Hon'ble Vice chancellor
for approval

JK Lakshmipat University

Near Mahindra SEZ, Mahapura, Ajmer Road, Jaipur 302 026

Ph.: +91-141-7107500/504

INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Program

(Branch: Electrical Engineering)

Batch 2015-19

Course Structure, Detailed Syllabus

&

Scheme of Examination

(Approved by Academic Council in its 5th Meeting held on January 09, 2015)

JK Lakshmipat University, Jaipur
Institute of Engineering and Technology
Department of Electrical Engineering
Course Structure for the Batch 2015-19

Semester	Courses							(L T P) Credits Hrs/ Week
I	English Communication Skills	Engineering Mathematics - I	Engineering Chemistry	Electrical & Electronics Engineering	Workshop Practice	Machine Drawing		(13 3 10) 21
	LA101 (2 1 0) 3	MA101 (3 1 0) 4	CH101 (3 1 2) 5	EE101 (3 0 2) 4	ME141 (0 0 4) 2	ME241 (2 0 2) 3		26
II	Professional Communication Skills	Engineering Mathematics - II	Engineering Physics	Environmental Studies	Object oriented programming	Engineering Mechanics		(15 4 6) 22
	LA201 (1 1 2) 3	MA201 (3 1 0) 4	PH101 (3 1 2) 5	ID101 (2 0 0) 2	CSE201 (3 0 2) 4	ME201 (3 1 0) 4		25
III	Network Analysis & Synthesis	Electrical Machines –I	Electronic Devices & Circuits	Digital Electronics	Engineering Mathematics – III	Principles of Management for Engineers		(17 5 8) 26
	EE301 (3 1 2) 5	EE302 (3 1 2) 5	ECE301 (3 1 2) 5	ECE303 (3 1 2) 5	MA301 (3 1 0) 4	HS302 (2 0 0) 2		30
IV	Electrical Machines – II	Transmission & Distribution of Electrical Power	Electrical Measurement & Instruments	Electromagnetic Field Theory	Conventional Energy Sources	Numerical & Statistical Methods	Principles of Economics	(21 3 6) 27
	EE401 (3 1 2) 5	EE402 (3 1 0) 4	EE404 (3 0 2) 4	ECE403 (3 1 0) 4	EE403 (3 0 0) 3	MA402 (3 0 2) 4	HS401 (3 0 0) 3	30
	Practice School - I (PS 501) – (4 to 6 Weeks Duration) - 4 Credits							
V	Linear Control Systems	Power System Switchgear & Protection	Modeling & Simulation	Linear Integrated Circuits	Electrical Signal & Systems	Effective Public Speaking and Employability Skills		(17 4 8) 25+4
	EE501 (3 1 2) 5	EE502 (3 1 2) 5	EE503 (3 0 2) 4	ECE501 (3 1 2) 5	EE504 (3 1 0) 4	LA501 (2 0 0)A		29
VI	Non-conventional Energy Sources	Power System Analysis	Industrial Electronics	Advanced Control System	Microprocessors	Elective – I	HS Elective	(21 3 6) 27
	EE601 (3 1 0) 4	EE602 (3 1 2) 5	EE603 (3 1 2) 5	EE 604 (3 0 0) 3	EE605 (3 0 2) 4	(3 0 0) 3	(3 0 0) 3	30
VII	**Practice School – II (PS701) – (16 Weeks Duration) - 16 Credits**							16
VIII	Electrical Drive & Control	High Voltage Engineering	Testing and Commissioning of Electrical Machines	Elective – II	Elective – III	Seminar		(15 4 6) 22
	EE 801 (3 1 0) 4	EE 802 (3 1 0) 4	EE 803 (3 1 2) 5	(3 1 0) 4	(3 0 0) 3	SEM801 (0 0 4) 2		25

List of Elective Courses

Elective I	Restructured Power System (EE 622)	Power System Transients (EE 621)	Engineering Optimization (MA 621)	Advanced Distribution System (EE 624)	Electrical and Electronic Engineering Materials (EE 625)
Elective II	Power Quality& Utilization of Electrical power (EE 821)	Flexible AC Transmission System (EE822)	High Power Semiconductor devices (EE823)	Electrical Machine Design (EE724)	
Elective III	Biomedical Engineering (ECE 722)	Industrial Automation and Control (EE824)	Information Theory and Coding (ECE724)	IC Technology (ECE725)	
HS Elective	Organizational Behavior (HS 601)	Professional ethics (HS 602)	Technology management (HS 603)	Critical interpretation of literature and cinema (HS 604)	

Total Credits: 190

EL III Biomedical
EIV ML by CSE
EIV → Wireless Network

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-ONE

Detailed Syllabus

&

Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
LA 101	English Communication Skills	2	1	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

- Definition and Characteristic Features of Effective Communication
- Barriers to Communication: Types, Ways to Overcome
- Vocabulary Extension: Roots, Prefixes and Suffixes
- Vocabulary Extension: Synonyms, Antonyms, Homophones, One Word Substitution
- Vocabulary Extension: Learning words through Situations
- Basics of English Grammar
- Applied English Grammar and Standard English Usage
- Standard English Usage, Listening Skills
- Phonetics and Spoken English: Sounds of English, Word Accent and Weak Forms in English, Intonation
- Introducing students to the rules of Word Accent and Weak Forms in English
- Reading Comprehension: Problems, Types of Reading Skills, Strategies
- Paragraph Writing: Definition, Structure of a Paragraph, Construction of a Paragraph, Unity and Coherence
- Art of Condensation: Steps Required, Strategies

Text Book(s)

1. Sanjay Kumar and Pushp Lata, *Communication Skills,* New Delhi: OUP, 2011

Reference Book(s)

1. Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice*, Second Edition, New Delhi: OUP, 2011.
2. Krishna Mohan and Meenakshi Raman, *Effective English Communication*, New Delhi: Tata-McGraw Hill, 2000.
3. Krishna Mohan and N.P.Singh, *Speaking English Effectively,* New Delhi: Macmillan,1994.
4. V. Sasikumar and P.V. Dhamija, *Spoken English: A Self-Learning Guide to Conversation Practice*, Tata-McGraw Hill, 2007.
5. Norman Lewis, Word Power Made Easy, Delhi: GoyalSaab Publishers and Distributors, 1994.
6. A.J.Thomson and A.V.Martinet, A Practical English Grammar, 4th Edition, New Delhi: OUP, 1999.
7. Asha Kaul, Business Communication, Second Edition, New Delhi: PHI, 2010.
8. Edgar Thorpe and Showick Thorpe, Objective English, 2nd Edition, New Delhi: Pearson Education, 2008.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
MA 101	Engineering Mathematics – I	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

Unit 1: Calculus of several variables

Functions of two or more variables, Partial Derivatives, Total derivative, chain Rule, Euler's Theorem, Jacobian and transformation, Applications to errors, Optimization using derivatives - Maxima-Minima of functions of two variables, Lagrange's method.

Unit 2: Curve Sketching

Asymptotes, Double and Triple Points, Cartesian, parametric and polar curve sketching

Unit 3: Vector function and its derivatives

Vector functions, their derivatives and integration, Arc length and unit tangent vector, Curvature and unit normal vector, Torsion and unit Bi-normal vector, Directional derivative and gradient vectors, Tangent plane, Divergence and curl of a vector field

Unit 4: Integral Calculus

Definite Integral - Integral calculus, Line integral, Arc length, Solids of revolution: Surface and volume, Multiple Integrals - Double integral: Area, change of order of integration, changing to polar coordinates, Triple integral, Volume integral,

Unit 5: Vector Integration

Line integral, flux, work done, circulation, Path independence, potential function and conservative fields, Green's theorem in the plane, Stoke's theorem, Divergence theorem,

Text books and Reference books

1. Babu Ram, *Engineering Mathematics* Part – I, Pearson.
2. B. S. Grewal, *Higher Engineering Mathematics*, 41st Ed., Khanna Publishers, Delhi, 2011.
3. G.B. Thomas, Jr., *Thomas' calculus*, 11th edition (Indian), Pearson education, Delhi, 2008
4. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Fourth Edition (Student Edition), Jones & Barlett, Viba, New Delhi, 2011
5. Rober Wrede, Spiegel M. R., *Schaum's outline of advanced calculus*, 3rd edition, Tata Mc-GrawHill, NewYork, 2011
6. Peter V. O'Neil, *Advanced Engineering Mathematics*, Seventh Indian Reprint, Cengage Learning, New Delhi, 2011.
7. Kreyszig, E., *Advanced Engineering Mathematics*, John Willey, Delhi (2011).
8. Potter M.C., Goldberg J.L., Edward F.A., *Advanced Engineering Mathematics*, 3rd Edition, Oxford University Press, 2005.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
CH 101	Engineering Chemistry	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks **	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT-I Water Chemistry

Introduction, common Impurities in water, Hardness of water, Determination of hardness by Clark's test and complexometric (EDTA) method. Removal of hardness by Lime Soda, Zeolite and Ion exchange process.
Boiler feed water: troubles their causes, disadvantages and prevention, Scale & Sludge Carry over (Priming and Foaming), Boiler Corrosion and Caustic embrittlement.

UNIT-II Polymers

Introduction to Polymer, Classification of polymers. Methods of Polymerization, Plastics: Thermosets and Thermoplastic. Preparation, properties and uses of Vinyl resins, Bakelite, Polyesters and Nylons. Rubbers: Natural rubber, vulcanization, synthetic rubbers e.g. Buna-S, Buna-N, Butyl, Thiokol and Neoprene rubbers.

UNIT-III Corrosion &Lubricants

Definition and its significance, Theories of corrosion: Dry corrosion theory, Wet (Electrochemical) theory, Passivity, Types of electrochemical corrosion. Factors influencing rate of corrosion.
Introduction, classification and uses of lubricants. Types of lubrication. Viscosity & viscosity index, Flash point Fire point, cloud and pour point, steam emulsification number, precipitation number and neutralization number.

UNIT-IV Solid State Chemistry

Solid State, Types of solids, Space Lattice and Unit cell, Types of unit cell, Cubic System – Number of atoms per unit cell, Atomic Radius, Density Calculation of unit cell. Bragg's Law X-ray studies of Crystals.
Graphite – Structure, Properties and applications.
Liquid Crystal: Liquid Crystalline state, Classification of liquid crystal and their applications.

UNIT-V Engineering Materials

Cement: Definition, Composition basic constituents and their significance, manufacturing of Portland cement by Rotary Klin technology. Setting and hardening of cement and role of gypsum.
Nanotechnology and Nano materials: Fullerenes and Carbon Nano tubes - Introduction, Structural properties, preparation and their applications.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE101	Electrical & Electronics Engineering	3	0	2	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT I

INTRODUCTION: basic physical laws, circuit elements, Source Transformation, KVL, KCL, Wye (Y) – Delta (Δ) and Delta (Δ) – Wye (Y) transformations.

UNIT II

THEOREM: Norton, Thevenin, Superposition, Max power transfer Theorem

UNIT III

AC NETWORKS: Fundamental aspects of single phase ac supply, Sinusoidal Steady State, Real/Reactive Power, Phasor, Three phase circuits, Start-delta, Two watt-meter Method, simple circuits, RMS Average value, Transients in R-L, R-C, R-L-C.

UNIT IV

TRANSFORMER & MACHINE: Basics of transformer Faraday and Lenz law, Mutual Inductance, construction, working Principles of Transformers, AC/DC machines.

UNIT IV

INTRODUCTION TO SEMICONDUCTORS: Defining Insulator, Semiconductor, Conductors. Band gap energy and band formation, elementary idea about semiconductor behavior, conductivity, types of semiconductor, p-type and n-type, working principle, characteristics and applications of Diode and Transistor, Transistor CE, CB, CC configuration.

Syllabus (Practical)

ELECTRICAL LAB

1. Single line diagram of a power system and a distribution sub-station and basic functional study of main components used in power systems.
2. Make house wiring including earthling for 1-phase energy meter, MCB, ceiling fan, tube light, three pin socket and a lamp operated from two different positions. Basic functional study of components used in house wiring
3. Study the construction and basic working of ceiling fan, single phase induction motor and three phase squirrel cage induction motor. Connect ceiling fan along with regulator and single phase induction motor through auto-transformer to run and vary speed.

4. (a) Basic functional study and connection of moving coil & moving iron ammeters and Voltmeters, dynamometer, wattmeter and energy meter.

   (b) Run a 3-phase squirrel cage induction motor at no load and measure its voltage, current, power and power factor. Reverse the direction of rotation.

5. Study the construction, circuit, working and application of the following lamps:

   (i) Fluorescent lamp, (ii) Sodium vapour lamp, (iii) Mercury vapour lamp, (iv) Halogen lamp and (v) Neon lamp

6. (a) Study the construction and connection of single phase transformer and auto-transformer. Measure input and output voltage and fin turn ratio.

   (b) Study the construction of a core type three phase transformer. Perform star and delta Connection on a 3-phase transformer and find relation between line and phase voltage.

ELECTRONICS LAB

7. Identification, testing and applications of resistors, inductors, capacitors, PN-diode, Zener diode,LED, LCD, BJT, FET, UJT, SCR, Photo diode and Photo transistor.

8. (a) Functional study of CRO, analog & digital multi-meters and function / signal generator.

   (b) Study the single phase half wave and bridge rectifier and effects of filters on waveform.

9. Study the BJT amplifier in common emitter configuration. Measure voltage gain, plot gain frequency response and calculate its bandwidth.

10. (a) Study the construction and basic working of SCR.

    (b) Study the single phase half wave and bridge controlled rectifier and observe the effect of firing angle on waveform.

Text Book(s)

1. S.N.Singh "Basic Electrical Engineering", Prentice-Hall of India Pvt. Ltd, 2011.
2. J. Millman and C. Halkias, Integrated Electronics, McGraw Hill,2th Edition, 6th Indian Reprint, 2011.
3. B. L. Theraja, "Electrical Technology", Vol.1, S. Chand Publication, New Delhi
4. V. K. Mehta, "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi

Reference Book(s)

1. T.K.Nagsarkar,M.S. Sukhija,"Basic Electrical Engineering", Oxford University press, 2nd edition, 2011.
2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ME 141	Workshop Practice	0	0	4	2

Evaluation Scheme (Theory)						Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation	Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks
-	-	-	-	-	-	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Practical)

- Basics of manufacturing, types of production systems, ethics, safety in workshop.
- Metrology, quality, Least Count of a measuring Instrument, measurement with Vernier Caliper or Micrometer.
- Machining – Demonstration of Turning, Step Turning, Facing, etc.
- Casting – Demonstration of sand casting process
- Forging – Demonstration of forging operations
- Sheet metal working applications.
- Hands on practice of Sheet metal working operations using hand tools- Preparation of Funnel.
- Gas Welding, Demonstration of Gas Welding
- Hands on practice of Joining of metal parts by Arc Welding- Preparation of a Lap Joint model.
- Mechanical joining processes, Arc Welding
- Hands on practice of Joining of metal parts by Arc Welding- Preparation of a Butt Joint model.
- Introduction to wood working, Wood working Tools, Types of wood, Types of joints.
- Hands on practice of Wood working operations using hand tools- preparation of Lap Tee Joint, Mechanical joining processes, Soldering, Brazing.
- Machining – Demonstration of Shaping operations
- Hands on practice of Fitting operations using hand tools- Prepare a job in fitting shop.

Text Books:

1. H S Bawa, "Workshop Practice", TMH, New Delhi, 2nd Edition, 2011
2. B S Nagendra Parashar and R K Mittal, "Elements of Manufacturing Process", Prentice Hall of India, New Delhi, 2010 print
3. B S Raghuwanshi, "A Course in Workshop Technology", Dhanpat Rai & Co., New Delhi, Volume I & II, 2011 reprint,
4. Serope Kalpakjian and Steven R. Schmid, "Manufactuirng Engineering and Technology," Pearson Education (Low Cost Indian Edition), New Delhi, 4th Edition, 2005

Reference Books:

1. K. Venkata Reddy, "Workshop Practice Manual", BS Publications, Hyderabad,6th Edition, 2011 print
2. P. kannaiah and K. L. Narayana, "Engineering Practices Laboratory", SciTech Publications, Chennai, 2006

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
CE 102	Engineering Drawing	2	0	2	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

Unit I

Lines, Lettering & Dimension (Sketch Book)

Scales: Representative factor, plain scales, diagonal scales, scale of chords.

Conic sections: Construction of ellipse, parabola, & hyperbola by different methods; Engineering Curves: Cycloid, Epi-cycloid, Hypo-cycloid, Involutes, Archimedean and logarithmic spirals.

Unit II

Projection: Types of projection, orthographic projection, first and third angle projection, (Sketch Book)

Projection of points and straight lines: Line inclined to one plane, inclined with both the plane, methods for determining True Length, true Inclinations, and Traces of straight lines.

Unit III

Projection of planes and solids: Projection of Planes like circle and polygons in different positions; Projection of right and regular polyhedrons like prisms, pyramids and solids of revolutions like cylinder, cones in different positions.

Unit IV

Section of Solids: Section of right solids (like Prism, Pyramid, Cylinder and Cone) by normal and inclined planes in different positions; Intersection of cylinders.

Development of Surfaces: Parallel line and radial-line method for right, regular solids.

Unit V

Isometric Projections: Isometric scale, Isometric axes, Isometric Projection of solids from orthographic drawing.

Computer Aided Drafting (CAD): Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; Draw Toolbar, Object & Modify toolbar; solution of projection problems on CAD.

Syllabus (Practical)

Sketching and drawing of geometries and projections on Sketch Book & on AutoCAD based on above syllabus

Text Books:

1. Kulkarni D M, Rastogi A P, Sarkar A K, Engineering Graphics with AutoCAD, PHI Learning Pvt. Ltd., New Delhi, India, Fourth Printing (Revised Edition), 2012.
2. Bhatt N D, Engineering Drawing, Charotar Book Stall, Anand, India.

Reference Books:

1. Jolhe D A, Engineering Drawing with an introduction to AutoCAD, TMH, New Delhi, India.
2. Gill P S, Engineering Drawing (Geometrical Drawing), S K Kataria & Sons, Delhi, India
3. Jeyopoovan T.; Engineering drawing & Graphics Using AutoCAD; Vikas publishers.
4. Engineering Drawing, Basant Agarwal & CM Agarwal, Tata McGraw Hill.
5. Shah MB and Rana BC; Engg.drawing; Pearson Education
6. Luzadder WJ and Duff JM; Fundamental of Engg Drawing; PHI
7. Dhananjay A Jolhe; Engg. Drawing an Introduction; Tata McGraw Hill.
8. Visvesvaraya Tech. University; A Premier on Computer Aided Engg drawing; VTU Belgaum
9. Venugopal K.; Engineering Graphics; New Age

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Program

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-TWO

Detailed Syllabus

&

Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
LA 201	Professional Communication Skills	1	1	2	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

** The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

- Professional Communication: Definition, Types, Process, Features
- Importance of Non-Verbal Communication: Eye contact, Facial Expressions, Gestures, Posture, Proxemics, etc.
- Importance of Paralinguistic Features: Voice, Volume, Pitch, Intonation, Pauses, Rate, Vocalized Pauses and Vocal Cues.
- Group Discussion: Purpose, Difference between GD and Debate, Personality Traits to be Evaluated, dynamics of Group Behaviour, Opening and Ending a GD
- Job Interviews: Process, Stages, Desirable Qualities, Steps to Preparation, Body Language, Confidence, Frequently Asked Questions
- Presentation Skills: Combating Nervousness and Stage Fright, Beginning and Ending of a Presentation, Dynamics of Team Presentations, Using Slides and Audio-Visual Aids
- Business Letters and Resume: Structure, Style, Types
- Professional Reports: Types, Features, Structure, Style (The Assignment on Report Writing will include technical input from other faculty members from the Institute of Engineering and Technology and will be oriented towards developing in students the competencies required for writing PS-I Reports)
- E-mail Writing, Other Business Writings

Syllabus (Practical)

- Sounds of English: Vowel and Consonant Sounds, Word Stress, Intonation - Listening and Practice
- Reading Comprehension: Reading Passages and Answering Questions
- Vocabulary Extension: :Learning Words through Situations and Modules
- Presentation Skills: Learning through Video Presentations
- Group Discussion: Learning through Recorded Group Discussions
- Job Interviews: Learning through Recorded Job Interviews

Text Book(s)

1. Sanjay Kumar and Pushp Lata, *Communication Skills,* New Delhi: OUP, 2011

Reference Book(s)

1. Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice*, Second Edition, New Delhi: OUP, 2011.
2. Krishna Mohan and Meenakshi Raman, *Effective English Communication*, New Delhi: Tata-McGraw Hill, 2000.
3. Krishna Mohan and N.P.Singh, *Speaking English Effectively,* New Delhi: Macmillan,1994.
4. V. Sasikumar and P.V. Dhamija, *Spoken English: A Self-Learning Guide to Conversation Practice*, Tata-McGraw Hill, 2007.
5. Norman Lewis, *Word Power Made Easy,* Delhi: GoyalSaab Publishers and Distributors, 1994.
6. A.J.Thomson and A.V.Martinet, *A Practical English Grammar,* 4th Edition, New Delhi: OUP, 1999.
7. Asha Kaul, *Business Communication,* Second Edition, New Delhi: PHI, 2010.
8. Edgar Thorpe and Showick Thorpe, *Objective English*, 2nd Edition, New Delhi: Pearson Education, 2008.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
MA 201	Engineering Mathematics – II	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation	Additional Continuous Evaluation *	Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

Unit 1: Ordinary Differential equation

Differential equation of first order, Differential equation of higher order with constant coefficients, Differential equation of second order with variable coefficients, Solution in series

Unit 2: Partial differential equation

Partial Differential Equations of First Order, Variable separable technique for solving PDE, Boundary value problems: Heat equation, wave equation, Laplace equation

Unit 3: Matrix Algebra

Matrices, Rank of a Matrix, System of Linear Algebraic Equations, Linear Independence and Dependence, Eigen Values and Eigen Vectors, Diagonalization, Cayley Hamilton Theorem

Unit 4: Linear Algebra

Unit Vector Space, Subspaces, Bases and Dimensions, Coordinates, Row Equivalence and Computations concerning Subspaces, Linear Transformations, The Algebra of Linear Transformations, Representation by matrices

Unit 5: Linear Programming Problems

Introduction to LP Problems, LP formulations, Graphical Methods, Convex Sets, Simplex Methods

Text books and Reference books

1. Babu Ram, *Engineering Mathematics Part II,* Pearson.
2. B. S. Grewal, *Higher Engineering Mathematics*, 41st Ed., Khanna Publishers, Delhi, 2011.
3. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Fourth Edition (Student Edition), Jones & Barlett, Viba, New Delhi, 2011.
4. B.V.Ramana, *Higher Engineering Mathematics*, Tata Mc-graw Hill.
5. Peter V. O'Neil, *Advanced Engineering Mathematics*, Seventh Indian Reprint, Cengage Learning, New Delhi, 2011.
6. Kreyszig, E., *Advanced Engineering Mathematics*, John Willey, Delhi (2011).
7. Potter M.C., Goldberg J.L., Edward F.A., *Advanced Engineering Mathematics*, 3rd Edition, Oxford University Press, 2005.
8. G.B. Thomas, *Jr., Thomas' Calculus*, 11th edition (Indian), Pearson education, Delhi, 2008.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
PH 101	Engineering Physics	3	0	2	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

Coherence, Interference and Optical Technology

Introduction to optics, Spatial Coherence, Temporal coherence, Coherence length, Coherence time and 'Q' factor for light

Formation of Newton's rings, Measurement of wavelength of light, Diameter of Newton's rings.

Elementary idea of anti-reflection coating and interference filters.

Diffraction

Single slit diffraction, position of maxima / minima and width of central maximum, intensity variation.;2

Construction and theory, Formation of spectra by plane transmission grating, Determination of wavelength of light using plane transmission grating

Polarization

Plane, circular and elliptically polarized light on the basis of electric (light) vector, Malus law

Quarter and half wave plates, construction, working and use of these in production and detection of plane, circular and elliptically polarized light.

Introduction and law of optical rotation, specific rotation and its measurement using the half-shade and bi-quartz device

Laser and Fibre Optics

Theory of Laser Action, Einstein's Coefficients, Threshold Conditions for Laser Action

Theory, Design, and Applications of He-Ne Laser

Theory of Semiconductor Lasers

Optical Fibre, Numerical Aperture, and Maximum Angle of Acceptance

Quantum Mechanics

Heisenberg's Uncertainty Principle, Wave and Particle Duality of Radiation, De-Broglie's Concept of Matter waves, Quantum Nature of Light

Concept of Compton Effect

Concept of Wave Function, Physical interpretation of wave function and its properties

Schrödinger's Wave Equation: Time dependent and time independent cases

Particle in one-dimensional box

Particle in three-dimensional boxes, Degeneracy

Course Syllabi (Practical):

1. To determine the wave length of sodium light by Newton's Ring
2. To determine the specific rotation of Glucose (Sugar) solution using a Polarimeter
3. To measure the Numerical Aperture of an Optical Fibre.
4. To determine coherent length and coherent time of laser using He-Ne Laser
5. To determine the height of object with the help of a Sextant.

6. To determine the dispersive power of material of a Prism for Violet Red and Yellow colours of Mercury light with the help of a spectrometer.
7. To study the Charge & Discharge of a condenser and hence determine time constant (Both current and voltage graphs are to be plotted).
8. To study characteristics of G.M. Counting System.
9. To convert a Galvanometer in to an ammeter of range 1.5/3 amp and calibrate it.
10. To convert a Galvanometer in to a Volt of range 1.5/3 volt and calibrate it.

Text Books:

1. Mahesh C. Jain, "Textbook of Engineering Physics", Part I , PHI
2. Mahesh C. Jain, "Textbook of Engineering Physics", Part II, PHI
3. Lab Manuals for Physics

Reference Books:

1. Arther Beiser, "Concept of Modern Physics" Tata McGrawHill, New Delhi, 5th edn. 1997.
2. Ajoy Ghatak, "Optics", Tata McGraw Hill, 4th edn
3. Eyvind H Wichman, "Quantum Physics" Tata McGraw Hill, Volume 4
4. Neeraj Mehta, "Applied Physics for Engineers", PHI, I edn. 2011
5. Dattu R Joshi, "Engineering Physics", Tata McGraw Hill Education Pvt. Ltd. New Delhi, I edn. 2010.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ID 201	Environmental Studies	2	0	0	2

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation	Additional Continuous Evaluation *	Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Course Syllabi (Theory):

- Understanding environment, The global crisis, Basic Concepts
- Forest and Grassland ecosystems, Desert Ecosystems, Aquatic Ecosystems
- Introduction to Biodiversity, Biodiversity Conservation
- Water Resources, Energy Resources, Forest Resources
- Land, Food, and Mineral Resources
- Air and Noise Pollution, Water, Soil, and Marine Pollution
- Solid Waste Management and Disaster Management
- Population Growth, Environment and Human Health, Sustainable Development
- Global Warming, Acid Rain, and Ozone Depletion
- Different types of laws and regulations

Text Books:

1. Rajagopalan, R., "Environmental Studies: From Crisis to Cure", Oxford University Press, New Delhi, 2e, 2011

Reference Books:

1. Ranjit Daniels & J. Krishnaswamy "Environmental Studies", Wiley India
2. Davis & Cornwell "Environmental Engineering", Mc Graw Hill

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ME 201	Engineering Mechanics	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation / Additional Continuous Evaluation*	Total Marks
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

- Fundamentals of engineering mechanics, Laws of Motion, Equilibrium, Conditions for equilibrium, Equations of equilibrium.
- **Statics of Particles and Rigid Bodies:** System of forces, Resultant force, Resolution of force, Moment and Couples.
- **Trusses:** Truss analysis, analysis of frames and machines.
- **Friction:** Types of Friction, Laws of friction, Angle of friction, Angle of repose, Applications of Friction.
- **Lifting Machines:** Mechanical advantage, Velocity Ratio, Efficiency of machine, Ideal machine, Ideal effort and ideal load, Reversibility of machine, Law of machine, Lifting machines; System of Pulleys, Simple wheel and axle, Wheel and differential axle, Weston's differential pulley block, Worm and worm wheel.
- **Properties of Plane Surfaces:** Centroids & Centre of Mass, area of moments, principle moments of inertia, Second moment of mass.
- **Virtual work:** Principle of Virtual Work, Active forces and active force diagram.
- **Kinematics of Particles and Rigid Bodies:** Velocity, Acceleration, Types of Motion, Equations of Motion, Rectangular components of velocity and acceleration, Angular velocity and Angular acceleration, Radial and transverse velocities and accelerations, Projectiles motion on plane and Inclined Plane, Relative Motion.
- **Kinetics of Particles and Rigid Bodies**: Equation of motion in rectangular coordinate, radial and transverse components, Equation of motion in plane for a rigid body.
- **Work, Energy and Power:** Work of a force, weight, spring force and couple, Power, Efficiency, Energy, Kinetic energy of rigid body, Principle of work and energy, Conservative and Non-conservative Force, Conservation of energy.
- **Impulse and Momentum:** Linear and angular momentum, Linear and angular impulse, Principle of momentum for a particle and rigid body, Principle of linear impulse and momentum for a particle and rigid body, Principle of angular momentum and Impulse, Conservation of angular momentum, Angular momentum of rigid body.

Text Books:

1. Meriam and Kraige, **"Engineering Mechanics-STATICS"**, John Wiley & Sons, Fifth Edition, 2010
2. Meriam and Kraige, **"Engineering Mechanics-DYNAMICS"**, John Wiley & Sons, Fifth Edition, 2010

Reference Books:

1. Engineering Mechanics, Basudeb Bhattacharyya, Oxford University Press
2. Vector Mechanics for Engineers, Beer and Johnston, Tata McGraw-Hill., Ninth Edition, 2009.
3. Engineering Mechanics, Hibbeler, Pearson Education, Sixth Edition, 2010
4. Engineering Mechanics, Andrew Pytel & Kiusalas, Cengage Learning, Third Edition, 2010.
5. Engineering Mechanics, Timoshenko and Young, Tata McGraw-Hill, Fourth Edition, 2006.
6. Engineering Mechanics- Statics and Dynamics, Shames, Pearson Education.
7. Engineering Mechanics, Boresi and Schmidt, CL-Engineering, First Edition, 2008.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
CSE201	Object Oriented Programming	3	0	2	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

- Identifiers and constants (Literals), Keywords, Data Types, The Operators, New Casting Operators, Typeid and throw, The Conditional structures and Looping Constructs
- Difference between Struct and class in C++, The difference between Union and Class, Static Data members of a class, Pointer to objects and pointer to members of class, The local classes,
- Assigning Objects
- Introduction to Functions, The Inline function, Default Arguments to the function, Functions with object as parameters, Call by reference and return by reference, Prototyping and Overloading, Friend functions, Const and Volatile functions, Static functions, Private and Public functions
- Introduction to constructors, The explicit constructors, Parameterized constructors, Multiple constructors, Constructors with default arguments, Dynamic Initialization, Constructor with dynamic allocation, copy constructors, The member initialization list, destructors
- Overloading Operators, The need, Defining derived class using single base class, Derivation using public, private and protected access modifiers
- The implementation of Inheritance in the C++ object model, multiple-inheritance, Abstract classes, Composite objects (container objects), Compile Time and Runtime Polymorphism
- Introduction, Need for Exception handling, Components of exception handling mechanism

Course Syllabi (Practical):

Programs using C++/Java which covers following concepts:

- Declaration and Usage of Classes and Objects
- Constructors and Destructors.
- Overloaded Functions and Overloaded Operators.
- Inheritance
- Exception handling mechanism.

Text Books:

1. Object Oriented Programming using C++ and Java, E. Balagurusamy, Tata McGraw Hill.

Reference Books:

1. Programming with ANSI C++ by Bhushan Trivedi, Oxford University Press
2. An Introduction to Object Oriented Programming with Java, C Thomas WU, Fourth Edition, Tata McGraw Hill.

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-THREE

Detailed Syllabus

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Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE301	Network Analysis & Synthesis	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT-I

NETWORK CONCEPTS: RLC parameter, Independent and dependent sources, Voltage/current relationship for individual element, source transformation techniques, KCL, KVL for network having both Independent and dependent sources

NETWORK ANALYSIS TECHNIQUES AND THEOREMS: Superposition, Thevenin and Norton Theorem, Maximum power transfer Reciprocity theorem, Tellengen Theorem, Series and parallel resonant circuits and Q-factor, Mutual inductance ,Dot Convention and duality and concept of dual network, magnetically couples circuit analysis.

UNIT-II

GRAPH THEORY AND ITS APPLICATIONS: Fundamental concepts, definitions of a graph and various related terms, paths and circuit connections, trees of a graph, cut sets and tie sets, non-separable planner and dual graphs, matrices of oriented graphs, properties and inter relationships of incidence, tie and cut set matrices, complete circuit analysis using tie set and cutest matrices

UNIT-III

AC AND DC TRANSIENTS ANALYSIS: Laplace transform fundamentals, properties and theorems, unit step function, other unit function, the impulse, ramp and doublet, Laplace transform for shift and singular, functions, initial and final value theorems, Formulation and solution of network equilibrium equations on loop and node basis, Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Time Constant, Complete response of RL, RC, and RLC circuits to step, sinusoidal, exponential, ramp, impulses and the combinations of excitations.

UNIT-IV

NETWORK FUNCTIONS: Concepts of Complex Frequency, Transform Impedance, Network functions of one and two port network, concepts of poles and zeros, properties of driving point and transfer functions, time response stability from pole zero plot.

TWO PORT NETWORK: Voltage & current ratio of two port network, Admittance, impedance, hybrid and transmission parameter of two port networks, Conversion of one parameter to another parameter, Series,

Syllabus (Practical)

1. Speed control of D.C. shunt motor by (a) Field current control method & plot the curve for speed vs. field current. (b) Armature voltage control method & plot the curve for speed vs armature voltage.

2. Speed control of a D.C. Motor by Ward Leonard method and to plot the curve for speed vs applied armature voltage

3. To determine the efficiency of D.C. Shunt motor by loss summation (Swinburne's) method.

4. To determine the efficiency of two identical D.C. Machine by Hopkinson's regenerative test.

5. To perform O.C. and S.C. test on a 1-phase transformer and to determine the parameters of its equivalent circuit its voltage regulation and efficiency.

6. To perform back-to-back test on two identical 1-phase transformers and find their efficiency & parameters of the equivalent circuit.

7. To perform parallel operation of two 1-phase transformers and determine their load sharing.

8. To determine the efficiency and voltage regulation of a single-phase transformer by direct loading.

9. To study the performance of 3-phase transformer for its various connections, i.e. star/star star/delta delta/star and delta/delta and find the magnitude of 3rd harmonic current.

10. To perform parallel operation of two 3-phase transformers and determine their load sharing.

Text Book(s)

1. Nagrath I.J.and Kothari D.P, "Basic Electrical Engineering" TMH, Third Edition 2011.
2. B. L. Theraja, "A Text Book on Electrical Technology" S.Chand, Volumell. 2012.
3. Electric Machinery and Transformers-Bhag S. Guru,Huseyin R. Hiziroglu-Oxford Publication.
4. J B Gupta, "Theory and Performance of Electrical Machines"4th Edition, S.K.Kataria and Sons

Reference Book(s)

1. Electrical Engineering - Principles and Applications, Allan R. Hambley, PHI, fourth edition- 2007.
2. Electrical Machines by P S Bhimbra- Khanna Publishers.
3. Ashfaq Hussain, "Electrical Machines" 2nd Edition, Dhanpatrai and Sons

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ECE 301	Electronic Devices & Circuits	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

- **Semiconductor Physics:** Mobility and conductivity, charge densities in a semiconductor, Fermi Dirac distribution, carrier concentrations and Fermi levels in semiconductor, Generation and recombination of charges, diffusion and continuity equation, Mass action Law, Hall effect.
- **Junction Diode:** PN Junction diodes, Diode as a circuit element, load line concept, clipping and clamping circuits, Voltage multipliers. Zener diode, characteristics and its applications.
- **Bipolar Junction Transistor:** Transistor characteristics, Current components, Current gains: alpha and beta. Operating point. Hybrid model, h-parameter equivalent circuits. CE, CB and CC configuration. DC and AC analysis of CE, CC and CB amplifiers. Ebers-Moll model. Biasing & stabilization techniques. Thermal runaway, Thermal stability.
- **Field Effect Transistor** JFET, MOSFET, Equivalent circuits and biasing of JFET's & MOSFET's. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor. Biasing, Small signal model analysis.
- **Small Signal Amplifiers at Low Frequency:** Analysis of BJT and FET, DC and RC coupled amplifiers. Frequency response, mid-band gain, gains at low and high frequency. Analysis of DC and differential amplifiers. Miller's Theorem. Cascading Transistor amplifiers, Darlington pair. Emitter follower, source follower.

Syllabus (Practical)

1. Plot V-I characteristic of P-N junction diode & calculate cut-in voltage, reverse saturation current and static & dynamic resistances.
2. Plot V-I characteristic of Zener diode and study of Zener diode as voltage regulator. Observe the effect of load changes and determine load limits of the voltage regulator.
3. Study of application of diode as clipper & clamper circuit.
4. Plot input and output characteristics of BJT in CB, CC and CE configurations.
5. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.

6. Plot drain current-drain voltage and drain current-gate bias characteristics of field effect transistor and measure of I_{DSS} & V_P.
7. Plot gain-frequency characteristic of two stages RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.

Text Books:

1. Microelectronics Circuits (Theory and Applications), Adel S. Sedra and Kenneth C. Smith, Adapted by Arun N. Chandorkar, 5th Ed. Oxford International Student Edition.
2. Electronic Device and Circuits, J.B. Gupta, Katson Educational Series.
3. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar and A Vallavaraj, Tata Mc-Graw Hill 2rd Edition

Reference Books:

1. Millman's Electronic Devices and Circuits, Jocob Millman, Christos C Halkias & Satyabrata Jit, Tata Mc-Graw Hill 3rd Edition.
2. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, Pearson 10th Edition.
3. Electronic Devices and Circuits, David A. Bell, Oxford 5th Edition.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ECE306	Digital Electronics	3	1	2	5

Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others
**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

- Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes.
- Gate-level minimization: The K-map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method)
- Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers ,demultiplexers
- Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.
- Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.
- Memory and programmable logic: RAM, ROM, PLA, PAL. Design at the register transfer level: ASMs, design example, design with multiplexers. Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race Free State assignment, hazards.

Course Syllabi (Practical):

1. Study of logic gates.
2. Design and implementation of adders and subtractors using logic gates.
3. Design and implementation of code converters using logic gates.
4. Design and implementation of 4-bit binary adder/subtractor and BCD adder using IC 7483.
5. Design and implementation of 2-bit magnitude comparator using logic gates, 8-bit magnitude comparator using IC 7485.
6. Design and implementation of 16-bit odd/even parity checker/generator using IC 74180.
7. Design and implementation of multiplexer and demultiplexer using logic gates and study of IC 74150 and IC 74154.

8. Design and implementation of encoder and decoder using logic gates and study of IC 7445 and IC 74147.
9. Construction and verification of 4-bit ripple counter and Mod-10/Mod-12 ripple counter.
10. Design and implementation of 3bit synchronous up/down counter.
11. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education
2. Pedroni - Digital Electronics & Design, Elsevier

Reference Books:

1. F. Vahid: Digital Design: Wiley Student Edition, 2006
2. J. F. Wakerly, Digital Design Principles and Practices, Fourth Edition, Prentice-Hall, 2005.
3. R. L. Tokheim, Digital electronics, Principles and applications, 6th Edition, Tata McGraw Hill Edition.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
MA 301	Engineering Mathematics – III	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

Unit 1: Laplace Transform

Laplace transform and its properties and applications

Unit 2: Sequences and Series

Sequences, Series, Orthogonal function, Fourier Series

Unit 3: Fourier Transform

Fourier transform and its properties and applications

Unit 4: Special Functions

Gamma and Beta functions, Bessel functions, series representations and recurrence relations

Unit 5: Complex Analysis

Functions of complex variables and its derivatives, Integration in complex planes, Series, Singularities and Residues, Evaluation of Real Integrals, Conformal mappings

Text books and Reference books

1. Babu Ram, *Engineering Mathematics Part II*, Pearson
2. Dennis G. Zill and Warren S. Wright, *Advanced Engineering Mathematics*, Fourth Edition (Student Edition), Jones & Barlett, Viba, New Delhi, 2011
3. Peter V. O'Neil, *Advanced Engineering Mathematics*, Seventh Indian Reprint, Cengage Learning, New Delhi, 2011.
4. Erwin Kreyszig, *Advanced Engineering Mathematics*, Wiley 9th Edition.
5. B. S. Grewal, *Higher Engineering Mathematics*, 41st Ed., Khanna Publishers, Delhi, 2011.
6. H. K. Dass, *Advanced Engineering Mathematics*, 12th editions with corrections, S. Chand and Company, Meerut, 2004
7. B. V. Ramana, *Higher Engineering Mathematics*, Tata Mcgraw Hill.
8. Potter M.C., Goldberg J.L., Edward F.A., *Advanced Engineering Mathematics*, 3rd Edition, Oxford University Press, 2005

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
HS302	Principles of Management for Engineers	2	0	0	2

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Course Syllabi (Theory):

- **Concepts of management:** Functions and Responsibilities of managers, Principles of management and visiting various, Schools of management Thoughts in developing, Excellent managers
- **Planning:** Nature and purpose of planning, Planning process and principles, Types of planning, Advantages and disadvantages of planning, Concept of objectives and types of objectives, Case analysis
- **Organizing:** Nature and purpose of organizing, Process of organizing, Span of management and determination of span of management, Principles of organizing, Departmentalization, delegation and, Decentralization. Case analysis
- **Directing and leading:** Requirements of Effective directions, Giving orders, motivation, Nature of leadership, leadership and management, Recapitulation and case discussion
- **Controlling:** concept and process, Need for controlling and types of control methods, Essentials of effective control, Benefits and problems in control systems. Case analysis
- Social responsibilities of business: Meaning, Social responsibility of business towards different groups, Social performance of business in India, Social audit, Business ethics and corporate governance

Text Books:

1. Tripathy, P.C. and Reddy, P. N. "Principles of Management". McGraw Hill, New Delhi.4th ed. 2008.

Reference Books:

1. Koontz, Herold and Weihrich, Heinz. "Management". McGraw Hill, New York. 9th ed. 1988.
2. Stoner, James A. F. and Freeman, R Edward. "Management". Prentice Hall of India, New Delhi. 6th e, 1989.
3. Bateman, T. S. and Snell, S. A. "Management: Leading and Collaborating in a Competitive World", McGraw Hill Irwin. 8th edition,2009.
4. Draft, R. L. "Principles of Management". Cengage learning.2009
5. Schermerhron, J. R. "Introduction to Management", 10th edition, Wiley India. 2009

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-FOUR

Detailed Syllabus

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Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE401	Electrical Machine-II	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	40	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT-I

THREE PHASE INDUCTION MOTOR: Basic theory and construction of squirrel-cage and wound-rotor motors; equivalent circuit; measurement of equivalent circuit parameters, Synchronous Speed, speed of rotor field, slip, Various methods of measurement of slip, starting & running torque, analysis of machine equations, speed/torque curves, maximum torque, effect of change in voltage & frequency on torque, speed & slip, circle diagram, no load & block rotor tests. Starting and speed control methods, cascaded connection, Braking, Effect of rotor resistance. Cogging, Crawling. Double cage squirrel cage induction motor, induction generator, induction regulator

UNIT-II

SINGLE-PHASE INDUCTION MOTOR: Double revolving field theory, equivalent circuit, no load & block rotor tests, starting methods. Outline of shaded-pole, universal, permanent magnet, and reluctance machines with applications.

UNIT-III

ALTERNATOR: Basic concepts, types and construction, generated emf, distribution & Pitch factor, armature reaction; phasor diagram; synchronous reactance; equivalent circuit, open and short-circuit characteristics, voltage regulation, OC & SC tests, zero power factor characteristics, potier triangle and ASA method of finding voltage regulation, synchronization, hunting phenomena.

UNIT-IV

SYNCHRONOUS MOTORS: Types, construction, principle, phasor diagrams, speed torque characteristics, power factor control, V-curves, starting methods, performance calculations, applications, synchronous condenser, and synchronous induction motor.

Syllabus (Practical)

1. To perform OC & SC test on a 3-phase transformer & find its efficiency and parameters for its equivalent circuit.

2. To perform no load and blocked rotor test on a three phase induction motor to determine the parameters of its equivalent circuits.
3. To plot OCC & SCC of an Alternator and to determine its regulation by synchronous impedance method.
4. To plot the V-curve for a synchronous motor for different values of loads.
5. To perform no load and blocked rotor test on a 3 phase induction motor and to determine the parameters of its equivalent circuits. Draw the circle diagram and compute the following (a) Max. Torque (b) Current (c) slip (d) p.f. (f) Efficiency.
6. To find Xd and Xq of a salient pole synchronous machine by slip test.
7. To perform the load test on a 3-phase induction motor and determine its performance
8. characteristics (a) Speed vs load curve (b) p.f. vs load curve (c) Efficiency vs load curve (d) Speed vs torque curve
9. To perform sumpner's back-to-back test on 3 phase transformers, find its efficiency &
10. Parameters for its equivalent circuits.

Text Book(s)

1. Nagrath I.J.and Kothari D.P, "Basic Electrical Engineering" TMH, Third Edition 2011.
2. B. L. Theraja, "A Text Book on Electrical Technology" S.Chand, VolumeII. 2012.
3. Ashfaq Hussain, "Electric Machines", Dhanpar Rai and Co.
4. Electric Machinery and Transformers-Bhag S. Guru,Huseyin R. Hiziroglu-Oxford Publication

Reference Book(s)

1. Electrical Engineering - Principles and Applications, Allan R. Hambley, PHI, fourth edition- 2007.
2. Electrical Machines by P S Bhimbra- Khanna Publishers.
3. J.B.Gupta, "Theory and Performance of Electrical Machines", S.K.Kataria and Sons.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE402	Transmission & Distribution of Electrical Power	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

INTRODUCTION TO BASIC STRUCTURE OF POWER SYSTEM: Generation, Transmission and Distribution, generating stations, Schematic arrangement, advantages and disadvantages, efficiency, choice of site, types of prime movers, characteristic, speed control and auxiliaries. Environmental aspects for selecting sites and locations for; (a) Steam power station, (b) Hydro power station, (c) Nuclear power station (d) Gas turbine power plant, (e) Combined cycle power plant

INTRODUCTION OF SUPPLY SYSTEM: Structure of electric power system: generation, transmission and distribution; Types of AC and DC distributors, distributed and concentrated loads, interconnection HVDC and EHV AC transmission

UNIT II

OVERHEAD LINE INSULATORS: Different types, Insulator failure, voltage distribution in insulator string and grading, improvement of string efficiency.

MECHANICAL DESIGN OF OVERHEAD LINES: Sag and tension calculations, Effect of ice and wind, Stringing chart, Sag template, Tower design, Spacing and clearance, Vibration damper

OVERHEAD TRANSMISSION LINE: Types of conductors, Calculation of line parameters – Inductance and Capacitance of single phase, three phase, symmetrical and unsymmetrical configurations, Concepts of GMD and GMR, Transposition, Bundle conductors, Double or parallel circuit, Effect of earth on capacitance calculation, Interference with communication circuit, Concept of Corona discharge.

UNIT III

POWER FLOW THROUGH TRANSMISSION LINE: Mathematical expressions, Effect of active and reactive power flow on bus voltage magnitude and phase angle.

PERFORMANCE OF LINES: Short, medium and long lines - Representation, A, B, C, D constants, Voltage regulation and Transmission efficiency, Ferranti effect.

UNIT IV

UNDERGROUND CABLES: Different types, Insulating materials, Dielectric stress, Grading, Capacitance, Heating and causes of breakdown.

POWER SYSTEM GROUNDING OR EARTHING: Equipment grounding, Neutral grounding – Different methods, Grounding transformer. Introduction to EHVAC and HVDC transmission and comparison between them

Text Book(s)

1. C.L.Wadhwa,"Electrical Power System", New age international publisher.
2. V.K.Mehta, Rohit Mehta" Principles of Power System", S.Chand Publications.
3. Sivanagaraju and Satyanarayana, "Electrical Power Transmission and Distribution", Pearson Education.

Reference Book(s)

1. William H.Kersting, "Distribution system modeling and analysis", CRC press publication.
2. J.B.Gupta "Transmission & Distribution of Electrical Power", S.K.Kataria & Sons publication.
3. Soni, Gupta, Bhatnagar "Electrical Power System."Dhanpat Rai & Sons.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 404	Electrical Measurements & Instrumentation	3	0	2	4

Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

Introduction: Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electrodynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type, Electrodynamic & Induction type wattmeter, Measurement of active & reactive power & energy in single phase & three phase circuits.

Introduction of Measurements and Theory of Error: Significance of measurements, different methods of measurements, Instruments used in measurements, Elements of a Generalized Measurement System. Characteristics of instruments, Errors analysis, Types of Error, Significant figures.

AC Bridges: Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge and Anderson bridge for self-inductance measurement. De-Sauty Bridge for capacitance measurement. Wien's bridge for capacitance and frequency measurements. Sources of error in bridge measurements and precautions.

Digital Instruments: Advantages of digital over analogue processing. Techniques of converting Digital to Analogue (D/A) and Analogue to Digital (A/D). Digital Voltmeter.

Transducers and display devices: Definition, Classification, Selection Criteria, Principle, Resistive Transducer (Strain Gauge, Thermistor and RTD), Capacitive, Piezoelectric, Thermocouple and Inductive, LVDT transducer, Application of above transducers, Classification of display devices and systems. Cathode Ray Tube, LED, LCD and Recorders.

Course Syllabi (Practical):

1. To study Anderson Bridge
2. To Study Wien Bridge Oscillator trainer
3. To study Maxwell's Capacitance & Inductance Bridge
4. To study Solar Energy Trainer with built in Voltmeter & Ammeter.
5. To study Ultrasonic transducer Trainer
6. Displacement measurement using LVDT

7. Temperature measurement using RTD, Thermistors, Thermocouple, Thermometers, Calibration.
8. To study Bench top LCR meter
9. Force measurement using Strain Gauges and Load Cells
10. Measurement of earth resistance by fall of potential method
11. To study the working of Spectrum analyzer and determine the bandwidth of different signals.

Text Books:

1. Cooper & Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", PHI.
2. A.K.Sawhney, "A Course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Sons

Reference Books:

1. H. S. Kalsi, "Electronic Instrumentation", TMH.
2. Thomas and Clark, "Handbook of Electronic Instruments and Measurement Techniques", PHI

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
HS 401	Principles of Economics	3	0	0	3

Evaluation Scheme (Theory)								
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations /Mock Interviews/others

Course Syllabi (Theory):

- Definition of Economics and role of economics in Engineering and Technology; Basic economic terms; The economy, working of an economy, kinds of an economy and its basic problems; Laws of Demand and Supply and market Equilibrium; Elasticity of demand its measurements and application, Production function and law of Variable Proportion and Law of Returns to Scale; Concepts of cost and revenue, short run and long run cost function; Profit maximization hypothesis, Price and output determination under Perfect Competition, Monopolistic competition and Monopoly.
- Measurement of macroeconomic aggregates, National Income, Consumption, saving and investment function; Macroeconomic issues: Inflation, Unemployment and Economic growth International aspects of macroeconomics; Foreign Exchange rate and Balance of payments.

Text Books:

1. T.R. Jain and M.L. Grover, "Economics for Engineers", V. K. (India) Enterprises

Reference Books:

1. D N Dwivedi "Principles of Economics", Vikas Publishing House Pvt Ltd.
2. G. Mankiew. Economics Principles and Applications. Cengage Learning

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-FIVE

Detailed Syllabus

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Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 501	Linear Control Systems	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT I

INTRODUCTION TO CONTROL SYSTEM: Open loop and closed loop systems, examples, components of control systems, types of control systems, concept of feedback, positive and negative feedback.

MATHEMATICAL MODELING OF PHYSICAL SYSTEMS: Modeling of physical systems such as mechanical, electrical, thermal and chemical systems, analogous systems, concept of transfer function, poles, zeros, order and type of the system, computation of overall transfer function, block diagram reduction techniques, signal flow graphs.

UNIT II

TIME RESPONSE ANALYSIS: Standard test signals, transient and steady state response of first and second order systems, time response specifications, types of systems, steady state error and error constants. Basic control action and automatic controllers, Effect of PI, PD and PID controllers on system performance.

UNIT III

STABILITY ANALYSIS OF CONTROL SYSTEMS: Notations of stability, Necessary conditions for stability, Routh-Hurwitz stability criterion, Relative stability, Basic properties of root locus, rules to construct root locus, stability analysis using root locus.

UNIT IV

FREQUENCY DOMAIN ANALYSIS: Introduction to frequency response, frequency domain specifications, stability analysis using Bode plots, stability analysis using Polar and Nyquist plots.

UNIT V

INTRODUCTION TO STATE SPACE: Concept of state, state variables, state space modeling, conversion of state space equations to transfer function, solution of state equation, controllability and observability.

DESIGN AND COMPENSATION: Design consideration of control system, lead, lag, lead-lag compensation, Design of compensating network using bode plots and root locus.

Syllabus (Practical)

1. Introduction to MATLAB Computing Control Software.

1. For a given 2nd order system plot step response and obtain time response specification.

2. Defining Systems in TF, ZPK form.

   (a) Plot step response of a given TF and system in state-space. Take different values of damping ratio and w_n natural undamped frequency (b) Plot ramp response.

3. To design 1st order R-C circuits and observes its response with the following inputs and traces the curve.

   - Step
   - Ramp
   - Impulse

4. To design 2nd order electrical network and study its trarient response for step input and following cases.

   - Under damped system
   - Over damped System.
   - Critically damped system

5. To Study the frequency response of following compensating Networks, plot the graph and final out corner frequencies.

   Log Network

   Lead Network

   Log-lead Network.

6. To perform experiment on Potentiometer error detector.

7. To draw characteristics of a.c servomotor

8. Plot bode plot for a 2nd order system and find GM and PM..

Text Book(s)

1. I J Nagrath and M Gopal: Control Systems Engineering, 3rd Ed, New Age Publication.
2. B C Kuo: Modern Control Engineering, , New Age Publication
3. Katsuhiko Ogata, "Modern Control Engineering", PHI Learning Pvt. Ltd., New Delhi

Reference Book(s)

1. Robert H Bishop : Modern Control Systems, Boyd and Fraser pub
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. Gene F. Frankline, J. David Powell, Abbas Emami-Naeini, "Feedback Control of Dynamic Systems", Pearson Education Inc., 2006

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE502	Power System Switchgear & Protection	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT I: INTRODUCTION AND PHILOSOPHY OF A PROTECTIVE RELAYING SYSTEM: Types of Faults – Abnormalities – Functions of Protective Relay Schemes – major Components of Power system – Basic Tripping Circuit – Testing and Maintenance of Relays – Zones of Protection – Requirements of Protective Systems – Relay Operating Criteria – Main and Backup Protection ,HRC Fuse.

UNIT II: PROTECTIVE CURRENT and POTENTIAL TRANSFORMER: CT Equivalent Circuit, Vector diagram, Construction, magnetization Curve, Core, Errors, accuracy, Specifications, Factors affecting selection PT: Equivalent circuit, Construction, CVT, Specifications.

DIFFERENT TYPES OF RELAYS: Electromagnetic Relays: Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay, amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay, Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Static Relays: Advantages and Limitations, basic Elements, Static Relays Architecture.

UNIT III: THEORY OF CIRCUIT INTERRUPTION: Introduction, Physics of arc phenomena, Maintenance of the arc, Losses from plasma, Essential properties of arc, Arc interruption theories.

CIRCUIT CONSTANTS IN RELATION TO CIRCUIT BREAKING: Introduction, Circuit breaker rating,Circuit constants and circuit conditions Re-striking voltage transient Characteristics of re-striking voltage, Interaction between the breaker and circuit, Current chopping, The duties of switchgear.

THEORY AND PRACTICE OF CONVENTIONAL CIRCUIT BREAKERS: Automatic switch, Air-break circuit breakers, Oil circuit breakers, Single and multi break construction, Air-blast circuit breaker, Performance of circuit breakers and system requirements, Modification of circuit breaker duty by shunt resistors, Power factor correction by series resistance, Comparative merits of different types of conventional circuit breakers.

RECENT DEVELOPMENTS IN CIRCUIT BREAKERS: Modern trends, Vacuum circuit breakers, Sulphur hexafluoride (SF6) circuit breakers DC circuit breaker.

UNIT IV: GENERATOR PROTECTION : Differential Protection , Inter-turn fault Protection, stator E/F, Rotor E/F, NPS, Field Failure, Over Load, Over Voltage, Reverse Power, Pole-Slipping, Back-up Impedance, Under Frequency , Miscellaneous Protection.

TRANSFORMER PROTECTION: Faults in Transformer – Gas operated relays – Over Current Protection – REF Protection – Differential Protection – Protection against over fluxing – Protection of Grounding transformers – Protection Against Overheating - Protection for small transformers.

UNIT V: PROTECTION OF TRANSMISSION LINES: Protection of Lines by Over Current Relays-Protection of Lines by Distance Relays-Carrier Current Protection for lines.

BUS ZONE PROTECTION: Protection Requirements-Non unit protection-Unit protection schemes.

MICROPROCESSOR BASED DIGITAL PROTECTION: Advantages of Numerical Relays – Numerical Relay Hardware - Digital Signal Processing – estimation of Phasors – Full Cycle Fourier Algorithm – Half Cycle Fourier Algorithm – Practical Consideration for Selection of Algorithm – DFT- FFT.

Syllabus (Practical)

1. Study the burden effect on the performance of CT and measure ratio error.
2. Find out the sequence components of currents in three 1-Phase transformers and 3-Phase transformer and compare their results.
3. Checking characteristic and operation of Inverse Time Over Current relays having following characteristic

   Electromechanical relays.

   A. Extremely Inverse relay (EI)

   B. Very Inverse Relay (VI)

   C. Normal Inverse Relay (NI)
4. Checking characteristic and operation of percentage bias differential and plot the characteristics of a percentage bias differential relay for 20%, 30% and 40% biasing.
5. Study gas actuated Buchholz relay
6. Study under frequency relay and check it's setting experimentally.
7. Study a typical grid substation
8. Study earthing of power station, substation and building
9. Understanding SCADA System for the above Protection Systems setups having IEC 61850 open protocol.

Text Book(s)

1. C.L.Wadhwa,"Electrical Power System", New age international publisher.
2. V.K.Mehta, Rohit Mehta" Principles of Power System", S.Chand Publications
3. Sunil S. Rao – "Switchgear and Protection" Khanna Publications New Delhi
4. Y. G. Parithankar and S. R. Bhide, "Fundamentals Of Power System Protection" 2nd edition, PHI.

Reference Book(s)

1. J.B.Gupta "Transmission & Distribution of Electrical Power", S.K.Kataria & Sons publication.
2. B. Ravindranath And M. Chander, "Power System Protection And Switchgear"
3. Patra and Basu, "Power System Protection"

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE503	MODELING AND SIMULATION	3	0	2	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid erm Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT I

SYSTEMS AND MODELS: Introduction to system, classification of systems, Models and Simulation, different types of mathematical models, Building and verifying models.

PHYSICAL MODELING: General Principles of modeling, Examples of dynamic mathematical models, circuits as dynamic systems, distinguished role of differential equations in developing mechanistic models, setting up ODE models, Numerical solution of ODEs.

UNIT II

ANALYSIS OF MODELS: Laplace Transform, circuit analysis with Laplace Transform, Circuit transformation from time to complex frequency, complex impedance, complex admittance, transfer functions, concept of pole and zero, stability, transient analysis , minimum phase and non-minimum phase system, Use of simulation software for electrical system analysis.

UNIT III

CONCEPT OF STATE AND STATE-SPACE BASED MODELING: Linearization of first principle model,Concept of state, state variables, state-space form, state diagram representation, non-uniqueness of state-space model, derivation of state model from different representation of a system, canonical state space models, Examples of state-space modeling of different electrical systems, observability and controllability, derivation of transfer function from state-space and vice versa, state transition matrix, solution of state-space equations, computation of state transition matrix.

UNIT IV

DISCRETE SYSTEM ANALYSIS USING Z-TRANSFORM: Introduction to Discrete systems, sampling, conversion of continuous to discrete state Space models, Introduction to Z-transform, properties of Ztransform.

DATA BASED MODELING TECHNIQUES: Stochastic and statistical properties of the process, different types of regression models, parametric modeling using least square technique, Using system identification as a tool for model building, design of identification experiments, post treatment of data, choice of model structure, Model validation using cross validation concept.

Syllabus (Practical)

1. Introduction to mathematical computational and simulation software.
2. To study linearization of non-linear systems.
3. Solving ODEs using computational software (Development of Process Simulator).
4. Mathematical model development and simulation of DC Motor using computational software.
5. Introduction to graphical programming.
6. Modeling and simulating, the generation, transmission, distribution, and consumption of electrical power.
7. Experiment based on data based modeling techniques.
8. Mathematical modeling of unstable systems using closed loop identification techniques.
9. Transient analysis of simple RC, RL and RLC circuits.
10. Introduction to for PSpice , PSCAD and LABVIEW as a tool for modeling and simulation.

Text Book(s)

1. Lennart Ljung, Torkel Glad, "Modeling of Dynamic System", Prentice Hall, Englewood Cliffs, NJ,1994
2. Robert L. Woods and Kent L. Lawrence, "Modeling and Simulation of Dynamic Systems", 1st Edition, Prentice Hall, 1997.
3. SR Otto, "An Introduction to Programming and Numerical Methods in MATLAB", Springer, 2011.
4. Charles M. Close, Dean K. Frederick, Jonathan C. Newell, "Modeling and Analysis of Dynamic Systems", 3rd Edition, John Wiley and Sons Inc., 2002
5. Steven T.Karris, "Circuit Analysis II with MATLAB Computing and Simulink/SimPower Systems Modeling", Orchard Publications, Fremont, California, 2009

Reference Book(s)

1. Kai Velten, "Mathematical Modeling and Simulation-Introduction for Scientists and Engineers", Wiley-VCH Verlag GmbH and Co. KGaA, 2009.
2. P. P. J. van den Bosch, A. C. van der Klauw, "Modeling, Identification and Simulation of Dynamical Systems", CRC Press, 1994.
3. John Penny, George Lindfield, "Numerical Methods using MATLAB", PHI, Upper Saddle River, NJ 2000.
4. Frankline, J. Powelll, Abbas Emami-Naeini, "Feedback Control of Dynamic Systems", 5th Edition, Pearson Education, 2006.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ECE 501	Linear Integrated Circuits	3	1	2	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test – I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

- Operational Amplifiers: Op-amp Basics, Properties of Ideal Op-Amp, Inverting, Non-inverting, Summing, Difference amplifier, Voltage Follower, Current-to-Voltage Converter, and Characteristics of Practical Op-Amp, Effect of Non-ideal behavior on Op-Amp performance, Differentiator, Integrator, Exponential and logarithmic amplifier, Analog Multiplier, Precision Half wave and Full wave rectifiers, Clipper and Clamper, Peak Detector, Comparator and its applications, Schmitt Trigger.
- Active Filters: Low pass, high pass, band pass and band reject filters, all-pass filter, Switched capacitor filter, Butterworth filter design, Chebyshev Filter design.
- Phase Locked Loops:Operating Principles of PLL, Linear Model of PLL, Lock range, Capture range, Applications of PLL as FM detector, FSK demodulator, AM detector, frequency translator, phase shifter, tracking filter, signal synchronizer and frequency synthesizer, Building blocks of PLL, LM565 PLL.
- Analog to Digital and Digital to Analog Convertors: Analog switches, High speed sample and hold circuits and sample and hold ICs, Types of D/A converter, Current driven DAC, Switches for DAC, A/D converter-Flash, Single slope, Dual slope, Successive approximation, Delta Sigma Modulation, Voltage to Time converters.
- Special Function IC's: Four quadrant multiplier & its applications, Basic blocks of linear IC voltage regulators, Three terminal voltage regulators, Positive and negative voltage regulators, Frequency to Voltage converters, Voltage to Frequency converters, Tuned amplifiers, power amplifiers, Isolation Amplifiers, Video amplifiers, Fiber optic ICs and Opto-couplers.

Course Syllabi (Practical)

1. To study Op-Amp 741 characteristics and its various parameters from data sheet.
2. To study Op-amp based inverting and non-inverting amplifiers, voltage comparator and zero crossing detectors.
3. To study Op-Amp as scalar, summer and voltage follower.
4. To study Op-Amp as differentiator and integrator.

5. To design 1st order low pass and high pass active filters using Op-Amp 741.
6. To design Band Pass and Band reject Active filters using Op-Amp 741.
7. To design Oscillators using Op-Amp (i) RC phase shift (ii) Wien bridge at 1 kHz.
8. To design (i) Astable (ii) Monostable Multivibrators using IC-555 timer
9. To design Triangular & square wave generator using 555 timer.
10. To study operation of IC NE/SE 566 Voltage Controlled Oscillator and determine output frequency for various voltage levels.
11. To study Op-Amp based V to I and I to V converters.
12. To study a PLL circuit and determine the free running frequency.
13. To study Op-Amp based sample and hold circuit.
14. To design Schmitt trigger using op-amp.

Text Books:

1. Op-Amps and Linear Integrated Circuits, Ramakant A. Gayakwad, PHI Learning, 4th Edition.
2. Op-amp & Linear ICs, David A. Bell, Prentice Hall of India, 2nd Edition, 1997.

Reference Books:

1. Analysis and Design of Analog Integrated Circuits, Gray and Meyer, Wiley International, 1995.
2. Design with operational amplifiers and analog integrated circuits, Sergio Franco, McGraw-Hill, 1997.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE504	Electrical Signals & Systems	3	1	0	4

Evaluation Scheme (Theory)

Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test – I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Course Syllabi (Theory):

- **Introduction:** Background in Complex Arithmetic, Analysis Background, Mathematical Definitions of Signals, Elementary Operations on Signals, Elementary Operations on the Independent Variable, Energy and Power Classifications ,Symmetry-Based Classifications of Signals ,Additional Classifications of Signals ,Discrete-Time Signals: Definitions, Classifications, and Operations, Continuous-Time Signal Classes, Discrete-Time Signal Classes ,Introduction to Systems, System Properties , Interconnections of Systems

- **Discrete & Continuous Time LTI Systems:** Discrete-Time LTI Systems, DT LTI Systems and Convolution, Properties of Convolution - Interconnections of DT LTI Systems ,DT LTI System Properties ,Response to Singularity Signals , Response to Exponentials (Eigen function Properties) ,DT LTI Systems Described by Linear Difference Equations, Continuous-Time LTI Systems, CT LTI Systems and Convolution, Properties of Convolution - Interconnections of DT LTI Systems, CT LTI System Properties, Response to Singularity Signals, Response to Exponentials (Eigen function Properties) ,CT LTI Systems Described by Linear Difference Equations

- **Periodic CT Signal Representation (Fourier series):** CT Fourier Series, Real Forms, Spectra, and Convergence, Operations on Signals CT LTI Frequency Response and Filtering

- **Periodic DT Signal Representation (Fourier series):** DT Fourier Series, Real Forms, Spectra, and Convergence, Operations on Signals, DT LTI Frequency Response and Filtering

- **Fourier Transform Representation for CT Signals:** Introduction to CT Fourier Transform, Fourier Transform for Periodic Signals, Properties of Fourier Transform Convolution Property and LTI Frequency Response, Additional Fourier Transform Properties, Inverse Fourier Transform, Fourier Transform and LTI Systems Described by Differential Equations , Fourier Transform and Interconnections of LTI Systems.

Text Books:

1. Signals and Systems by Tarum Kumar Rawat, Oxford.

Reference Books:

1. Signals And Systems by Oppenhiem Willsky- Nawabi, PHI
2. Linear Systems and Signals by B.P.Lathi, Oxford
3. A. Papoulis, Circuits and Systems, Modern Approach, HRW, 1980

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
LA 501	Effective Public Speaking & Employability Skills	2	0	0	A

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	–	–	–	–

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Mock Interviews/others

Course Syllabi (Theory)

- Planning, Preparing and Organizing a Presentation: Collecting the Material, Making an Outline, Drafting, Editing
- Structuring the Presentation: Choosing and Pattern such as Chronological, Causal, Spatial, Directional, Psychological, etc.
- Audience Analysis: Recognizing Needs, Expectations and Attitudes
- Combating Nervousness: Signs and Symptoms; Hidden Causes of Stage Fright; Remedies
- Designing a Presentation: Planning Innovative Beginnings; Developing and Substantiating the Main Body; Casting Effective Endings
- Using Body and Voice to Communicate Effectively: Nuances of Body Language such as Gestures, Posture, Eye Contact, Hand Movements, Facial Expressions; and Elements of Voice such as Volume, Pitch, Articulation, Inflections, Pauses, Vocalized Pauses, etc.
- Choosing Appropriate Language for the Right Effect: Vocabulary, Wit and Humour
- Preparing Speeches for Special Occasions: Welcome Speech, Welcome Speech, Introduction Speech, Felicitation Speech, Farewell Speech, Vote of Thanks, etc
- Preparing Resume and Curriculum Vitae
- Group Discussion: Understanding the Purpose and Relevance; Learning Tips for Effective Participation; Various Traits to be Evaluated such as Reasoning Ability, Group Dynamics, Leadership Skills, Openness, Assertiveness, Motivation, Non-verbal Communication, Originality, Composure, Expression; Learning through Mock Group Discussions, etc
- Job Interviews: Discussing with students the different steps and strategies required in job interviews; highlighting the importance of preparation, alertness, confidence and knowledge; preparing for commonly asked questions during interviews, marshalling techniques for answering effectively, reviewing different job interviews; displaying effective body language; sailing through dicey questions; Learning through Mock Interviews.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
PS501	Practice School – I				4

Evaluation Scheme

S. No.	Evaluation Component	Marks (100) (Weightage %)
1	Quiz-I	4
2	Quiz-II	4
3	Group Discussion-I	4
4	Group Discussion-II	4
5	Seminar-I	4
6	Seminar-II	4
7	Diary-I	4
8	Diary-II	4
9	Observation-I	4
10	Observation- II	4
11	Mid Term Evaluation (Project Report and Presentation/Viva)	20
12	Final Evaluation (Project Report and Presentation/Viva)	40

Course Syllabi:

This course is for 6 weeks at the end of 4th semester during summer term of 4 year full time B. Tech. and 5 year Integrated Dual degree (B.Tech + M.Tech, B.Tech + MBA) programs in all the engineering disciplines. The objective of this programme is to provide the students an understanding of working of corporate world in various functions associated with an Industry/Organization. During this programme, they will observe and learn various real world applications of their curricula and develop an understanding of vast engineering operations and its various facets such as inventory, productivity, management, information systems, human resource development, data analysis etc. The general nature of PS-1 assignments is of study and orientation.

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-SIX

Detailed Syllabus

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Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 601	Non-Conventional Energy Sources	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid erm Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

INTRODUCTION: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

SOLAR CELLS: Theory of solar cells, solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II

SOLAR THERMAL ENERGY: Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

THERMO-ELECTRICAL AND THERMIONIC CONVERSIONS: Principle of working, performance and limitations.

WIND ENERGY: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics, Performance and limitations of energy conversion systems

UNIT-V

BIO-MASS: Availability of bio-mass and its conversion theory.

OCEAN THERMAL ENERGY CONVERSION (OTEC): Availability, theory and working principle, performance and limitations.

WAVE AND TIDAL WAVE: Principle of working, performance and limitations. Waste Recycling Plants

Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE5602	Power System Analysis	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

Unit-I

Percent and per unit quantities. Single line diagram for a balanced 3-phase system. Admittance Model: Branch and node admittances Equivalent admittance network and calculation of Y bus. Modification of an existing Y bus. Transient on a Transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions.

Unit-II

Fortescure theorem, symmetrical component transformation. Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system. Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition.

Unit-III

Power system stability, power angle curve, transfer reactance, swing equations, steady state stability theoretical and practical, transient stability using equal area criterion and step by step method. Introduction to Grid Failure, Methods of improving stability using traditional techniques and new approaches eg. High speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking, and Independent pole operation of circuit breaker acting automatic voltage regulation.

Unit-IV

Load frequency control, nature of control problems, Basic concept of Governor Mechanism and Their performance in steady state, Turbine and Generator model. Load frequency control of an isolated power system. Division of load between Generators, Basic concept of control area

Unit-V

Load flow problem, development of load flow equations, bus classification. Gauss Seidel, Newton Raphosn, decoupled and fast decoupled methods for load flow analysis. Comparison of load flow methods.

Syllabus (Practical)

1. Simulate Swing Equation in Simulink (MATLAB)
2. Modelling of Synchronous Machine
3. Modelling of Induction Machine.
4. Simulate simple circuits using Circuit Maker
5. Modelling of Synchronous Machine
6. Simulation of Synchronous Machine with FACTS device.
7. Modelling of Synchronous Machine with FACTS device
8. Simulation of Synchronous Machine with FACTS devices.
9. FACTS Controller designs with FACT devices for SMIB system

Text Book(s)

1. C.L.Wadhwa,"Electrical Power System", New age international publisher.
2. Power system engineering -Nagarath & Kothari
3. Power System Stability & Control -P.Kundur

Reference Book(s)

1. Electric Power System -B.M.Weedy

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE603	Industrial Electronics	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT I

INTRODUCTION TO SOLID STATE POWER DEVICES & OPERATION : SCR, G.T.O., Power transistor, Classification of SCR triggering methods, design and operation of triggering circuits, commutation methods, pulse transfer and isolation scheme, protection of power devices. Series & parallel operation of SCRs

UNIT II

PHASE CONTROLLED CONVERTERS: Single phase uncontrolled, half-controlled and fully controlled converters. Three-phase half-controlled and full controlled bridge converters

UNIT III

CHOPPERS: Principle of operation of chopper, types of choppers (single, two and four quadrant choppers), various commutation methods, and voltage commutated chopper and current commutated choppers, Principle of cycloconverter operation, single phase to single phase cycloconverter circuit

UNIT I

REGULATORS: Single phase A.C. Regulators-different circuit configurations and their operation.

INVERTERS: Voltage & current source inverters, single phase half bridge and full bridge inverter with resistive load and inductive load, concept of feedback diode, three phase bridge inverters. Basics of PWM inverters.

CYCLOCONVERTERS: Three-phase to single-phase and three-phase to three phase configurations.

Syllabus (Practical)

1. Determine V-I characteristics of SCR and measure forward breakdown voltage, latching
2. Find V-I characteristics of TRIAC and DIAC
3. Find transfer and output characteristics of MOSFET and IGBT
4. Find output characteristics of MOSFET and IGBT
5. Study and test firing circuits for SCR-R, RC and UJT firing circuits.

6. Study and test 3-phase diode bridge rectifier with R and RL loads. Study the effect of
7. Study and obtain waveforms of single-phase half wave controlled rectifier with and
8. Study and obtain waveforms of single-phase half controlled bridge rectifier with R and
9. Study and obtain waveforms of single-phase full controlled bridge converter with R and
10. Study Control the speed of a dc motor using single-phase half controlled bridge

Text Book(s)

1. Bimbhra.P.S. "Power Electronics" Khanna Publisher.
2. Singh .M.D. & Khanchandani K.B. "Power Electronics" Tata McGraw Hill
3. Sen. P.C. "Power Electronics", Tata McGraw Hill

Reference Book(s)

1. M. Ramamurthy: An Introduction to Thyristors and their Applications, East West Press Pvt Ltd.
2. Mohammad H. Rashid : Power Electronics Circuits, Devices and Applications, Prentice Hall of India Pvt Ltd.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 604	ADVANCED CONTROL SYSTEMS	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

Unit-I: Discrete-Time Control Systems

Introduction: Discrete Time Control Systems and Continuous Time Control Systems, Sampling Process, Digital Control Systems: Sample and Hold, Analog to digital conversion, Digital to analog conversion.

Unit-II: Z-transform

Discrete-Time Signals, the Z-transform, Z-transform of Elementary functions, important properties and Theorems of the Z-transform. The inverse Z-transform, Z-Transform method for solving Difference Equations

Z-Plane Analysis of Discrete Time Control Systems: Impulse sampling & Data Hold, Reconstruction of Original signals from sampled signals: Sampling theorem, folding, aliasing. Pulse Transfer function: Starred Laplace Transform of the signal involving both ordinary and starred Laplace Transforms; General procedures for obtaining pulse Transfer functions, Pulse Transfer function of open loop and closed loop systems. Mapping between the s-plane and the z-plane, Stability analysis of close-loop systems in the z-plane: Stability analysis by use of the Bilinear Transformation and Routh stability criterion, Jury stability

Unit-III: State Variable Analysis & Design

Introduction: Concepts of State, State Variables and State Model (of continuous time systems): State Model of Linear Systems, State Model for Single-Input-Single-Output Linear Systems and linearization of the State Equation. State Models for Linear Continuous – Time Systems: State-Space Representation Using Physical Variables, State – space Representation Using Phase Variables, Phase variable formulations for transfer function with poles and zeros, State-space Representation using Canonical Variables, Derivation of Transfer Function for State Model. Diagonalization, Eigen values and Eigen vectors, Generalized Eigen vectors. Solution of State Equations: Properties of the State Transition Matrix, Computation of State Transition Matrix, Computation by Techniques Based on the Cayley-Hamilton Theorem, Sylvester's Expansion theorem. Concepts of Controllability and Observability: Controllability, Observability, Effect of Pole-zero Cancellation in Transfer Function. Pole Placement by State Feedback

Unit-IV: Nonlinear Systems

Introduction: Behavior of Nonlinear Systems, Investigation of nonlinear systems. Common Physical Nonlinearities: Saturation, Friction, Backlash, Relay, Multivariable Nonlinearity.

Text Books:

1. Discrete-Time Control System, by K.Ogata, 2nd edition (2009), PHI.
2. Control Systems Engineering, by I.J. Nagrath and M.Gopal., 5th Edition (2007 / 2009), New Age International (P) Ltd. Publishers.

Reference Books:

1. Design of Feedback Control Systems by Stefani, Shahian, Savant, Hostetter, Fourth Edition (2009), Oxford University Press.
2. Modern Control Systems by K.Ogata, 5th Edition (2010), PHI.
3. Modern Control Systems by Richard C. Dorf. And Robert, H.Bishop, 11th Edition (2008), Pearson Education Inc. Publication.
4. Control Systems (Principles & Design) by M.Gopal, 3rd Edition (2008), Tata Mc.Graw Hill Publishing Company Ltd.
5. Control Systems Engineering by Norman S.Nise, 4th Edition (2008), Wiley India

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE605	Microprocessors	3	0	2	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	40	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Course Syllabi (Theory):

UNIT I: Evolution and overview of Microprocessor, microcomputer organization. Microprocessor Architecture - introduction and pin diagram of 8085, ALU timing and control unit, registers, data and address bus, timing and control signals, fetch and execute operations, instruction and data flow, system timing diagram, minimum system configuration for 8085.

UNIT II: Instruction type classification of instructions addressing modes, instruction format,assembler directives, over view of instruction set, writing assembly language programs with and without subroutines, concepts of stack, interrupts, interrupt service subroutine.

UNIT III: Memory types, memory organization, static RAM interfacing memory, use of RAMs and EPROMs, RAM-6116, 6164, EPROM-2716, 2732, 2764, Programmable Peripherals Interface (8255). Programmable Interval Timer 8253, Basic concepts in serial I/O and data transfer schemes and their classification.

UNIT IV: Types of A/D & D/A converters, Interfacing & programming of ADC-0808/0809 and DAC-0800. Multiplexers and demultiplexers, 8085 based data acquisition system, stepper motor control, DC motor control, temperature control, traffic control.

UNIT V: 16-bit Microprocessor 8086 and its internal architecture, instruction set. Introduction to programming of 8086, 8086 interrupts, multi-user, multitasking, Introduction to microcontrollers- 80286, 80386, 80486, microprocessor family, Comparison of microprocessors.

Course Syllabi (Practical):

1. Familiarization with 8085 register level architecture and trainer kit components, including the memory map. Familiarizationwiththeprocessofstoringandviewingthecontentsofmemoryaswellas registers.
2. Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical)
3. Transfer of a block of data in memory to another place in memory in the direct and reverse order.
4. Searching a number in an array and finding its parity.

5. Serial and Parallel data transfer on output port 8155 & 8255 & designing of disco light, running light, and sequential lights on off by above hardware.
6. Generation of different waveform on 8253/ 8254 programmable timer.
7. Program using subroutine calls and IN/OUT instructions using 8255 PPI on the trainer kit eg, subroutine for delay, reading switch state & glowing LEDs accordingly, finding out the frequency of a pulse train etc
8. Interfacing any 8 bit Latch (eg,74LS373) with trainer kit as a peripheral mapped output port with absolute address decoding.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor Architecture, programming and applications with the 8085", Penram International
2. B.Ram," Fundamentals of Microprocessors and Microcomputers "
3. Muhammad Ali Mazidi, "The 8051 Microcontroller and embedded systems, Pearson Ed.
4. S. K. Venkata Ram, "Advanced Microprocessors and Microcontrollers", McGraw Hill.

Reference Books:

1. Uffenbeck, John, "Microcomputers and Microprocessors", PHI.
2. Douglas Hall, "Microprocessor and Interfacing, Programming of Hardware",McGraw Hill.
3. Krishna Kant, "Microprocessors and Microcontrollers", PHI.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE622 (Elective-I)	Restructured Power Systems	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I: Need and conditions for deregulation. Introduction of Market structure, Market Architecture, Spot market, forward markets and settlements. Review of Concepts marginal cost of generation, least-cost operation, and incremental cost of generation. Power System Operation: Old vs. New

UNIT II: Electricity sector structures and Ownership /management, the forms of Ownership and management. Different structure model like Monopoly model, Purchasing agency model, wholesale competition model, Retail competition model.

UNIT III: Framework and methods for the analysis of Bilateral and pool markets, LMP based markets, auction models and price formation, price based unit commitment, country practices

UNIT IV: Transmission network and market power. Power wheeling transactions and marginal costing, transmission costing. Congestion management methods- market splitting, counter-trading; Effect of congestion on LMPs- country practices

UNIT V: Ancillary Services, Standard Market Design, Distributed Generation in restructured markets, Developments in India, IT applications in restructured markets, working of restructured power systems

Text Book(s)

1. Understanding electric utilities and de-regulation, Lorrin Philipson, H. Lee Willis, Marcel Dekker Pub., 1998.
2. Operation of restructured power systems. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, Kluwer Academic Pub., 2001.
3. Restructured electrical power systems: operation, trading and volatility Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker Pub., 2001.
4. Operation of restructured power systems - K. Bhattacharya, M.H.J. Bollen and J.E. Daalder

Reference Book(s)

1. Market operations in electric power systems - M. Shahidehpour, H. Yamin and Z. Li
2. Fundamentals of power system economics - S. Kirschen and G. Strbac
3. Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry - N. S. Rau.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE621(Elective-I)	Power System Transients	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid erm Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

SWITCHING TRANSIENTS: Wave terminology, Development of wave quotations, Terminal problems, Lattice diagrams, Origin and Nature of power system transients and surges, Surge parameters of plants, Equivalent Circuit representations. Lumped and distributed circuit transients.

UNIT II

LOAD SWITCHING: Line denergisation and de-energisation transients-Earth and earthwire effects. Current chopping in circuit breakers. Short line fault condition and its relation to circuit breaker duty. Trapped charge effects. Effect of source and source representation in short line fault studies.

UNIT III

LIGHTNING TRANSIENTS AND TRAVELLING WAVES: Lightening phenomenon ,Mechanism of Lightning Discharge Types of Lightning strokes, Harmful effects of lighting, protections against lightning, overhead Ground wires, influence of tower footing resistance and earth resistance, Traveling waves in distributed parameters multiconductor lines, parameters as a function of frequency.

UNIT IV

LIGHTENING ARRESTERS: Types of lightening arresters, Surge absorber, surge diverters, Fourier integral and z transform methods in power system transient.

Text Book(s)

1. M.S.Naidu and V.Kamraju – High Voltage Engineering, Tata McGraw Hill Publishing,Company, New Delhi
2. C.L.Wadhwa,"Electrical Power System", New age international publisher.
3. V.K.Mehta, Rohit Mehta" Principles of Power System", S.Chand Publications
4. Sunil S. Rao – "Switchgear and Protection" Khanna Publications New Delhi

Reference Book(s)

1. B. Ram, D.N. Vishwakarma- Power system protection and switchgear-TMH
2. Juan A. Martinez-Velasco,"Power System Transients: Parameter Determination", CRC Press,2009
3. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
MA 621 (Elective-I)	Engineering Optimization	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test – I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks	Mid Term Test - I	End Term Test	Class Participation	Additional Continuous Evaluation *	Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

- **Introduction:** Introduction to Optimization and its scope, Formulating a Mathematical Model, Deriving Solutions from the Model
- **Linear Programming Problems:** Revised Simplex Method, Duality Theory and Sensitivity Analysis, Dual Simplex Method, Transportation Problem, Assignment Problem
- **Non-linear Programming:** Introduction, Single variable and multi variable optimization, Constrained and unconstrained problems, Kuhn-Tucker conditions
- **Network Optimization Models:** The Terminology of Networks, Shortest-Path Problem, Minimum Spanning Tree Problem
- **Other Optimization Models:** Dynamic Programming, Integer Programming, Game Theory
- **Multi-objective optimization:** Introduction to various multi-objective optimization techniques and its scope, Linear Goal Programming and Its Solution

Text books and Reference books

1. Hillier F.S. and Lieberman G.J., *Introduction to Operations Research: Concepts and Cases*, Tata Mc Graw Hill, 8th Ed., (Indian Adapted Edition), 2005.
2. Taha. H. A, *Operations Research: An Introduction*, Pearson Education, 7th ed., 2003.
3. Ronald L. Rardin, *Optimization in Operations Research*. Pearson Education, First Indian Reprint 2002.
4. Pant.J.C., *Introduction to Optimization: Operations Research*, Jain Brothers, 5th Ed., 2000.
5. Sharma. S. D., *Operations Research*, Kedarnath Ramnath & Co., 15th Edition, 2006.
6. Kalyanmoy Deb, Optimization for Engineering Design: Algorithms and Examples, PHI.
7. Kasana H.S. and Kumar K.D., Introductory Operations Research: Theory and Applications, Springer.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE625 (Elective-I)	ELECTRICAL AND ELECTRONIC ENGINEERING MATERIALS	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

METAL AND INSULATORS: Electron theory of metals, factor affecting electrical resistance of materials, Matthiessen's rule, mixture, Skin effect: HF resistance of a conductor, thin metal films and integrated circuits interconnections, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effects, dielectrics, polarization and relative permittivity, polarization mechanisms, frequency dependent dielectric constant and dielectric loss, dielectric strength and insulation breakdown, partial discharge, capacitor dielectric materials, ultra-capacitors, properties and applications of electrical conducting and insulating materials, composite conductors, aluminum conductor steel reinforced (ACSR), Aluminum Conductor Composite Reinforced (ACCR).

UNIT II

SEMICONDUCTOR MATERIALS: Introduction to quantum mechanics, number of states, density of energy states in conduction and valance band of semiconductor, types of semiconductors, current carriers in semiconductors, Hall effect, drift and diffusion currents, continuity equations, P-N junction diode, built in potential barrier, electric field, space charge width, junction capacitance, one sided junctions, generation and recombination currents, junction transistor, introduction to silicon carbide, properties of semiconducting materials.

UNIT III

SEMICONDUCTOR OPTICAL DEVICES: Optical absorption, photon absorption coefficient, electron-hole pair generation rate, Solar cells; PN junction solar cells, conversion efficiency and solar concentration, non uniform bsorption effects, Light emitting diodes; generation of light, internal quantum efficiency and external quantum efficiency, LED Devices, semiconductor laser diodes.

UNIT IV

MAGNETIC PROPERTIES OF MATERIALS: Origin of permanent magnetic dipoles in matters, classification diamagnetism, Para-magnetism, ferromagnetism, anti-ferromagnetism and ferrimagnetisms, magnetostriction, properties of magnetic materials, CRGO, μ-metal, soft and hard magnetic materials, permanent magnetic materials, super conductivity and superconducting materials.

Text Book(s)

1. R.K. rajput, "Electrical Engineering Materials", Laxmi Publications
2. T.K. Basak, "Electrical Engineering materials", New Age International
3. Donald. A. Neamen, "Semiconductor physics and devices", Tata McGraw Hill publications

Reference Book(s)

1. S.O. Kasap, "Principles of electronic materials and devices", Tata McGraw Hill publications
2. A.J. Dekker, "Electrical Engineering Materials", Prentice Hall of India
3. Ian p. Hones, "Material Science for electrical and electronic engineering", Oxford University Press.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE522 (Elective-I)	Advanced Distribution System	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

DISTRIBUTION SYSTEMS & LOAD FORECASTING: Distribution of power, future distribution systems, power loads, Introduction, load survey, load forecasting-regression analysis, correlation theory, analysis of time series, load growth factors, sources of error.

UNIT II

OPERATION: Operation criterion and standards: Voltage control – voltage regulation, kVA – km conductor loading, correction of system voltage. Harmonics, effects of harmonics on networks, limits of harmonics, filters. Load variations- causes of voltage fluctuations, measures to reduce flickering. Ferroresonance. System losses, introduction, losses in components, measurement of losses, reduction of losses

UNIT III

DISTRIBUTION POWER CAPACITORS: Reactive power flow, monitoring and compensation in distribution system, maintaining system voltage, Series and shunt capacitors, comparison. Shunt capacitors in distribution system - LT and HT shunt capacitors, capacitor rating for power factor improvement, constructional features. System harmonics.

UNIT IV

GROUNDING: Grounding system, earth and safety, earth electrode- earth resistance calculation, effect of rod size and soil resistivity, earth conductor sizes, Introduction to earth electrode design. Brief description of system earthingsystem neutral earthing, earthing of substations, lines and consumer premises, Earth fault protection of feeders.

UNIT V

DISTRIBUTION AUTOMATION: Introduction to distribution automation, Concept of communication power line carrier, radio communication, fibre optics, satellite communication and sensors, Introduction to supervisory control and data acquisition (SCADA), Brief descriptor of an automation system.

Text Books

1. A S Pabla: Electric Power Distribution. (TMH)
2. B R Gupta: Power System Analysis & Design, S. Chand Publishers
3. Nagrath Kothari: Modern Power System Analysis. (TMH)

Reference Books

1. J. J. Grainger& W. D. Stevenson: Power System Analysis (TMH).
2. Kamaraju: Electrical Power Distribution Systems (TMH)

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
S 601(HS-Elective)	Organizational Behaviour	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid erm Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Unit I - Introduction to Organizational Behavior

Introduction, evolution of OB, fundamental concepts, models of OB & challenges in OB

Unit II - Understanding Self

Perception, personality, emotions, values, attitudes, learning

Unit III - Understanding Groups

Group dynamics, teams and groups, interpersonal skills, communication, conflict and negotiation, motivation, leadership

Unit IV - Understanding Organisations

Organisational culture, power, politics, decision making, change and its management

Text Book

1. Organizational behavior by Stephen P. Robbins, Pearson Education Asia.

Reference Books

1. Organisational Behaviour by Fred Luthans
2. Behavior in Organisations by Jerald Greenberg & Robert A.Baron, Pearson Education
3. Organizational behavior by Mirza S Saiyadain
4. Organisational Behaviour by Dr. K. Ashwathappa

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
HS 602(HS-Elective)	Professional Ethics	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Unit I – Concept of Ethics

Importance, human values, moral reasoning, stakeholder theory

Unit II – Ethical issues in organizations

Engineering ethics, Ethics in different areas of organizations

Unit III – Unethical business practices

Corruption, bribe, smuggling, hawala, money laundering, tax heavens, unethical marketing communications, counterfeiting, piracy, dumping, etc.

Unit IV – Developing corporate citizenship

Responsibility and rights, whistle blowing, developing ethical culture, ethical leadership

Text Book

1. Professional Ethics and Human Values, Govindarajan, M., Natarajn, S. and Senthilkumar, V.S., PHI

Reference Books

1. Professional Ethics by R. Subramaniam, Oxford University Press
2. Human Values and Professional Ethics by S. Kannan, Taxmann

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
S 603(HS-Elective)	Technology Management	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid erm Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Unit I - Introduction to Technology Management

Sources and types of technological change, incremental and disruptive change, product life cycles and dominant designs

Unit II – Technology strategy

Corporate and technology strategy, technology assessment, technological forecasting - exploratory and normative

Unit III – Technology Diffusion

Diffusion of technology, technology indicators, technology transfer, technology management scenario in India

Unit IV – Organizational implications of technology

Technical structure and organizational infrastructure, flexible manufacturing management systems (FMMS), financial aspects, social issues, environmental impact assessment, human aspects in technology management

Text Book

1. Management of Technology: The Key to Competitiveness and Wealth Creation by Tarek Khalil and Ravi Shankar, McGraw Hill Education India

Reference Books

1. Technology Management by SBS Publishers
2. Technology, Management and Society By Peter F Drucker, HBS Press

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
HS 604(HS-Elective)	Critical Interpretation of Literature and Cinema	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

- Significance of Literature and Cinema
- Interpreting Literature through Devices such as Narrative Technique, Theme, Plot, Action, Characterization, Structure, Unity, Stylistic Features, Figures of Speech such as Simile, Metaphor, Alliteration, Personification, Paradox, Antithesis, Oxymoron, Onomatopoeia, Litotes, Epithets, Hyperbole, etc.
- Interpreting Cinema through Devices such as Light, Sound, Structure, Continuities, Shots, Close-ups, Flashbacks, Memory, Scopophilia, Soundtrack, Counterpoints, Acting, Make-up, Costume, Camera Angles, Editing, Cuts, Ambiguity etc.
- Complexities and Compromises in Cinematic Adaptions
- Analyzing Selected Poems, Short Stories, Plays and Works of Fiction
- List of Selected Works: Poems by Robert Frost, Alexander Pope, Short Stories by Chekhov, Katherine Mansfield, and Somerset Maugham; John Osborne's Look Back in Anger, Jhumpa Lahiri'sThe Namesake
- Analyzing Selected Films through Cinematic Devices, Adaptation Techniques, etc.
- List of Selected Works: The Namesake, French Lieutenant's Woman, Pride and Prejudice, Guide

JK Lakshmipat University

Near Mahindra SEZ, Mahapura, Ajmer Road, Jaipur 302026

Ph.: +91-141-7107500

INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-SEVEN

Detailed Syllabus

&

Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
PS 701	Practice School - II	-	-	-	16

Evaluation Scheme (Theory)						Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
-	-	-	-	-	-	-	-	-	-	-

**** Duration for practice school is Five and a half month**

Course Syllabi:

This course is for five and half months (summer and one semester) in VII or VIII Semester. The objective of this programme is to provide the students, an opportunity to work on live projects of corporate world in various fields. During this programme, they will work on real world applications of their curricula through organizational function of their choice. The students are expected to be involved directly in problem solving efforts of specific interest to the host organization. The learning of PS-I will help them in completing PS-II successfully.

Evaluation Scheme:

S. No.	Evaluation Component	Marks (100) (Weightage %)
1	Quiz-I	4
2	Quiz-II	4
3	Group Discussion-I	4
4	Group Discussion-II	4
5	Seminar-I	4
6	Seminar-II	4
7	Diary-I	4
8	Diary-II	4
9	Observation-I	4
10	Observation- II	4
11	Mid Term Evaluation (Project Report and Presentation/Viva)	20
12	Final Evaluation (Project Report and Presentation/Viva)	40

JK Lakshmipat University

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INSTITUTE OF ENGINEERING AND TECHNOLOGY

4 Year B. Tech Programme

(Branch: Electrical Engineering)

Batch 2015-19

SEMESTER-EIGHT

Detailed Syllabus

&

Scheme of Examination

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 701	Electric Drives and Control	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

INTRODUCTION: - Definition & classification of different type of drives, Review of characteristics and components of electric drives, Speed control methods of various a.c. and d.c. drives, its advantages and applications, acceleration and retardation time, energy consideration.

UNIT II

BRAKING OF DRIVES:- Various methods of braking of a.c. and d.c drives, Automatic control arrangement, characteristics and application, acceleration and Retardation time ,Energy consideration.

UNIT III

INDUCTION MOTOR (A.C) DRIVES:- Basic principle of induction motor drives, 3 Ø a.c voltage controller fed I.M drive, variable frequency control, voltage source inverter (VSI) and current source inverter (CSI), cycloconverter fed IM drive, Slip Power control, static rotor resistance control, chopper control of 3 -Ø slip ring induction motor.

UNIT IV

DRIVES: - Rectifier controlled circuits, Single phase fully controlled and half controlled rectifier fed separately excited d.c motor, 3Ø fully and half controlled fed separately excited d.c. Motor, performance and characteristics of single phase and 3Ø rectifier controlled d.c drives. Control techniques of d.c. Drives using chopper, multi quadrant control of chopper fed motors.

UNIT V

DYNAMICS OF ELECTRIC DRIVES:- Fundamental load torque equation, permissible frequency of starting and stopping, definite time, speed and current limit control, Automatic starting and pulling operation of synch.

Text Book(s)

1. G.K.Dubey," Fundamentals of Electric Drive". Narosa Publishing House.
   Bimbhra.P.S. "Power Electronics" Khanna Publisher.
2. Singh .M.D. & Khanchandani K.B. "Power Electronics" Tata McGraw Hill
3. Sen. P.C. "Power Electronics", Tata McGraw Hill

Reference Book(s)

1. M. Ramamurthy: An Introduction to Thyristors and their Applications, East West Press Pvt Ltd.
2. Mohammad H. Rashid : Power Electronics Circuits, Devices and Applications, Prentice Hall of India Pvt Ltd.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 702	High Voltage Engineering	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

BREAK DOWN IN GASES: Ionization processes, Townsend's criterion, breakdown in electro negative gases, time lags for breakdown, streamer theory, Paschen's law, breakdown in non-uniform field, breakdown in vacuum.

BREAKDOWN IN LIQUID DIELECTRICS: Classification of liquid dielectric, characteristic of liquid dielectric, breakdown in pure liquid and commercial liquid.

BREAKDOWN IN SOLID DIELECTRICS: Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT II

GENERATION OF HIGH VOLTAGES AND CURRENTS: Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT III

MEASUREMENT OF HIGH VOLTAGES AND CURRENTS: Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillograph for impulse voltage and current measurements.

UNIT IV

NON-DESTRUCTIVE TESTING: Measurement of direct current resistivity, measurement of dielectric constant and loss factor, partial discharge measurements.

HIGH VOLTAGE TESTING: Testing of Insulators and Bushings, testing of Isolators and Circuit Breakers, testing of Cables, testing of Transformers, testing of Surge Arresters, leakage current monitoring test of Surge Arrester, Testing of CVT and VT, radio interference measurement.

UNIT V

OVERVOLTAGE AND TRAVELLING WAVES: Causes of over voltages, introduction to lightning phenomena, over voltages due to lighting, Travelling waves on transmission lines-open end line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at a T-junction and line terminated through a capacitance, Attenuation of travelling waves.

Over Voltage Protection & Insulation Coordination: Basic construction and operation of ground wires-protection angle and protective zone, ground rods, counterpoise, surge absorber, rod gap and arcing horn, lighting arresters - expulsion type, non -linear gap type and metal oxide gapless type, volt - time curves, basic impulse insulation levels, coordination of insulation levels

Text Book(s)

1. M.S.Naidu and V.Kamraju – High Voltage Engineering, Tata McGraw Hill Publishing,Company, New Delhi
2. C.L. wadhawa -High Voltage Engineering-New Age international (P) Ltd. Publications.
3. Subir Ray, "An Introduction to High Voltage Engineering", Prentice Hall of India.

Reference Book(s)

1. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
2. E. Kuffel and W. S. Zacngai, "High Voltage Engineering", Pergamon Press.
3. M. P. Chaurasia, "High Voltage Engineering", Khanna Publishers.
4. R. S. Jha, "High Voltage Engineering", Dhanpat Rai and Sons.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 703	TESTING and COMMISSIONING OF ELECTRICAL MACHINES	3	1	2	5

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation*	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

**The ratio of weightage between Theory and Practical content will be 60%: 40%

Syllabus (Theory)

UNIT I

TRANSFORMERS: Testing procedure for HV testing ,Phase shifting/ phase group , Radio interference, Ratio Test , Load loss ,Separate source voltage testing ,Induced voltage testing , Impulse and Surge testing , Noise level and vibration testing , Short circuit withstand test ,Tan Delta test , Core insulation voltage test, Measurement of impedance ,Testing of auxiliaries and safety device , Oil testing ,Classification of testing methods , Testing of bushing. DC and AC Resistance measurement, Temp. Rise test, Short circuit test, Dielectric test, Partial discharge, Insulation resistance testing. Polarity testing, Short time current rating, Impulse and surge testing, Determination of error and accuracy class, Power frequency voltage withstand test, over voltage inter-turn test. Determination of polarization index for transformer. Drying out procedure for transformer. Commissioning steps for transformer, Purification and Filtration Procedure.

UNIT II

INDUCTION MOTOR: TESTING (3-PHASE and 1-PHASE): Hammer test, Testing against variation of voltage/current/frequency, Load test, NL and BR test, DC and AC, Resistance measurement, Insulation measurement, Starting test, Temp. Rise test, Slip measurement, HV test, testing on auxiliaries, Vibration Test, Noise level test. Drying out methods / Polarization Index / Hot Temperature measurement Degree of protection (IP Grade) Commissioning steps for Induction motor, Heat Run Test. Commissioning of Induction Generator. Troubleshooting and maintenance of induction motor.

UNIT III

SUBSTATION EQUIPMENTS: Bus bar Temp. Rise test, Rated short time current test, HV test, Power frequency voltage withstand test, Impulse / surge testing, Vibration.

EARTHING: Earthing resistance measurement, Substation grid Earthing, Soil resistivity measurement.

ISOLATOR TESTING: Temp. Resistance test, Short circuit test, charging current making and breaking test, Inductive current making and breaking test.

UNIT IV

CIRCUIT BREAKER: TESTING OF HV/LV CIRCUIT BREAKER: No load Mechanical Operation, Mechanical endurance test, Temp. Rise test, Impulse and surge testing, short time current test. Short circuit making and breaking test, Line Charging current making and breaking test, Cable charging and capacitor bank making and breaking test, Out of phase switching, Short line fault test, and Electrical and Mechanical endurance test for LT switch gear like MCB / MCCB / ELCB etc. C.T. and P.T. Testing, Relay testing, Coupling capacitors, Station Batteries for DC Supply, Fire Shifting Equipments. Testing and Commissioning of Lightning Arrestor, Substation Commissioning by Thermograph. Troubleshooting and maintenance of circuit breakers.

UNIT V

COMMISSIONING OF TRANSMISSION LINE and CABLE: De-rating of cable capacity, HV test, AC and DC Resistance check, Insulation resistance, Impedance measurement, Location finding technique for fault in underground cables (Murray loop test and Warley loop test), Testing of open circuit faults in cables. Line charging, loading and Dropping.

Syllabus (Practical)

1. Measurement of IR Value for Three Phase and Single Phase Transformer.
2. Measurement of IR Value for Three Phase IM.
3. Measurement of IR Value for Synchronous Machine.
4. Measurement of X0 and X2 for synchronous Machines.
5. Measurement of Poles for IM.
6. Tan (δ) Measurement Test for Transformer.
7. Measurement of Direct axis Sub-transient and Transient Reactance for synchronous Machines .
8. Testing of Induction Motor.

Text Book(s)

1. S. Rao, "Testing, Commissioning, Maintenance and Operation of Electrical Equipments", Khanna Tech. Publications.

Reference Book(s)

1. R C H Richardson, "The Commissioning of Electrical Plant", Chapman and Hall

SEMINAR

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
SEM801	Seminar	0	0	4	2

S. No.	Evaluation Component	Duration (Hours)	Marks (100)	Nature of Component
1.	Presentation	Weekly	25	Open Book
2.	Report(Soft Copy)	Weekly	25	Open Book
3.	Assignment	Continuous	10	Open Book
4.	Final Presentation		20	Open Book
5.	Final Report(Hard Copy)		20	Open Book

Syllabus (Practical)

Operation Procedure

1. Student has to devote full semester for SEM701 course.
2. Student has to report to the Supervisor regularly.
3. Seminars s evaluation has to be carried out in the presence of a two member Committee comprising.
4. Experts in the relevant area constituted by the Supervisor.

Final Seminar Report to be submitted has to be in formal hard bound cover bearing of the Institute emblem.

Reference Books:

1. Based on literature survey to be done with peer reviewed journals and magazines.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 821(Elective-II)	Power Quality & Utilization of Electrical Power	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

INTRODUCTION OF POWER QUALITY: Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers. Power Quality

UNIT II

CHARACTERISTICS & POWER QUALITY STANDARDS: Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions, Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electro technical Commission(IEC Other International Standards Organizations.

POWER QUALITY SOLUTIONS: Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions.

UNIT III

UTILIZATION OF ELECTRICAL POWER

- **Electric Heating:** Advantages of electrical heating, principle of core type and coreless induction furnace, Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace, Dielectric heating, applications in various industrial fields, Infra-red heating and its applications, Microwave heating, Simple design problems of resistance heating element
- **Electric Welding:** Advantages of electric welding, Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method of and their applications,

comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper, Introduction to TIG, MIG Welding.

- **Refrigeration and Air Conditioning and Water Coolers:** Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly Refrigerants, Description of Electrical circuit used in a) refrigerator, b) air-conditioner, and c) water cooler.

UNIT IV

ELECTRIC TRACTION: Advantages of electric traction, Different systems of electric traction, DC and AC systems, diesel electric system, types of services , urban, sub-urban, and main lines and their speed-time curves Different accessories for track electrification such as overhead capacitor wire, conductor rail system, current collector-pantograph ,Factors affecting scheduled speed. Electrical block diagram of an electric locomotive with description of various, equipment and accessories. Types of motors used for electric traction, starting and braking of traction motors, Introduction to EMU and metro railways

Text Books:

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.
3. Wadha C L: Generation, Distribution and Utilization of electrical energy - New Age International Ltd.

Reference Books

1. Soni, Gupta, Bhatnagar: Electrical Power System – Dhanpat Rai & Sons.
2. Partab H: Art and Science of Utilization of Electrical Energy, Dhanpat Rai & Sons.
3. E.Openshaw Taylor – Utilisation of Electric Energy – Orient Longman, Pitman Publications.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 823(Elective-II)	High Power Semiconductor Devices	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks**
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

BASIC DEVICE MODELS: Theory of bipolar and MOS transistors. Small-signal models of bipolar and MOS transistors, Gummel-Poon model

UNIT II

HIGH CURRENT EFFECTS IN DIODES: Dependence of lifetime on high-level injection, non-uniform current distribution under high current injection.

UNIT III

POWER BIPOLAR TRANSISTORS: Onset of high-current effects in transistors; Theories of Kirk effect, crowding, pinch-in effects, second breakdown, Emitter geometries for high current and HF operation.

UNIT IV

SCR : Theories of operation; Relation between shorted emitter and dv/dt ratings; Gate turn-off devices, inverter grade SCRs, special diffusion techniques for SCRs. Power VMOS devices. Heat transfer in power devices

UNIT V

POWER MOS DEVICES :VMOS & DMOS device structure and models; device packaging.

Text Book(s)

1. S.M. Sze, Physics of Semiconductor Devices, 2nd ed., Wiley, 1981.
2. G K Dube,Power Semiconductor Controlled Drives , Hardcover, Prentice Hall

Reference Book(s)

1. B Jayant Baliga ,Power Semiconductor Devices , Hardcover, PWS Publication

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
E 822 (Elective-II)	Flexible AC Transmission System	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid erm Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks**
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

INTRODUCTION TO FACTS: Introduction Problems of AC transmission systems, power flow in parallel paths and meshed system, factors limiting loading capability, stability consideration, Power flow control of an ac transmission line, Basic types of facts controllers. Advantages of FACTS technology, Introduction to power factor control. Transformer connections for 12- pulse, 24 pulse and 48 pulse operations.

UNIT II

STATIC SHUNT COMPENSATORS: Midpoint and end point voltage regulation of transmission line, and stability improvement. Basic operating principle of Static Synchronous Compensators (STATCOM), Comparison between STATCOM and SVC, Static Series Compensators, Concept of series capacitive compensation, voltage and transient stabilities, power oscillation and sub synchronous oscillation damping. Introduction to thyristor switched series capacitor (TSSC), thyristor controlled series capacitor (TCSC), and static synchronous series compensator- operation, characteristics and applications.

UNIT III

STATIC VOLTAGE AND PHASE ANGLE REGULATORS: Voltage and phase angle regulation. Power flow control and improvement of stability by phase angle regulator. Introduction to thyristor controlled voltage and phase angle regulators (TCVR and TCPAR).

Controller (UPFC), basic operating principles, conventional transmission to series compensators and phase angle regulator, Applications of UPFC, operating principles and characteristics, Applications of IPFC.

(FACTS) by Y.H. Song, and Allan T. Johns Institution of Electrical

for Electrical transmission systems by R .Mohan Mathur and Rajiv ce, ISBN no. 0-471-20643-1, 2002.

3. FACTS controllers for transmission and Distribution systems by K.R.Padiyar New Age international Publishers.

Reference Book(s)

1. Concepts and Technology of flexible ac transmission system Hingorani , L.Gyugyi IEEE Press New York, 2000 ISBN –078033 4588.

3. FACTS controllers for transmission and Distribution systems by K.R.Padiyar New Age international Publishers.

Reference Book(s)

1. Concepts and Technology of flexible ac transmission system Hingorani , L.Gyugyi IEEE Press New York, 2000 ISBN –078033 4588.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 824(Elective-II)	Electrical Machine Design	3	1	0	4

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks**
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I

BASIC CONSIDERATIONS IN ELECTRICAL MACHINES DESIGN: Design factors, Limitations in design,Modern trends in design of electric machines, Conducting materials, Magnetic materials, Insulating materials and its classification. Temperature rise, Expression for temperature rise, heating and cooling time constants, examples. Types of duties and ratings, Types of enclosure, Selection of motor capacity,examples. Cooling of machines.

UNIT II

DESIGN OF TRANSFORMER: Specification, Output equation of transformer, Output equation- Volt per turn. Stacking factor, Ratio of iron loss to copper loss, Relation between core area and weight of iron and copper. Optimum designs, variation of output and losses in transformer with linear dimensions,examples. Design of core, Choice of flux density and current density, Choice of window space factor,window dimensions. Design of yoke, Overall dimensions, examples. Design of high voltage and low voltage winding, examples. Estimation of operating characteristics: Primary and Secondary resistance,Leakage reactance of windings, Regulation, examples. Mechanical forces, No load current calculation,Change of parameters with change of frequency. Temperature rise of transformer, Design of tank, examples. Design of Current Transformer: Introduction, construction, design principles, turns compensation.

UNIT III

WINDINGS OF ELECTRICAL MACHINES: Types of transformer windings. D.C. Armature Winding: Types of dc winding, terms related to armature winding, comparison between closed and open winding, simplex lap and wave winding, Duplex lap and wave winding, Dummy coils in wave winding, Equalizer connections, examples.

A.C. ARMATURE WINDING: Number of phases and phase spread, classification of ac winding, Concentric winding, Mesh winding, Integral slot winding, Fractional slot winding, examples.

UNIT IV

DESIGN OF DIRECT CURRENT MACHINES: Field form, Carter's Fringe curves Specifications, Main Dimensions, Total Loadings, Specific Loadings, Choice of Specific Magnetic Loading,Choice of Specific

Electrical Loading, Interdependance of Bav and ac Output equation, Factors affecting size of machines, Seperation of DandL Selection of number of poles, examples Core length, Armature diameter, Pole proportions, Number of ventilacting ducts, Estimation of Length of air gap, examples. Armature reaction and its effects, Reduction of effects of armature reaction.

ARMATURE DESIGN: Number of armature conductiors, Number of armature coils, Number of armature slots, Cross section area of conductors, Slot dimensions, Armature volatge drop, Depth of armature core, examples. Design of Yoke, Magnetic circuit. Design of field system, Design of shunt and series winding, examples. Improvement in commutation Design of Interpoles, Desing of Commutator and Brushes, examples.

Text Book(s)

1. A. K. Sawhney and A. Chakrabarti, "A course in Electrical machine design" Dhanpat Rai and Co.
2. V. N. Mittal and A. Mittal, "Design of electrical machines", Standard Publishers distributors.
3. A. E. Fitzerald, Charles Kingsley, Stephen. D. Umans, "Electric Machinery" 6th Edition, Tata Mcgraw Hill.

Reference Book(s)

1. M. G. Say, "The performance and design of alternating current machines", CBS Publishers and Distributors Computer aided design : By Say & Sinha
2. Juha Pyrhonen, Tapani Jokinen, Valeria Hrabovsova, "Design of rotating electrical machines" Wiley publication

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ECE722(Elective-III)	Biomedical Engineering	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)				
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks**
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

1. **PHYSIOLOGY OF SYSTEMS AND ELECTRODES**: Brief description of neural, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities. Biopotential electrode, Active & passive transducers, Biochemical transducers. Resting & action potential, Polarization & depolarization, Propagation & action potential, Bioelectronic potential.
2. **CARDIOVASCULAR SYSTEM MEASUREMENTS**: Measurement of blood pressure, blood flow, cardiac output, cardiac rate, heart sounds, Electrocardiograph, phonocardiograph, Plethysmograph, Echocardiograph.
3. **INSTRUMENTATION FOR CLINICAL LABORATORY:** Measurement of pH valve of blood, ESR measurement, hemoglobin measurement, O_2 and CO_2 Concentration in blood, GSR measurement.
4. **MEDICAL IMAGING**: Diagnostic X-rays, CAT, MRI, thermography, Ultrasonography, medical use of isotopes, endoscopy.
5. **PATIENT CARE, MONITORING AND SAFETY MEASURES**: Elements of Intensive care monitoring basic hospital systems and components, physiological effect of electric current shock hazards from electrical equipment, safety measures, Standards & practices.
6. **THERAPEUTIC DEVICES AND BIOTELEMETRY:** Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy, heart lung machine, Hemodialysis, Applications of Laser. Real time computer applications

Text Books:

1. T. Cromwell, "Biomedical Instrumentation & Measurements", P

Reference Books:

1. R.S. Khanpur, "Handbook of Biomedical Instrumentation" Tata McGraw Hill.

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ECE725 (Elective-III)	IC Technology	3	0	0	3

Evaluation Scheme (Theory)

Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation		Total Marks**
20	20	50	10	100	-	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Course Syllabi (Theory):

- Introduction to Semiconductor Physics: Review of quantum mechanics, Electrons in periodic lattices, E-k diagrams, Quasiparticles in semiconductors, electrons, holes and phonons. Boltzmann transport equation and solution in the presence of low electric and magnetic fields - mobility and diffusivity; Carrier statistics; Continuity equation, Poisson's equation and their solution; High field effects: velocity saturation, hot carriers and avalanche breakdown.
- Semiconductor Junctions: Schottky, homo- and hetero-junction band diagrams and I-V characteristics, and small signal switching models; Two terminal and surface states devices based on semiconductor junctions.
- MOS Structures: Semiconductor surfaces; The Ideal and Non-ideal MOS Capacitor band diagrams and CVs; Effects of oxide charges, defects and interface states; Characterization of MOS capacitors: HF and LF CVs, avalanche injection; High field effects and breakdown.
- Characterization of Semiconductors: Four probe and Hall measurement; CVs for dopant profile characterization; Capacitance transients and DLTS.

Text Books:

1. S. M. Sze, Physics of Semiconductor Devices, 2nd edition John Wiley, 1981.
2. J. P. McKelvey, introduction to Solid State and Semiconductor Physics, Harper and Row and John Weathe Hill, 1966.

Reference Books:

1. E. H. Nicollian and J. R. Brews, MOS Physics and Technology, John Wiley, 1982

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
ECE724 (Elective-III)	Information Theory & Coding	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	20	50	30	100

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Course Syllabi (Theory):

- Information theory – Concept of amount of information -units, Entropy -marginal, conditional and joint entropies -relation among entropies Mutual information, information rate, channel capacity, redundancy and efficiency of channels.
- Discrete channels – Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Cascaded channels, repetition of symbols, Binary unsymmetrical channel, and Shannon theorem. Continuous channels – Capacity of band limited Gaussian channels, Shannon-Hartley theorem, Tradeoff between band width and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system.
- Source coding – Encoding techniques, Purpose of encoding, Instantaneous codes, Construction of instantaneous codes, Kraft's inequality, Coding efficiency and redundancy, Noiseless coding theorem. Construction of basic source codes – Shannon-Fano algorithm, Huffman coding, Arithmetic coding, ZIP coding.
- Codes for error detection and correction – Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes. Cyclic codes – Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes, BCH codes, RS codes, Burst error correction.
- Convolutional codes – Encoding- State, Tree and Trellis diagrams, Maximum likelihood decoding of convolutional codes -Viterbi algorithm, Sequential decoding -Stack algorithm. Interleaving techniques – Block and convolutional interleaving, Coding and interleaving applied to CD digital audio system -CIRC encoding and decoding, interpolation and muting. ARQ – Types of ARQ, Performance of ARQ, Probability of error and throughput.

Text Books:

1. Communication Systems by Simon Haykin, John Wiley & Sons. Pvt. Ltd.
2. Principles of Communication Systems by Taub & Schilling, Tata McGraw-Hill
3. Principles of Digital Communication by Das, Mullick & Chatterjee, Wiley Eastern Ltd

Reference Books:

1. Error Control Coding Fundamentals and Applications by Shu Lin & Daniel J. Costello Jr., Prentice Hall Inc.
2. Digital Communications Fundamentals and Applications by Bernard Sklar, Person Education Asia

Course code	Course Title	Teaching Scheme			
		L	T	P	Credits
EE 825 (Elective-III)	INDUSTRIAL AUTOMATION AND CONTROL	3	0	0	3

Evaluation Scheme (Theory)					Evaluation Scheme (Practical)			
Mid Term Test - I	Mid Term Test - II	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**	Mid Term Test - I	End Term Test	Class Participation/ Additional Continuous Evaluation	Total Marks**
20	20	50	10	100	-	-	-	-

*Additional Continuous Evaluation: Quizzes/Assignments/Presentations/Practical Records/Mock Interviews/others

Syllabus (Theory)

UNIT I: Process Control

Introduction: Process Definition, Feedback Control, PID Control, Multivariable Control. PID Controller Tuning: Introduction, Zeigler-Nichols Tuning Method (Based on Ultimate Gain and Period, and Process Reaction Curve), Digital PID Controllers.

UNIT II: Special Control Structures

Cascade Control, Feed forward Control, Feed forward-Feedback Control Configuration, Ratio Control, Selective Control, Adaptive Control, Adaptive Control Configuration.

UNIT III: Actuators

Introduction, Pneumatic Actuation, Hydraulic Actuation, Electric Actuation, Motor Actuators and Control Valves.

UNIT IV: Industrial Automation

Programmable Logic Controllers: Introduction, Principles of operation, Architecture, Programming (Programming Languages, Ladder Diagram, Boolean Mnemonics)

Distributed Control: Distributed vs. Centralized, Advantages, Functional Requirements, System Architecture, Distributed Control Systems (DCS), Communication options in DCS.

Text Books:

1. Krishna Kant, "Computer-Based Industrial Control", PHI, 2009.
2. M. Gopal, "Digital Control and State Variable Methods" Tata McGraw Hill, 2003.
3. Surekha Bhanot, Process Control: Principles and Applications, Oxford University Press, 2010

Reference Books:

1. Smith Carlos and Corripio, "Principles and Practice of Automatic Process Control", John Wiley & Sons, 2006.
2. Jon Stenerson, "Industrial Automation and Process Control", Prentice Hall, 2003.
3. C. Johnson, "Process Control Instrumentation Technology", PHI, New Delhi
4. D.R. Coughnowr, "Process System analysis and Control", McGraw Hill

Department of Electrical and Electronics Engineering, IET, JKLU, Jaipur
Corrigendum of Course Booklet
Programme Name: B.Tech. Electrical Engineering
Batch: 2015-19

Code Change:

1. ME241 changed to CE102 2. CSE201 to CSE202,

3. ECE303 to ECE306 4. HS401 to HS701,

Course Name Change: 1. Machine Drawing to Engineering Drawing.

Credit Change: 1. EE404 (4 to 5) 2. LAS501 (A to 2)

Any Other Discrepancy:

1. EE803 Testing Commissioning of Electrical Machines, credit (05) shifted to Elective III as EE732 Testing Commissioning of Electrical Machines, credit (04)

2. In detailed syllabus PH101 Engineering Physics credit change from 04 to 05.

3. In detailed syllabus Environmental Studies course code change from ID201 to ID101.

4. In detailed syllabus Object Oriented Programming course code change from CSE201 to CSE202.

5. In detailed syllabus ECE501 Linear Integrated circuits credit change from 04 to 05.

6. In semester 4^{th} total credit 27 changed 28.

7. In semester 7^{th} total credit 22 changed 16.

8. Total credit of course structure from 190 to 185.

Signature