and unit step, unit step and exponential, exponential and exponential, unit step and rectangular, and rectangular and rectangular.	[7]

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Unit 4: Fourier analysis of Periodic Signals Orthogonality of signals, synthesis and analysis equations of a Discrete time periodic signal, review of properties of DTFS, Numerical to obtain magnitude and phase spectra. Numerical to determine time-domain signal from spectra. Fourier series representation of continuous time periodic signals, numerical to obtain magnitude and phase spectra of given continuous time signal.	[6]
Unit 5: Fourier analysis of A-periodic signals: Synthesis and analysis equations of a discrete time a-periodic signal, review of properties of DTFT, numerical to draw magnitude and phase spectra of given signal, numerical to evaluate DTFT of the given signal, numerical to obtain time domain-domain signal from given DTFT and spectrum. Fourier Transform of continuous time a-periodic signals, numerical to obtain phase and magnitude spectra of a given continuous time signal.	[6]
Unit 6: The Z-Transforms: Z transform, properties of the region of convergence, numerical to find Z-transform and plot ROC time reversal time shifting, time scaling, convolution and differentiation in Z-domain. Initial and final value theorem, numerical to obtain Z-transform using properties, time domain signal from Z- domain using partial fraction method and power series expansion method, Z-Transform analysis of LTI system to obtain impulse response, unilateral Z-transform, Causality and stability of the system using ROC.	[8]

Text Books:

1. Signals and Systems by P. Ramesh Babu, Fourth edition, Scitech Publication.
2. Signals and Systems, 2nd Edition by Simon Haykin, Barry Van Veen, Wiley
3. Robert A. Gabel and Richard A.Roberts, "Signals & Linear Systems", John Wiley
4. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson Education, 2007

Reference Books:

1. Signal and Systems by Anand Kumar, 3rd Edition, PHI
2. Edward W Kamen& Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007
3. H P Hsu, RakeshRanjan, "Signals and Systems", Schaum's Outlines, Tata McGraw Hill, Indian Reprint, 2007.

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Power System

EE404	PCC	Power System	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	CA-1: 10 Marks
Tutorial: --	CA-2: 10 Marks
Practical: --	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Network analysis and synthesis

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the layout of power system
CO2	Evaluate steady state analysis of AC systems
CO3	Determine transmission line parameters
CO4	Solve power flow, symmetrical and unsymmetrical fault analysis
CO5	Determine economic load dispatch problem
CO6	Perceive power system stability problem

Course Contents:

Unit 1: Introduction to power systems: Brief history of power systems, structure of power systems, generation, transmission and distribution, Layout of power station and substation.	[6]
Unit 2: Steady state analysis of AC systems Representation of phasor quantities, power calculation in single phase and three-phase circuits, modelling of power system components, per unit representation, power factor correction.	[6]
Unit 3: transmission line modelling Resistance in transmission line, Bundled conductors, GMR and GMD of bundled	[7]

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conductors, Inductance calculation, capacitance calculation, different models of transmission line: Pi model, T model, ABCD parameters in transmission lines, voltage regulation and efficiency calculation, calculation of string efficiency of insulators	
Unit 4: Power flow and symmetrical fault analysis Calculation of admittance matrix, Gauss Seidel, Newton Raphson, Fast decoupled power flow, DC power flow, symmetrical fault analysis, symmetrical components, unsymmetrical fault calculations for L-G, LL-G and L-L faults	[7]
Unit 5: Economic load dispatch: Load duration curves, cost function of generators, incremental cost function, economic dispatch of generators without considering loss, economic dispatch considering loss function	[6]
Unit 6: Power system stability: Swing equation, transient stability, stable and unstable equilibrium, equal area criterion, critical clearing angle and critical clearing time	[6]

Text Books:

1. "Power System Analysis", John J. Grainger and William D. Stevenson, Tata McGraw-Hill, 2003.
2. "Power system analysis" Hadi Saadat, Tata McGraw-Hill, 2002

Reference Books:

1. "Electrical energy systems theory an introduction" Olle I. Elgerd, T M H Edition
2. "Power system engineering" I. J. Nagrath and D. P. Kothari, Tata McGraw-Hill, 2005
3. "Electrical Power Systems" C L Wadhwa, New Age International Publishers

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Electrical Engineering Materials (Elective-I)

EE405A	PEC	Electrical Engineering Materials	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs./week	CA-I:10 Marks
Tutorial: --	CA-II: 10 Marks
Practical:--	Mid Semester Exam: 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering, Physics, Chemistry

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain conducting Materials
CO2	Explain Super conducting Materials
CO3	Classify Insulating Materials
CO4	Summarize Magnetic Materials
CO5	Explain Dielectric Materials
CO6	Explain Nano Materials

Course Contents:

Unit 1: Conductive materials Free electron theory of metals, Effect of temperature on conducting materials, Factors affecting resistivity, Thermal conductivity of metals, Classification of conductor materials, Standards used in conducting materials	[6]
Unit 2: Super Conducting Materials Superconductivity, Factor affecting Superconductivity, Effect of magnetic temperature, Meissner effect, Type-I and Type-II superconductors, High temperature superconductors, Super conducting materials, Application of superconductors.	[6]
Unit 3: Insulating Materials General properties of insulating materials, Thermal classification, Dielectric gases, Liquid & solid insulating materials, Insulating materials for electrical devices, Effect of Moisture on insulating materials.	[5]

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Unit 4: Magnetic Materials Magnetic parameters, Classification of magnetic materials, Dia, Para and ferromagnetism, Antiferromagnetic and Ferrimagnetic materials, properties of ferromagnetism, Soft magnetic materials, Hard magnetic materials, Magnetic materials for electric devices.	[7]
Unit 5: Dielectric Materials Classifications of dielectric materials ,Mechanism & Types of polarization, Clausius-Mosotti equation, Internal field in solids and liquids, Dielectric constant, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials.	[7]
Unit 6: Nano Materials: Nanomaterials : Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD., Applications of nanomaterials.	[7]
Text Books: 1. A course in Electrical Engineering Materials, S.P. Seth, P.V. Gupta, Dhanpat Rai & Sons. 2. Electrical Engineering Materials, A.J. Dekker, PHI.	
Reference Books: 1. Materials Science for Electrical & Electronics Engineers, Ian P. Jones, Oxford. 2. Electrical Properties of Materials, L. Solymar& D. Walsh, Oxford. 3. Science of Engineering Materials and Carbon Nanotubes - C.M. Srivastava and C. Srinivasan.	

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Industrial Safety (Elective-I)

EE405B	PEC	Industrial Safety	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain various hazards in Industry
CO2	Explain principles of accidents prevention
CO3	Explain significance of first aid
CO4	Explain significance of Personal Protective Equipment's
CO5	Explain concepts of Safety Management

Course Contents:

Unit 1: Electrical Hazards in Industry Indian Electricity Act and Rules, Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Overload and Short circuit protection, Earthing standards and earth fault protection, Protection against voltage fluctuations, Effects of shock on human body, Hazards from Borrowed neutrals, Electrical equipment in hazardous atmosphere, Criteria in their selection, installation, maintenance and use, Control of hazards due to static electricity, Relevant IS and OSHA Standards	[6]
Unit 2: Fire and other Hazards Explosive Act and Rules, Gas Cylinders Rules, Static and Mobile Pressure Vessels (Unfired) Rule, General causes and classification of fire, Detection of fire, extinguishing methods, firefighting installations with and without water. Machine guards and its types, automation. High pressure hazards, safety, emptying, inspecting, repairing, hydraulic and nondestructive testing, Relevant IS and OSHA Standards	[6]

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Unit 3: Principles of accidents prevention Definition: Incident, accident, injury, dangerous occurrences, unsafe acts, unsafe conditions, hazards, error, oversight, mistakes etc. Accident Prevention: Theories / Models of accident occurrences, Principles of accident prevention, Accident and Financial implications, Hazard identification and analysis: fault tree analysis, Event tree analysis, failure modes and effects analysis, Hazop studies, Job safety analysis – examples, Plant safety inspection - objectives and types check procedure inspection report, Factories Act 1948, Workman's Compensation Act 1923, Employees State Insurance Act 1948	[6]
Unit 4: First aid Need of First aid. Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in muscles and joints, Bleeding, Burns, Scalds and accidents caused by electricity, Respiratory problems, Rescue and Transport of Casualty. Cardiac massage, poisoning, wounds, Statutory provisions, First Aider-Role & Responsibilities and Qualities	[6]
Unit 5: Personal Protective Equipment's Personal Protective Equipment's: Need, selection, supply, use, care and Maintenance, Personal protective devices for head, ear, face, eye, foot, knee and body protection, Respiratory personal protective devices. Training maintenance, precaution and care of PPE, Detection equipment, Testing Procedures and Standards	[6]
Unit 6: Safety Management Organizing for safety, Health and Environment Organization: Structure, Function and responsibilities Safety Committee: Structure and function, The competent person in relation to safety legislation - duties and responsibilities. Concept for training, Relevance of WTO regarding safety, Health and environment. Employee participation in safety - Role of Trade union in safety, Safety promotion and safety awards, safety, competitions. Safety Education & Training, Approaches to compliance & Violations, Safety Audit and Integrated Management System.	[6]
Text/Reference Books: 1. Industrial Safety –National Safety Council of India ISHET. 2. Dr. K. U. Mistry - Fundamentals of Industrial Safety & Health, Siddharth Prakashan, Ahmadabad.	
Text/Reference Books: 1. The Factories Act with amendments 1987, Govt. of India Publications DGFASLI, Mumbai 2. Grimaldi and Simonds, Safety Management, AITBS Publishers, New Delhi (2001)	

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Electrical Estimation and Costing (Elective-I)

EE405C	PEC	Electrical Estimation and Costing	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3hrs./week Tutorial: -- Practical: --	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electrical Engineering, Measurement and Instrumentation,

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain estimation and costing
CO2	Explain types of earthing
CO3	Explain Service connection
CO4	Estimate for residential installation
CO5	Estimate for commercial installation
CO6	Estimate for Power circuits

Course Contents:

Unit 1: General Principles of Estimation: Introduction to estimation and costing, Electrical Schedule, catalogues, Market survey and source selection, recording of estimates, determination of required quantity of material, labour conditions, determination of cost of material and labour, contingencies, overhead charges, profit, purchase system, purchase enquiry and selection of appropriate purchase mode, call for quotation, comparative statement purchase order payment of bills, tender form general idea about IE rules, Indian electricity act and major applicable IE rules.	[7]
Unit-2: Earthing: Meaning of earthing, touch potential and step potential, necessity of earthing, Points to be earthed, factors influencing earth resistance, methods of reducing earth resistance, standard values of earth resistance for various installations, method of selecting the size of earth conductor, types /methods of earthing, Pipe earthing-diagram, specifications of pipe earthing, Plate earthing-diagram and specifications of plate earthing.	[5]
Unit 3: Service connection: Meaning of service mains, code of Practice for service mains, types of service mains-Over Head Service Mains -materials and specifications, UG Service Mains -materials	[6]

and specifications, Standard wire size table, current ratings for Aluminium, copper conductors and selection of size of conduit pipe as per the size and number of wires. Load calculation, selection of size and type of conductor/UG cable, discrimination of size of protective devices, Quantity calculation, schedules of materials and estimates for single phase OH service connection, three phase OH service connection, single phase UG service connection and three phase UG service connection.	
Unit 4: Electrification of Residential installation: General rules, guidelines for wiring of residential installation and positioning of equipment, the principles of circuit design in lighting and power circuits, procedure for designing circuit and deciding the number of circuits, selection of type of wiring and rating of wires and cables, load calculations and selection of size of conductor, selection of rating of main switch, distribution board, protective switch gear ELCB and MCB and wiring accessories, Earthing of residential installation, sequence to be followed for preparing estimate, preparation detailed estimates and costing of residential installation.	[7]
Unit 5: Electrification of commercial installation: Concept of commercial installation, differentiate between electrification of residential and commercial installation, design considerations for planning of and electrical installation system for commercial building, load calculation and selection of size of service connection and nature of supply, deciding the size of the cables, busbar and bus bar chambers mounting arrangements and positioning of switchboards, distribution boards main switch, earthing of the electrical installation, selection of type of wiring system, sequence to be followed to prepare estimate, preparation of detailed estimate and costing of commercial installation.	[6]
Unit 6: Electrical Installation for power circuits: Introduction, important considerations regarding motor installation wiring, determination of input power, determination of input current to motors, determination of rating of cables, determination of rating of fuse, determination size of conduit, distribution board main switch and starter.	[6]
Text Books: 1. Electrical Wiring Estimation and Costing by S. L. Uppal, Khanna publications 2. Electrical Design Estimation and Costing by K. B. Raina and S. K. Bhatacharya New Age International publications.	
Reference Books: 1. A Course in Electrical Installation Estimation and Costing by J B Gupta, S K Katariya and Sons publications	

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DC Machines & Transformers Laboratory

EE406	PCC	DC Machines & Transformers Laboratory	0-0-2	1 Credits

Teaching Scheme	Evaluation Scheme
Practical: 2 hrs/week	CA1-:15 Marks CA2- 15 Marks End Semester Exam- 20 Marks

Pre-Requisites: Basic Electrical Engineering

Course Outcomes: At the end of the course, students will be able to:

CO1	Test for performance parameters of transformers.
CO2	Demonstrate constructional details of DC machines.

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List of Experiments: At least 8 experiments should be performed from the following list.

Title of Experiment

1. To verify turn ratio of transformer.
2. To verify relation in i) Scott connection ii) open delta connection
3. To determine efficiency by direct load test on single phase transformer.
4. To study the parallel operation of 3 phase transformer
5. Details and assembly of 3-phase transformer with design report.
6. To determine efficiency by Break load test on DC Shunt motor.
7. To Determine the constant losses and hence to find the efficiency of a given DC Machine at any desired load by Swinburne's Test.
8. To Determine the stray loss and hence to find the efficiency of the given DC shunt Motor & Shunt Generator by Hopkinson's Test.
9. To determine OCC of DC Shunt Generator.
10. To determine efficiency by direct load test on DC Generator.
11. Report based on Industrial visit to a manufacturing unit. (Transformer or DC motor).

Text Books:

1) Bhattacharya S. K, "Electrical Machines", (Tata McGraw Hill Publications)
2) Kothari Nagrath, "Electrical Machines", (Tata McGraw Hill Publications)
3) M. N. Bandopadhyay, "Electrical Machines", (Tata McGraw Hill Publications)

Reference Books:

1) Fitzerland, "Electrical Machines", (Tata McGraw Hill Publications)
2) A Course in Electrical Machine Design, A.K.Sawhney, Dhanpat Rai & sons New Delhi
3) Principles of Electrical Machine Design, R. K. Agarwal, S. K. Katariya and sons.
4) A Text Book of Electrical Engineering Drawings, K.L. Narang, Satya Prakashan, New Delhi.
5) Electrical Machine Design Data Book, A Shanmugasundaram, G. Gangadharan, R. Palani, 3rd Edition, Wiely Eastern Ltd., New Delhi.

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Control Systems Laboratory

EE407	PCC	**Control Systems Laboratory**	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Practical: 2 hrs/ week	CA1-:15 Marks CA2- 15 Marks End Semester Exam- 20 Marks

Pre-Requisites: Network Analysis, Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Evaluate the transfer function of the system using block diagram reduction techniques
CO2	Determine the system response in both time-domain.
CO3	Determine stability by applying Routh-Hurwitz criteria and Root Locus method
CO4	Determine the stability and response by constructing Polar, Nyquist & Bode plot
CO5	Evaluate the effect of P, PI, PD and PID controllers on system.
CO6	Explain control system models using state space models

List of Experiments: At least **8** experiments should be performed from the following list.

1. Familiarization with MATLAB control system toolbox, MATLAB Simulink toolbox.
2. Linear Time-invariant Systems and Representation using MATLAB
3. Block Diagram Reduction using MATLAB
4. Time Response of Second Order System using MATLAB
5. Simulation of Step response & impulse response for type-0, type-1 & type-2 system with unity feedback using MATLAB
6. Determination of stability by using Root locus using MATLAB for 2^{nd}, 3^{rd} & 4^{th} order system of a Linear Time Invariant System.
7. Determination of stability by using Bode plot using MATLAB for 2^{nd}, 3^{rd} & 4^{th} order system of a Linear Time Invariant System.
8. Determination of stability by using Nyquist plot using MATLAB for 2^{nd}, 3^{rd} & 4^{th} order system.

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of a Linear Time Invariant System.

9. State Model for Classical Transfer Function & Vice-Versa Using MATLAB.

10. PID Controller using MATLAB

Term Work:

The term work consists of continuous assessment & performance of laboratory work.

Textbooks:

1. I. J. Nagrath, M. Gopal, "Control System Engineering", New Age International Publishers – Fourth edition
2. Control system: Principles and Design, M. Gopal, Tata Mc Graw-Hill Publication
3. Modern Control Engineering, K. Ogata, Eastern Economy, 5th edition 2011.
4. Control System Engineering, I. J. Nagrath and M. Gopal, New Age publication, 5th edition, 2008.

Reference Books:

1. Katsuhiko Ogata," Modern Control Engineering", Prentice Hall, 2010
2. Automatic Control System, B. C. Kuo, Wiley Publication 8th edition.
3. Control System Engineering, Norman S. Nise, John Wiley and Sons, 6th edition, 2014.
4. Digital Control and State Variable Methods, M.Gopal, Tata Mc Graw Hill, 3rd edition.

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Power System Laboratory

EE408	PCC	**Power System Laboratory**	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: --	CA1-:15 Marks
Tutorial: --	CA2- 15 Marks
Practical: 2hrs./week	End Semester Exam- 20 Marks

Pre-Requisites: Basic Electrical Engineering, Network analysis

Course Outcomes: At the end of the course, students will be able to:

CO1	Analyze Sinusoidal voltages and currents, transmission lines model (pi and T model), Transient stability of Single Machine connected to Infinite Bus
CO2	Analyze Power Flow using Gauss-Seidel Methods and Newton Raphson Methods
CO3	Determine fault current in case of L-L, L-G and L-L-G and symmetrical faults
CO4	Determine load distribution between generators economically with and without losses.

Term Work: The term work consists of continuous assessment & performance of laboratory work.

List of Experiments:

At least 8 experiments should be performed from the following list.

1. Analysis of sinusoidal voltages and currents
2. Computation of GMR, inductance and capacitance of bundled conductors.
3. Analysis of pi and T model of transmission lines.
4. Formation of bus admittance model.
5. Power flow analysis using Gauss-Seidel method
6. Power flow analysis using Newton-Raphson method
7. Three phase symmetrical fault analysis for synchronous machines.
8. Calculation of fault current in case of L-L, L-G and LL-G faults

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9. Determination of economic load dispatch of generators with and without losses
10. Transient stability analysis of Single Machine connected to Infinite Bus (SMIB)

Text Books:

1) "Power System Analysis", John J. Grainger and William D. Stevenson, Tata McGraw-Hill, 2003.
2) "Power system analysis" Hadi Saadat, Tata McGraw-Hill, 2002.

Reference Books:

1) "Electrical energy systems theory an introduction" Olle I. Elgerd, T M H Edition
2) "Power system engineering" I. J. Nagrath and D. P. Kothari, Tata McGraw-Hill, 2005
3) "Electrical Power Systems" C L Wadhwa, New Age International Publishers.

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Environmental Sciences

MDC02	MC	Environmental Sciences	2-0-0	Audit

Teaching Scheme	Examination Scheme
Lecture: 2 hrs./week	CA1: - 25
Tutorial: --	CA2: - 25
Practical: --	

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain various natural resources and associated Problems
CO2	Summarize various ecosystems
CO3	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO4	Recognize various causes of environmental pollution along with various protection acts in India to limit the pollution
CO5	Extract the information based of field study and prepare a report.

Course Contents:

Unit 1: Nature of Environmental Studies: Definition, scope and importance, Multidisciplinary nature of environmental studies. Need for public awareness.	[2]
Unit 2: Natural Resources and Associated Problems: a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. e) Land resources: Solar energy, Biomass energy, Nuclear	[6]

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energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. f) Role of individuals in conservation of natural resources	
Unit 3: Ecosystems: Concept of an eco-system. Structure and function of an ecosystem. Producers, consumers and de composers. Energy flow in the eco system. Ecological succession. Food chain etc. in concern with forest ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Grassland ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Desert ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with various aquatic ecosystems	[4]
Unit 4: Biodiversity: Introduction- Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Various approaches for the conservation of biodiversity.	[4]
Unit 5: Environmental Pollution and Environmental Protection: Definition: Causes, effects and control measures of various types of pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development: From Unsustainable to Sustainable development, Various environmental Protection Acts and their scope.	[4]
Unit 6: Field Work: The student should Visit to a local area to document environmental Assets-River/Forest/Grassland/Hill/Mountain. Or Visit to a local polluted site - Urban / Rural / Industrial /Agricultural. Or Study of common plants, insects, birds. or Study of simple ecosystems - ponds, river, hill slopes, etc. **The student should expect to do this activity in a group size of 4-5 and prepare and submit a report on it.**	[4]

Text/Reference Books:

1. Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net
3. Brunner R.C.,1989, Hazardous Waste Incineration, McGraw Hill Inc.480p

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Aptitude Skills –II

HMS03	HSMC	Aptitude Skills- II	1-0-0	Audit

Teaching Scheme	Examination Scheme
Lecture: 1 hrs/week Tutorial: NA Practical: NA	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Communication Skills, Aptitude Skills- I

Verbal Ability (12Hrs) (Compulsory)

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand basic concepts of sentences and its structure
CO2	Understand the tenses and its use in daily life
CO3	Explain basic uses of speeches and voices in day to day life
CO4	Understand the use of modal verbs in sentence construction
CO5	Summarize various Phrases, Idioms and Proverbs
CO6	Summarize different words used in daily life

Course Contents:

Unit 1: English Grammar Structure and Types of Sentence, Conditional Sentences	[2]
Unit 2: Tenses Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[2]
Unit 3: Speeches and Voices Direct and Indirect Speech, Active and Passive Voice	[2]
Unit 4: Modal Use of Modal verbs in Sentence Forming, Substitution and Elimination	[2]
Unit 5: Proverbs, Idioms and Phrases Use of Proverbs, Idioms and Phrases in Sentence Construction, Judgment and Inference Sentence	[2]

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Unit 6: Vocabulary Vocabulary Building in Various Situations	[2]

Text Books:

1. Raymond Murphy, Essential English Grammar with Answers, Murphy
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15 March 2017)

Reference Books:

1. Rao N, D, V, Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press; Second edition

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Language Skills- II

HMS04	HSMC	Language Skills- II	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Lecture: NA Tutorial: NA Practical: 2 hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Communication Skills, Language Skills- I

Languages (Any One)

C Programming (Technical Language) (24Hrs)

Syllabus for C Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Illustrate the concept of Function Types, and its type
CO2	Make use of Structures and Unions.
CO3	Make use of Pointers
CO4	Illustrate the concept of File handling in C programming.

Course Contents:

Unit 1: Function Editing, Basic of functions, Types of functions, returning non-integers external variables, scope rules, Recursion Function.	[6]
Unit 2: Structures and Unions Variable Defining a Structure, Advantage of Structure, Size of Structure, Arrays of Structures, Structures and Functions, Defining Unions.	[6]
Unit 3: Pointers Pointers to integers, characters, floats, arrays, structures.	[6]

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Unit 4: File handling	[6]
Initializing Introduction to dynamic memory allocation- Malloc, Calloc, Realloc, Introduction to file management, Opening/Closing a file, Input/ Output operations on Files, Error handling during I/O Operations.	

Text Books

1. C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013)
2. C Programming Language 2nd Edition, Pearson Publication

Reference Books

1. C: The Complete Reference, McGraw Hill Education; 4th edition (1 July 2017)
2. C Programming in easy steps, 5th Edition, In Easy Steps Limited
3. The C Programming Language, Second Edition, By Pearson Education India (1 January 2015)

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Foreign Languages (Any One)

Japanese Language Course I (12Hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Converse in Standard Japanese to perform basic communicative tasks (e.g., exchange greetings/personal information, give time/directions/daily activities)
CO2	Make use of Japanese vocabulary effectively.
CO3	Demonstrate reading comprehension.

Course Contents:

Unit 1: Basic communicative tasks Learning expressions involving "---ni---gaimasu" pattern, Introduction of counters, simple translations, Communicative situations—shopping, Grammar: Introduction of adjectives, na-adjectives	**[4]**
Unit 2: Communicative situations Time relations, Communicative situations-confirming schedules etc, Particles and their functional use in Japanese sentences, Reading comprehension—a story	**[4]**
Unit 3: Easy conversation Introduction of past tense aspect in r/o verbs, and adjectives, Communicative situation: asking questions and answering, Easy conversation, Overall revision, and discussion	**[4]**

Text Book:

1. Netzwerk Arbetisbuch A1 Goyal Publisher.
2. "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time" by Ed Swick
3. "German Made Simple: Learn to Speak and Understand German Quickly and Easily" by Eugene Jackson and Adolph Geiger

Reference Books

1. "Hammer's German Grammar and Usage" (Fifth Edition) by Professor Martin Durrell
2. "Learn German with Stories: Café in Berlin" by André Klein

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Foreign Languages

German Language Course I (12Hrs)

Course Outcomes: At the end of the course, students will be able to:

CO1	Introduce herself or himself in German.
CO2	Understand alphabets, numbers in German language
CO3	Make basic and easy sentences required in day to day situations
CO4	Read, write, speak and listen basic and simple text in German.

Course Contents:

Unit 1: Introduce oneself Introduction, Greetings, German Alphabets, Numbers (1 -100), Giving and asking Information related to numbers	[3]
Unit 2: Formal and Informal form Difference between Formal and Informal form, Personal Pronouns, verb conjugation	[3]
Unit 3: Everyday situations Learning about the things in the classroom, Definite, indefinite, negative articles, Possessive Articles of all the nouns	[3]
Unit 4: Simple activities Watch timings learning, Routine activities	[3]
Text Books 1. Netzwerk Arbetisbuch A1 Goyal Publisher 2. "The Everything Learning German Book: Speak, Write and Understand Basic German in No Time" by Ed Swick 3. "German Made Simple: Learn to Speak and Understand German Quickly and Easily" by Eugene Jackson and Adolph Geiger	
Reference Books 1. "Hammer's German Grammar and Usage" (Fifth Edition) by Professor Martin Durrell 2. "Learn German with Stories: Café in Berlin" by André Klein	

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Mini Project -III

PRJ03	PROJ	Mini Project III	0-0-2	1 Credit

Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	Continuous Assessment –I :25 Marks Continuous Assessment –II :25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

1	Select the appropriate method for solving the problem
2	Make use of various engineering techniques and tools to give a solution
3	Justify the method/tools used to develop the solution.
4	Demonstrate tangible solutions to the problem
5	Describe the solution with the help of a project report and presentation.

The project is a part of addressing societal and industrial needs. Mini project is one of the platforms that students will use to solve real-world challenges. This course focuses on the selection of methods/engineering tools/analytical techniques for problem-solving. Through this course, students gain a thorough understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills, and responsibility.

Guidelines

1. Every student shall undertake the Mini project activity for semester IV.
2. the same group of minimum three and maximum of five students who were working for mini project II should work together in Mini project III
3. The students have to work on different approaches and finalize the best methodology to solve the problem in consultation with the project guide.
4. The students should use different tools /Techniques for the development of the solution to the problem.
5. While developing solutions, the student can take care of effective use of resources, follow ethical practices, finance management,
6. The solution should be optimal, affordable, user-friendly and environment friendly.
7. Critically analysis and testing of the solution provided.
8. By using IPR, students should reserve their rights of innovations as well as communicate new findings to society with the help of research papers.

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The committee of senior faculty members and a project guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members.

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Head of the Department
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Yadrav (Ichalkaranji) Dist.Kolhapur

Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
(An Autonomous Institute)
Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur

Industrial Training/Field Training - I

IFT01	PROJ	Industrial Training/Field Training - I	0-0-0	Audit

Teaching Scheme	Examination Scheme
Lecture: -- Tutorial: -- Practical: --	End Semester Exam: 50 Marks

Course Description:-

Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the fourth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD /TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the fifth semester by the department.

Course Learning Outcomes:-

After successful completion of the course, students will be able to

1.	Verify the Technical knowledge in real industrial situations.
2.	Develop interpersonal communication skills.
3.	Discuss activities and functions of the industry in which the Internship/training has done.
4.	Write the technical report.

Prerequisite: - Basics of (Programme) Engineering, Good written and Oral Communication.

Guideline for Students:-

1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.

Student's Diary/ Daily Log

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and

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reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor.

Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report

After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:

i. Originality.
ii. Adequacy and purposeful write-up.
iii. Organization, format, drawings, sketches, style, language etc.
iv. Variety and relevance of learning experience.
v. Practical applications, relationships with basic theory and concepts taught in the course.

Evaluation of Internship/Training

The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.

Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.

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