Study & Evaluation Scheme

of

Bachelor of Technology
(Electrical Engineering)

[Applicable for Academic Session 2016-17]

[Approved by AC meeting dated March 25, 2017 & Hon'ble VC dated August 08, 2017]

[With revision approved by VC date July 23, 2018, August 14, 2018 & January 23, 2019 & November 29, 2019]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

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TEERHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Bagarpur, Moradabad (U.P)

Study & Evaluation Scheme
Bachelor of Technology
SUMMARY

Programme	:	B.Tech (Electrical Engineering)
Duration	:	Four-year full time (Eight Semesters)
Medium	:	English
Minimum Required Attendance	:	75 %
Credit	:	
Maximum Credit	:	196
Minimum credit required for the degree	:	188

Assessment :

Internal	External	Total
40	60	100

Internal Evaluation (Theory Papers)

Class Test I	Class Test II	Class Test III	Assignment(s)	Attendance	Total
Best two out of three					
10 Marks	10 Marks	10 Marks	10 Marks	10 Marks	40 Marks

Project Phase-I :

Internal	External	Total
100	-	100

Evaluation of Practical/Industrial Training/ Project Phase-II :

Internal	External	Total
50	50	100

Duration of Examination :

External	Internal
3 hrs.	$1\frac{1}{2}$ hrs

(To qualify the course a student is required to secure a minimum of 45% marks in aggregate in each course including the semester-end examination and the teacher's continuous evaluation shall be essential for passing the course and earning its assigned credits. A candidate, who secures less than 45% marks in a course, shall be deemed to have failed in that course.)

Question Paper Structure

1. *The question paper shall consist of six questions. All six are compulsory. First question shall be of short answer type (not exceeding 50 words). Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 2 marks each).*
2. *Remaining five questions will be one from each unit with internal choice. The student has to answer one of the two in each question. The weightage of Question No. 2 to 6 shall be 10 marks each.*
3. *Usually each question in the examination should be designed to have a numerical component, where part of syllabus.*

Note 1:

Evaluation Scheme for MOOC, Short Term Courses:

University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

Keeping this in mind the Academic Council in its 10th meeting on February 13, 2016, approved the University proposal and allowed a maximum of two credits to be allocated for MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through edX, Coursera, IIRS and NPTEL could be given a maximum credit of two with 1 credit for credit with 30-60 contact hours and 2 credits for courses having more than 60 credit hours.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

1. There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
2. The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalise a list of courses to be offered with credits defined for each course and the mode of credit consideration of the student. The complete process including the approval of the Vice Chancellor shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course the approval will be valid only for the semester on offer.
3. A student can opt for a maximum of two MOOC courses for credit during the complete duration of the course other than offered under SWAYAM.
4. College can offer upto 20% credit through courses offered by SWAYAM. However, if the college is offering courses on other MOOC platforms, the total credit offered under MOOC will not exceed 20% including those offered under SWAYAM.
5. Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Co-ordinator MOOC through the Principal of the College.
6. Where the MOOC course or Add-on on courses are only offering certificate of successful completion, and credit has been assigned to the course, the University examination division will conduct a MCQ examination for the course with 50 MCQ with 100 marks to facilitate inclusion of the courses in CPI computation.

7. College will define whether the credits are regular credits or to be considered only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.
8. In case the College wants the additional course to be shown in the mark sheet as additional course completed by the students the same shall also be mentioned by the College and the student will opt for the same at the time of taking admission to the course.

Study & Evaluation Scheme

Semester I

S. No	*Course Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
			L	*T*	*P*		*Internal*	*External*	*Total*
1	EAS111	Engineering Mathematics-I	3	2	-	4	40	60	100
2	EAS112/212	Engineering Physics	3	2	-	4	40	60	100
	EAS113/213	Engineering Chemistry							
3	EEE111/211	Basic Electrical Engineering	3	2	-	4	40	60	100
	EEC111/211	Basic Electronics Engineering							
4	EAS114	Environmental Science	1	2	-	2	40	60	100
5	EHM 111	Foundation English – I	1	1	2	2	40	30-Written 30-Viva	100
6	EAS162/262	Engineering Physics (Lab)		-	2	1	50	50	100
	EAS163/263	Engineering Chemistry (Lab)							
7	EEE161/261	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
	EEC161/261	Basic Electronics Engineering (Lab)							
8	EME161/261	Engineering Drawing (Lab)	-	-	4	2	50	50	100
	EME162/262	Workshop Practice (Lab)							
		Total	**11**	**9**	**10**	**20**	**350**	**450**	**800**

Semester II

S. No	*Course Code*	*Subject*	*Periods*			*Credit*	*Evaluation Scheme*		
			L	*T*	*P*		*Internal*	*External*	*Total*
1	EAS211	Engineering Mathematics-II	3	2	-	4	40	60	100
2	EAS112/212	Engineering Physics	3	2	-	4	40	60	100
	EAS113/213	Engineering Chemistry							
3	EEE111/211	Basic Electrical Engineering	3	2	-	4	40	60	100
	EEC111/211	Basic Electronics Engineering							
4	ECS201	Computer Basics & C Programming	3	-	-	3	40	60	100
5	EHM 261	Language Lab I	-	-	4	2	50	50	100
6	EAS162/262	Engineering Physics (Lab)	-	-	2	1	50	50	100
	EAS163/263	Engineering Chemistry (Lab)							
7	EEE161/261	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
	EEC161/261	Basic Electronics Engineering (Lab)							
8	ECS251	Computer Basics & C Programming (Lab)	-	-	2	1	50	50	100
9	EME161/261	Engineering Drawing (Lab)		-	4	2	50	50	100
	EME162/262	Workshop Practice (Lab)							
		Total	**12**	**6**	**14**	**22**	**410**	**490**	**900**

Semester III

S. No	*Course Code*	*Subject*	*Periods*			*Evaluation Scheme*			
			L	*T*	*P*	*Credit*	*Internal*	*External*	*Total*
1	EEC314	Analog and Digital Communication System	3	1	-	4	40	60	100
2	EEE311	Electrical Machines – I	3	1	-	4	40	60	100
3	EEE312	Circuit Theory	3	1	-	4	40	60	100
4	EEC311	Engineering Electromagnetics	3	1	-	4	40	60	100
5	EEC312	Digital Logic & Circuits	3	1	-	4	40	60	100
6	EHM349/ EHM449/ BHM349	English communication and soft skill-III	1	1	2	2	40	60	100
7	EEE361	Electrical Machines – I (Lab)	-	-	3	2	50	50	100
8	EEC361	Digital Logic & Circuits (Lab)	-	-	3	2	50	50	100
9	EGP311	Discipline & General Proficiency	**-**	**-**	**-**	1	100	-	100
		Total	**16**	**6**	**8**	**27**	**440**	**460**	**900**

Following additional Course for Lateral Entry Students with B.Sc. background to be taken in III semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	EME161/261	Engineering Drawing (Lab)	-	-	4	-	50	50	100

Semester IV

S. No	*Course Code*	*Subject*	*Periods*			*Evaluation Scheme*			
			L	*T*	*P*	*Credit*	*Internal*	*External*	*Total*
1	EEE411	Electrical Machines – II	3	1	-	4	40	60	100
2	EEE412	Electrical Measurements and Measuring Instruments	3	1	-	4	40	60	100
3	EEE413	Network Analysis & Synthesis	3	1	-	4	40	60	100
4	ECS412/ ECS312	Object oriented Programming using JAVA	3	1	-	4	40	60	100
5	EEE461	Electrical Machines – II (Lab)	-	-	3	2	50	50	100
6	EEE462	Electrical Measurements and Measuring Instruments (Lab)	-	-	3	2	50	50	100
7	EEE463	Network Analysis &Synthesis (Lab)	-	-	3	2	50	50	100
8	ECS461/ ECS361	Object oriented Programming using JAVA (Lab)	-	-	3	2	50	50	100
9	EGP411	Discipline & General Proficiency	-	-	-	1	100	-	100
		Total	**12**	**4**	**12**	**25**	**460**	**440**	**900**

Following additional Courses for Lateral Entry Students with B.Sc. background to be taken in IV semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	EME162/262	Workshop Practice (Lab)	-	-	4	-	50	50	100

Semester V

S. No.	Course Code	Subject	Periods			Evaluation Scheme			
			L	T	P	Credit	Internal	External	Total
1	EEE511	Control Systems	3	1	-	4	40	60	100
2	EEE512	Power Electronics	3	1	-	4	40	60	100
3	EEE513	Power System Analysis-I	3	1	-	4	40	60	100
4	EHM599/ EHM699/ BHM499	English Communication and Soft Skills-IV	1	1	2	2	50	50	100
5	EEC511	Microprocessor & Applications	3	1	-	4	40	60	100
6	EEE561	Control Systems (Lab)	-	-	3	2	50	50	100
7	EEE562	Power Electronics (Lab)	-	-	3	2	50	50	100
8	EEC561	Microprocessor & Applications (Lab)	-	-	3	2	50	50	100
9	MOOC01	MOOC Program -I (Optional)	-	-	-	1/2	-	100	100
10	EGP511	Discipline & General Proficiency	-	-	-	1	100	-	100
		Total	**13**	**5**	**11**	**25**	**460**	**440**	**1000**

Semester VI

S. No	Course Code	Subject	Periods			Evaluation Scheme			
			L	T	P	Credit	Internal	External	Total
1	EEE611	Electrical Drives & Controls	3	1	-	4	40	60	100
2	EEE612	Power System Analysis-II	3	1	-	4	40	60	100
3	EEC611	Signals & Systems	3	1	-	4	40	60	100
4	EEC612	Embedded System	3	1	-	4	40	60	100
	EEC617	Microcontroller Hardware, Programming & its Application (Arduino)	2	2	-				
5	ECS511/ 611/411/ MSC014/ BCS311	Database Management System	3	1	-	4	40	60	100
6	EEE661	Electrical Drives & Controls (Lab)	-	-	3	2	50	50	100
7	EEE662	Control Systems Using MATLAB	-	2	2	2	50	50	100
8	MOOC02	MOOC Program -II (Mandatory)	-	-	-	1/2	-	100	100
9	EGP611	Discipline & General Proficiency	-	-	-	1	100	-	100
		Total	**15**	**7**	**5**	**26/27**	**400**	**500**	**900**

Semester VII

S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1	EEE711	Switchgear & Protection	3	-	-	3	40	60	100
2	EEE712/ EEE614	Non-Conventional Energy Resources	3	1	-	4	40	60	100
3	**Departmental Elective-I**								
	EEE713	FACTS Technology	3	-	-	3	40	60	100
	EEE714	Power Generation Systems							
4	**Open Elective-I**								
	FOE011	Principle of Management	3	1	-	4	40	60	100
	FOE012	Artificial Neural Network							
	FOE013	Industrial Sociology							
	FOE014	Organizational Behaviour							
	FOE015	Engineering and Managerial Economics							
	FOE016	Network security & cryptography							
5	EEE761	Switchgear & Protection (Lab)	-	-	2	1	50	50	100
6	EEC761	Electronics Devices & Circuits (Lab)	-	-	3	2	50	50	100
	EEC762/ BAS464	Design and installation of Solar Photovoltaic System	-	2	2				
7	EEE792	Industrial Training & Presentation (6 weeks)	-	-	-	4	50	50	100
8	EEE798	Project Work Phase-I (Synopsis, Literature Survey & Presentation & 30% Project	-	-	8	4	100	-	100
9	MOOC03	MOOC Program -III (Mandatory)	-	-	-	1/2	-	100	100
10	EGP711	Discipline & General Proficiency	-	-	-	1	100	-	100
		Total	**12**	**2/4**	**13/12**	**27/28**	**510**	**490**	**1000**

Semester VIII

S. No.	Course Code	Subject	Periods			Credit	Evaluation Scheme		
			L	T	P	Credit	Internal	External	Total
1	EEE811	Electric Power System Operation	3	-	-	3	40	60	100
2	**Departmental Elective-II**								
	EEE812	High Voltage Engineering	3	-	-	3	40	60	100
	EEC814	Electronic Circuits							
3	**Open Elective-II**								
	FOE021	Machine learning & Data Analytics	3	1	-	4	40	60	100
	FOE022	Total Quality Management							
	FOE023	Entrepreneurship							
	FOE024	Big Data & Hadoop							
	FOE025	Financial Management							
4	EEE861	Power System Simulation (Lab)	-	-	3	2	50	50	100
5	EEC861	PLC Programming (Lab)	-	-	4	2	50	50	100
	EEC862	Electronic Circuits (Lab)	-	-	3				
6	EEE898	Project Work Phase -II (100 % working condition, report analysis, plagiarism check report analysis Simulation, and Presentation)	-	-	14	7	50	50	100
7	MOOC04	MOOC Program -IV (Optional)	-	-	-	1/2	-	100	100
9	EGP811	Discipline & General Proficiency	-	-	-	1	100	-	100
		Total	**9**	**1**	**21/20**	**22**	**370**	**330**	**800**

Semester I
ENGINEERING MATHEMATICS-I

Course Code: EAS111 **L T P C**
3 2 0 4

Objective:

- To familiarize the basics of matrices, differential calculus, multiple integrals and vector calculus.
- To solve all problems related to matrices, calculus and vectors.

Unit A (Unit A is for building a foundation and shall not be a part of examination)

Some general theorem on deviation-Derivative of the sum or difference of two function, Derivative of product of two functions, Derivative of quotient, Derivative of Trigonometry function, Derivative of inverse Trigonometry function, Logarithms differential, Integration of 1/x, e^x, Integration by simple substitution. Integrals of the type f' (x), [f (x)]^n, $\frac{f'(x)}{f(x)}$, Integration of 1/x, e^x, tan x, cot x, sec x, cosecx , Integration by parts, Integration using partial fractions.

Course Contents-

Unit I **(Lectures 08)**

Determinants- Rules of computation; Linear Equations and Cramer's rule.

Matrices: Elementary row and column transformation; Rank of matrix; Linear dependence; Consistency of linear system of equations; Characteristic equation; Cayley-Hamilton Theorem (without proof); Eigen values and Eigen vectors; Complex and Unitary matrices.

Unit II **(Lectures 08)**

Differential Equation--First order first degree Differential equation: variable separable, Homogeneous method, Linear differential equation method, Exact Differential equation.

Sets and Functions- Elementary set theoretic operations, De Morgan's law, Convex sets, Relations and Correspondences, Number systems; Sequences and series – convergence; Open and Closed sets; Limits and Continuity.

Unit III **(Lectures 08)**

Differential Calculus: Leibnitz theorem; Partial differentiation; Euler's theorem; Change of variables; Expansion of function of several variables. Jacobians, Error function.

Unit IV **(Lectures 08)**

Multiple Integrals: Double integral, Triple integral, Beta and Gamma functions; Dirichlet theorem for three variables, Liouville's Extension of Dirichlet theorem.

Unit V **(Lectures 08)**

Vector Differentiation:

Vector function, Differentiation of vectors, Formulae of Differentiation, Scalar and Vector point function, Geometrical Meaning of Gradient, Normal and Directional Derivative, Divergence of a vector function, Curl of a vector

Vector Integration:

Green's theorem , Stokes' theorem; Gauss' divergence theorem.

Text Books-

1. Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers.
2. Prasad C., *Engineering Mathematics for Engineers*, Prasad Mudralaya.
3. Dass H.K., Engineering Mathematics Vol-I, S. Chand.

Reference Books-

1. Kreyszig E., *Advanced Engineering Mathematics*, Wiley Eastern.
2. Piskunov N, *Differential & Integral Calculus*, Moscow Peace Publishers.
3. Narayan Shanti, *A Text book of Matrices*, S. Chand

***Latest editions of all the suggested books are recommended.**

Semester I
Engineering Physics

Course Code: EAS112/212 **L T P C**
3 2 0 4

Objective: To understand the fundamentals of physics like interference of light, diffraction, Polarization, elements of material science, special theory of relativity etc.

Unit A (Unit A is for building a foundation and shall not be a part of examination)
Optics- Properties of light, Lance, Mirror, Focal length, Intensity, Power, Eye-piece, Work, Energy and its types, Waves, longitudinal and transverse waves, Time period, Frequency

Course Contents-

Unit-I **(08 Lectures)**

Interference of Light: Introduction, Principle of Superposition, Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring.

Unit-II **(08 Lectures)**

Diffraction: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope.

Unit-III **(08 Lectures)**

Polarization: Introduction, production of plane polarized light by different methods, Brewster's and Malu's Laws. Quantitative description of double refraction (Huygen's theory for explanation-mathematical derivation), Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter.

Unit-IV **(08 Lectures)**

Elements of Material Science: Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers.

Unit-V **(08 Lectures)**

Special Theory of Relativity: Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence.

Text Books:

1. Elements of Properties of Matter, D.S.Mathur, S.Chand & Co.
2. Engineering Physics, Bhattacharya & Tandon, Oxford University Press.
3. Optics, Ajoy Ghatak, Tata Mc Graw-Hill.
4. H. K. Malik & A.K. Singh, Engineering Physics, McGraw-Hill, latest edition.

Reference Books:

1. F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill.
2. Concept of Modern Physics, Beiser, Tata McGraw-Hill.
3. R. Resnick, Introduction to Special Relativity, John Wiley, Singapore.

***Latest editions of all the suggested books are recommended.**

Semester I
Engineering Chemistry

Course Code: EAS113/213 **L T P C**
3 2 0 4

Objective: To understand the fundamentals of chemistry like water and its Industrial Applications, Fuels and Combustion, Lubricants, Polymers, chemical analysis etc.

Course Contents-

UNIT I **(Lecture 08)**

Water And Its Industrial Applications: Sources, Impurities, Hardness and its units, Industrial water, characterstics, softening of water by various methods (External and Internal treatment).Boiler trouble causes effects and remedies .Characteristic of municipal water and its treatment. Numerical problem based on water softening method like lime soda, calgen etc.

UNIT II **(Lecture 08)**

Fuels and Combustion: Fossil fuel and classification, calorific value, determination of calorific value by bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number.

UNIT III **(Lecture 08)**

Lubricants: Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories.

UNIT IV **(Lecture 08)**

Polymers: Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber ,preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6,Terylene,Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S.

UNIT V **(Lecture 08)**

A. Instumental Techniques in chemical analysis: Introduction, Principle, Instrumentation and application of IR, NMR, UV,Visible, Gas Chromatography, Lambert and Beer's Law.

B. Water Analysis Techniques

Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques.

Text Books:

1. Agarwal R. K., Engineering Chemistry, Krishna Prakashan.
2. Lee I.D., Inorganic Chemistry.
3. Chawla Shashi, Engineering Chemistry, Dhanpat Rai Publication.

Reference Books:

1. Morrison & Boyd, Organic Chemistry, Prentice Hall
2. Barrow Gordon M., Physical Chemistry, McGraw-Hill.
3. Manahan Stanley E., Environmental Chemistry, CRC Press.

***Latest editions of all the suggested books are recommended.**

Semester I
Basic Electrical Engineering

Course Code: EEE111/211 **L T P C**
3 2 0 4

Objective- To understand the fundamental concept of Electrical Engineering like D.C. Network, A.C. Network, Measuring Instruments, Energy Conversion Devices etc.

Course Contents-

Unit I **(Lectures 08)**

D.C. Network Theory: Passive, active ,bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, tellegens theorem and Maximum Power Transfer theorem; Star Delta transformation.

Unit II **(Lectures 08)**

Steady State Analysis of A.C. Circuits: Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behaviour of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor, magnetic circuit.

Unit III **(Lectures 08)**

Measuring Instruments: Introduction and construction of energy meters and wattmeter.
Three Phase A.C. Circuits: Line and phase voltage/current relations; three phase power, power measurement using two wattmeter method. Introduction to earthing and electrical safety.

Unit IV **(Lectures 08)**

Single phase Transformer: Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses.
D.C. Machines: Principles of electromechanical energy conversion; E.M.F. equation, Types of D.C. machines and its applications; speed control of DC shunt motor.

Unit V **(Lectures 08)**

Single phase Motors: Principle of operation and methods of starting of induction motor.
Three phase induction Motor: Principle of operation; Types and methods of starting; slip-torque characteristics; Applications.
Synchronous Machines: Principle of Operation of Alternator and synchronous motor

Text Books-

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.

Reference Books-

1. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
2. A Grabel, Basic Electrical Engineering, McGraw Hill.
3. Cotton H., Advanced Electrical Technology, Wheeler Publishing.

***Latest editions of all the suggested books are recommended.**

Semester I
Basic Electronics Engineering

Course Code: EEC111/211 **L T P C**
3 2 0 4

Objective- To understand the basic concept of Electronics Engineering like p-n Junction, Bipolar Junction Transistor, Field Effect Transistor, Operational Amplifier and switching theory.

Course Contents

UNIT I **(Lectures 08)**

p-n Junction: Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator.

UNIT II **(Lectures 08)**

Bipolar Junction Transistor (BJT): Basic construction, transistor action; CB, CE and CC configurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias.

UNIT III **(Lectures 08)**

Field Effect Transistor (FET): Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics.

UNIT IV **(Lectures 08)**

Operational Amplifier (Op-Amp): Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator.

UNIT V **(Lectures 08)**

Switching Theory: Number system, conversion of bases (decimal, binary, octal and hexadecimal numbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth truth table- AND, OR & NOT, Flip-Flops –SR, JK and D type, seven segment display & K map.

Text Books-

1. Robert Boylestad & Louis Nashelsky, Electronic Circuit and Devices, Pearson India.
2. Millman & Halkias, Integrated Electronics, McGraw Hill.
3. Millman & Halkias, Electronics Devices and Circuits, McGraw Hill.
4. Morris Mano M., Digital Design, Prentice Hall.

Reference Books-

1. Sedra and Smith, Microelectronic Circuits, Oxford University Press.
2. Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd.
3. Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International.

***Latest editions of all the suggested books are recommended.**

Semester I
Environmental Science

[EAS114 amended vide approval dt. August 08, 2017 of V.C]

Course Code: EAS114 **L T P C**
1 2 0 2

Objective: To create awareness among students about environment protection.

Course Content:

Unit I **(Lectures 08)**

General: Definition and Scope of environmental science, multidisciplinary nature of environmental science, Segments of Environment

Ecology And Environment: Concept of an Ecosystem- its components and functions, Definition and Scope of Ecology. Tropic Levels-Producer, Consumer and Decomposer, Energy Flow in an Ecosystem, Food Chain, Food Web and Ecological Pyramid Biogeochemical Cycles

Unit II **(Lectures 08)**

Air pollution: Various segments of Atmosphere and their Significance, Sources and Effects Of Air Pollution, Classification of Air Pollutants, Stationary and Mobile Sources of Air Pollution Water pollution: Water Resources of the Earth and Indian Scenario, Point and non-Point sources of Water Pollution, Treatment of Water Pollution, Eutrophication

Unit III **(Lectures 08)**

Sources and Consequences of - Soil pollution, Noise pollution and Thermal pollution **Ill-effects of firework**s-Constituents of fireworks (gases and metals), Impacts of fireworks on human health (Potential impact of firework on respiratory health) and environment, Safety measures (do's and don'ts), Brief idea of laws related to fireworks.

Unit IV **(Lectures 08)**

Major environmental problems

Photochemical Smog, Acid Rain, Global Warming (Greenhouse Effect), Ozone Layer - Its Depletion and Control Measures, El-Nino,Solid Wastes- Pollution, Treatment & Disposal, Deforestation- causes and effects. Bioremediation, Biological Magnification

Unit V **(Lectures 08)**

Bio-Diversity- Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeoraphical Classification of India

Concept of Sustainable Development,

Dams and Reservoirs- Their Benefits and Problems

Environment Conservation Movement in India (Chipko Movement, Appiko Movement),

Text Books:

1. "Environmental Chemistry", De,A. K., New Age Publishers Pvt. Ltd.

2. "Introduction to Environmental Engineering and Science", Masters, G.M., Prentice Hall India Pvt.Ltd.

3. "Fundamentals of Ecology", Odem,E.P., W.B. Sannders Co.

Reference Books:

1. "Biodiversity and Conservation", Bryant,P.J., Hypertext Book.

2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I.K. Publication.

3. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II, Environment Media.

***Latest editions of all the suggested books are recommended.**

Semester I

Foundation English – I

[EHM111 amended vide approval dt. August 08, 2017 of V.C]

Course Code: EHM111 **L T P C**
1 1 2 2

Module -1

Introduction to English language **(Lecturer 12)**

a) Need of knowing language
b) Importance of language in present/scenario
c) Importance of spoken language

Module -2

Introduction to Personnel **(Lecturer 12)**

a) Self Introduction
b) Motivation , Positive attitude & Body Language

Module -3

Functional Grammar **(Lecturer 12)**

a) Parts of Speech
b) Tenses and Modals

Module -4

Writing Skills **(Lecturer 12)**

a) Applications
b) Short passages on given topics

Lab Exercise

(24 hours)

In collaboration with outside expert.

1. Activity Based Sessions
2. Asking the students to speak on given topics
3. Oral Exercises

Text books-

1. Raman Meenakshi & Sharma Sangeeta, Technical Communication: Principles & Practices, Oxford University Press, New Delhi.
2. Asha Kaul- Business Communication Second Edition, PHI Private Limited, New Delhi
3. Martin & Wren - High School English Grammar & Composition, S.Chand & Co. Delhi.

Reference Books:

1. Remedial English Language by Malti Agarwal, Krishna Prakashan Media (P) Ltd., Meerut.
2. English Grammar Composition & Usage by J.C. Nesfield, Macmillan Publishers
3. The Business letters by Madan Sood, Goodwill Publishing House, New Delhi
4. Communication Skills by Sanjay Kumar &PushpLata, Oxford University Press

***Latest editions of all the suggested books are recommended.**

Semester I
Engineering Physics Lab

Course Code: EAS162/262 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list.

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light by Michelson-Morley experiment.
3. To determine the wavelength of monochromatic light by Fresnel's Bi-prism.
4. To determine the Planck's constant using LEDs of different colours.
5. To determine the specific rotation of cane sugar solution using Polarimeter.
6. To verify Stefan's Law by electrical method.
7. To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up.
8. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment.
9. To compare Illuminating Powers by a Photometer.
10. To determine the frequency of A.C. mains by means of a Sonometer.
11. To determine refractive index of a prism material by spectrometer.
12. To determine the Flashing & Quenching of Neon bulb.
13. Determination of Cauchy's constant by using spectrometer.
14. To study the PN junction characteristics.
15. To determine the resolving power and dispersive power by a prism.
16. To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode.
17. Study the characteristics of LDR.
18. To study the characteristics of a photo-cell.

Books:

1. B.Sc. Practical Physics, Gupta and Kumar, Pragati prakashan.
2. B.Sc. Practical Physics, C.L. Arora, S.Chand & Campany Pvt. Ltd.

***Latest editions of all the suggested books are recommended.**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester I
Engineering Chemistry Lab

Course Code: EAS163/263

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list.

1. Determination of Total Hardness of a given water sample.
2. Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate
3. To determine the pH of the given solution using pH meter and pH-metric titration.
4. Determination of dissolved oxygen content of given water sample.
5. To find chemical oxygen demand of waste water sample by potassium dichromate
6. Determination of free chlorine in a given water sample.
7. To determine the chloride content in the given water sample by Mohr's method.
8. To prepare the Bakelite resin polymer.
9. To determine the concentration of unknown sample of iron spectrophotometrically.
10. To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer.
11. To determine the flash & fire point of a given lubricating oil.
12. Determination of calorific value of a solid or liquid fuel.
13. Determination of calorific value of a gaseous fuel.
14. Determination of % of O_2, CO_2 % CO in flue gas sample using Orsat apparatus.
15. Proximate analysis of coal sample.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester I
Basic Electrical Engineering Lab

Course Code: EEE161/261 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS-

Note: Select any ten experiments from the following list.

1. To verify the Kirchhoff's current and voltage laws.
2. To study multimeter.
3. To verify the Superposition theorem.
4. To verify the Thevenin's theorem.
5. To verify the Norton's theorem.
6. To verify Tellegens theorem
7. To verify the maximum power transfer theorem.
8. To verify current division and voltage division rule.
9. To measure energy by a single phase energy meter.
10. To measure the power factor in an RLC by varying the capacitance
11. To determine resonance frequency, quality factor, bandwidth in series resonance.
12. To measure the power in a 3-phase system by two-wattmeter method
13. To measure speed for speed control of D.C. Shunt Motor.
14. To determine the efficiency of single-phase transformer by load test.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester I
Basic Electronics Engineering Lab

Course Code: EEC161/261 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS

Note: Minimum eight experiments should be performed-

1. To study the V-I characteristics of p-n junction diode.
2. To study the diode as clipper and clamper.
3. To study the half-wave rectifier using silicon diode.
4. To study the full-wave rectifier using silicon diode.
5. To study the Zener diode as a shunt regulator.
6. To study transistor in Common Base configuration & plot its input/output characteristics.
7. To study the operational amplifier in inverting & non inverting modes using IC 741.
8. To study the operational amplifier as differentiator & integrator.
9. To study various logic gates & verify their truth tables.
10. To study half adder/full adder & verify their truth tables.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester I
Engineering Drawing Lab

Course Code: EME161/261 **L T P C**
0 0 4 2

LIST OF EXPERIMENTS-[All to be performed]

1. To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions.
2. To draw the types of lines and conventions of different materials.
3. To draw and study dimensioning and Tolerance.
4. To construction geometrical figures of Pentagon and Hexagon
5. To draw the projection of points and lines
6. To draw the Orthographic Projection of given object in First Angle
7. To draw the Orthographic Projection of given object in Third Angle
8. To draw the sectional view of a given object
9. To draw the development of the lateral surface of given object
10. To draw the isometric projection of the given orthographic projection.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
Drawing Sheet (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Drawing Sheet (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: The drawing sheet could be manual or in Auto CAD.

Semester I
Workshop Practice Lab

Course Code: EME162/262 **L T P C**
0 0 4 2

List of Experiments:
(Perform any ten experiments selecting at least one from each shop.)
Carpentry Shop:
1. To prepare half-lap corner joint.
2. To prepare mortise & tenon joint.
3. To prepare a cylindrical pattern on woodworking lathe.
Fitting Bench Working Shop:
1. To prepare a V-joint fitting
2. To prepare a U-joint fitting
3. To prepare a internal thread in a plate with the help of tapping process
Black Smithy Shop:
1. To prepare a square rod from given circular rod
2. To prepare a square U- shape from given circular rod
Welding Shop:
1. To prepare a butt and Lap welded joints using arc welding machine.
2. To prepare a Lap welded joint Gas welding equipment.
3. To prepare a Lap welded joint using spot welding machine.
Sheet-metal Shop:
1. To make round duct of GI sheet using 'soldering' process.
2. To prepare a tray of GI by fabrication
Machine Shop:
1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c.
2. To perform the following operations on Centre Lathe:
Turning, Step turning, Taper turning, Facing, Grooving and Knurling
3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine.
Foundry Shop:
1. To prepare core as per given size.
2. To prepare a mould for given casting.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester II
Engineering Mathematics- II

Course Code: EAS211 **L T P C**
3 2 0 4

Objective:

To familiarize the basic concept of Differential Equations, Laplace Transform, Fourier series etc.

Course Contents-

Unit I **(Lectures 08)**

Differential Equations: Linear Differential Equation, Linear Differential Equation with constant coefficient: Complementary functions and particular integrals, Linear Differential Equation with variable coefficient: Removal method, changing independent variables, Method of variation of parameters, Homogeneous Linear Differential Equation, Simultaneous linear differential equations.

Unit II **(Lectures 08)**

Series Solutions: Power Series solutions of ODE, Ordinary Point, Singular Points, Frobenius Method.

Special Functions: Legendre equation and Polynomial, Legendre Function, Rodrigue's formula, Laplace definite integral for first and second kind, Bessel equation and Polynomial, Bessel Function, Orthogonal properties and Recurrence Relation for Legendre and Bessel function.

Unit III **(Lectures 08)**

Partial differential equations – Method of separation of variables for solving partial differential equations; Wave equation up to two dimensions; Laplace equation in two-dimensions; Heat conduction equations up to two-dimensions; Equations of transmission Lines.

Unit IV **(Lectures 08)**

Fourier Series: Periodic functions, Trigonometric series; Fourier series; Dirichlet's conditions, Determination of fourier coefficient by Euler's formulae; Fourier series for discontinuous functions, Even and odd functions, Half range sine and cosine series.

Unit V **(Lectures 08)**

Laplace Transform: Laplace transform; Existence theorem; Laplace transform of derivatives and integrals; Inverse Laplace transform; Unit step function; Diratch delta function; Laplace transform of periodic functions; Convolution theorem; Application to solve simple linear differential equations.

Text Books-

1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers.
2. Prasad C., Engineering Mathematics for Engineers, Prasad Mudralaya.
3. Das H.K., Engineering Mathematics Vol-II, S. Chand.

Reference Books-

1. Kreyszig E., Advanced Engineering Mathematics, Wiley Eastern.
2. Piskunov N, Differential & Integral Calculus, Moscow Peace Publishers.
3. Narayan Shanti, A Text book of Matrices, S. Chand
4. Bali N.P., Engineering Mathematics-II, Laxmi Publications.

***Latest editions of all the suggested books are recommended.**

Semester II
Engineering Physics

Course Code: EAS212/112 **L T P C**
3 2 0 4

Objective: To understand the fundamentals of physics like interference of light, diffraction, Polarization, elements of material science, special theory of relativity etc.

Unit A (Unit A is for building a foundation and shall not be a part of examination)
Optics- Properties of light, Lance, Mirror, Focal length, Intensity, Power, Eye-piece, Work, Energy and its types, Waves, longitudinal and transverse waves, Time period, Frequency

Course Contents-

Unit-I **(08 Lectures)**

Interference of Light: Introduction, Principle of Superposition, Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring.

Unit-II **(08 Lectures)**

Diffraction: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope.

Unit-III **(08 Lectures)**

Polarization: Introduction, production of plane polarized light by different methods, Brewster's and Malu's Laws. Quantitative description of double refraction (Huygen's theory for explanation-mathematical derivation), Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter.

Unit-IV **(08 Lectures)**

Elements of Material Science: Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers.

Unit-V **(08 Lectures)**

Special Theory of Relativity: Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence.

Text Books:

1. Elements of Properties of Matter, D.S.Mathur, S.Chand & Co.
2. Engineering Physics, Bhattacharya & Tandon, Oxford University Press.
3. Optics, Ajoy Ghatak, Tata Mc Graw-Hill.
4. H. K. Malik & A.K. Singh, Engineering Physics, McGraw-Hill, latest edition.

Reference Books:

1. F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill.
2. Concept of Modern Physics, Beiser, Tata McGraw-Hill.
3. R. Resnick, Introduction to Special Relativity, John Wiley, Singapore.

***Latest editions of all the suggested books are recommended.**

Semester II
Engineering Chemistry

Course Code: EAS213/113 **L T P C**
3 2 0 4

Objective: To understand the fundamentals of chemistry like water and its Industrial Applications, Fuels and Combustion, Lubricants, Polymers, chemical analysis etc.

Course Contents-

UNIT I **(Lecture 08)**

Water And Its Industrial Applications: Sources, Impurities, Hardness and its units, Industrial water, characterstics, softening of water by various methods (External and Internal treatment).Boiler trouble causes effects and remedies .Characteristic of municipal water and its treatment. Numerical problem based on water softening method like lime soda, calgen etc.

UNIT II **(Lecture 08)**

Fuels and Combustion: Fossil fuel and classification, calorific value, determination of calorific value by bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number.

UNIT III **(Lecture 08)**

Lubricants: Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories.

UNIT IV **(Lecture 08)**

Polymers: Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6,Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S.

UNIT V **(Lecture 08)**

A. Instumental Techniques in chemical analysis: Introduction, Principle, Instrumentation and application of IR, NMR, UV,Visible, Gas Chromatography, Lambert and Beer's Law.

B. Water Analysis Techniques

Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques.

Text Books:

1. Agarwal R. K., Engineering Chemistry, Krishna Prakashan.
2. Lee I.D., Inorganic Chemistry.
3. Chawla Shashi, Engineering Chemistry, Dhanpat Rai Publication.

Reference Books:

1. Morrison & Boyd, Organic Chemistry, Prentice Hall
2. Barrow Gordon M., Physical Chemistry, McGraw-Hill.
3. Manahan Stanley E., Environmental Chemistry, CRC Press.

***Latest editions of all the suggested books are recommended.**

Semester II
Basic Electrical Engineering

Course Code: EEE211/111 **L T P C**
3 2 0 4

Objective- To understand the fundamental concept of Electrical Engineering like D.C. Network, A.C. Network, Measuring Instruments, Energy Conversion Devices etc.

Course Contents-

Unit I **(Lectures 08)**

D.C. Network Theory: Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, tellegens theorem and Maximum Power Transfer theorem; Star Delta transformation.

Unit II **(Lectures 08)**

Steady State Analysis of A.C. Circuits: Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behaviour of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor, magnetic circuit.

Unit III **(Lectures 08)**

Measuring Instruments: Introduction and construction of energy meters and wattmeter.
Three Phase A.C. Circuits: Line and phase voltage/current relations; three phase power, power measurement using two wattmeter method. Introduction to earthing and electrical safety.

Unit IV **(Lectures 08)**

Single phase Transformer: Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses.
D.C. Machines: Principles of electromechanical energy conversion; E.M.F. equation, Types of D.C. machines and its applications; speed control of DC shunt motor.

Unit V **(Lectures 08)**

Single phase Motors: Principle of operation and methods of starting of induction motor.
Three phase induction Motor: Principle of operation; Types and methods of starting; slip-torque characteristics; Applications.
Synchronous Machines: Principle of Operation of Alternator and synchronous motor

Text Books-

1. V. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.
2. W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.
3. Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill.

Reference Books-

1. Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.
2. A Grabel, Basic Electrical Engineering, McGraw Hill.
3. Cotton H., Advanced Electrical Technology, Wheeler Publishing.

***Latest editions of all the suggested books are recommended.**

Semester II
Basic Electronics Engineering

Course Code: EEC211/111 **L T P C**
3 2 0 4

Objective- To understand the basic concept of Electronics Engineering like p-n Junction, Bipolar Junction Transistor, Field Effect Transistor, Operational Amplifier and switching theory.

Course Contents

UNIT I **(Lectures 08)**

p-n Junction: Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator.

UNIT II **(Lectures 08)**

Bipolar Junction Transistor (BJT): Basic construction, transistor action; CB, CE and CC configurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias.

UNIT III **(Lectures 08)**

Field Effect Transistor (FET): Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics.

UNIT IV **(Lectures 08)**

Operational Amplifier (Op-Amp): Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator.

UNIT V **(Lectures 08)**

Switching Theory: Number system, conversion of bases (decimal, binary, octal and hexadecimal numbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth truth table- AND, OR & NOT, Flip-Flops –SR, JK and D type, seven segment display & K Map.

Text Books-

1. Robert Boylestad & Louis Nashelsky, Electronic Circuit and Devices, Pearson India.
2. Millman & Halkias, Integrated Electronics, McGraw Hill.
3. Millman & Halkias, Electronics Devices and Circuits, McGraw Hill.
4. Morris Mano M., Digital Design, Prentice Hall.

Reference Books-

1. Sedra and Smith, Microelectronic Circuits, Oxford University Press.
2. Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd.
3. Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International.

***Latest editions of all the suggested books are recommended.**

Semester II
Computer Basics & C Programming

Course Code: ECS201 **L T P C**
3 0 0 3

Objective: To learn the basics of computers & C programming language.

Course Contents:

Unit I **(Lectures 08)**

Concepts in Computer Application: Definition of Electronic Computer; History; Generations; Characteristics and Application of Computers; Classification of Computers; Functional Component of Computer: CPU, I/O devices, Type of Memory & Memory Hierarchy, Firmware and Human ware.

Data and data types: Definitions, data, data types: Integer, Character, Float, String, etc.; Constants and Variable Declaration; Token; Keyboard; Identifier.

Unit II **(Lectures 08)**

Programming Language Classification & Computer Languages: Generation of Languages; Introduction to 4GLs; Translators; Assemblers; Compilers; Interpreters. Number System: Decimal, Octal, Binary and Hexadecimal & their Conversions; Various Code: BCD, ASCII and EBCDIC and Gray Code.

Operators and Expressions: Numeric and relation operators; logical operator; bit operator; operator
precedence and associatively.

Unit III **(Lectures 08)**

Internet and Web Technologies: Hypertext Markup Language; WWW; Gopher; FTP; Telnet; Web Browsers; Search Engines; Email.

Control Structure: while statement, if, else, Nested if else statement. Nested logic: for loop, do- while loop, loop inside a loop structure, Switch Statement. Break and default with switch.

Unit IV **(Lectures 08)**

Concepts in Operating Systems: Elementary Concepts in Operating Systems; Textual Vs GUI Interface.

Arrays: Notation and representation; Manipulation of array elements; Multidimensional arrays.

Unit V **(Lectures 08)**

Functions & Strings: Definition; Declaration; Call by Value; Call by Reference; Returns values and
their types; Function calls.

Text Books-

1. Sinha P. K., Computer Fundamentals, BPB Publications.
2. Yadav, DS, Foundations of IT, New Age.
3. Curtin, Information Technology: Breaking News, Tata McGraw Hill.

Reference Books-

1. Peter Nortans, Introduction to Computers, Tata McGraw Hill.
2. Leon & Leon, Fundamental of Information Technology, Vikas Publishing.
3. Kanter, Managing Information System, Prentice-Hall.

***Latest editions of all the suggested books are recommended.**

Semester II
Language Lab I

[EHM261 amended vide approval dt. August 08, 2017 of V.C]

Course Code: EHM261

L	T	P	C
0	0	4	2

1. Written exercises based on Grammar portion covered in 1st semester. **(08 hours)**
2. Common conversation practice (making small talk etc.) **(10 hours)**
3. JAM Session (just a minute session) on various topics. **(10 hours)**
4. Paper presentations. **(10 hours)**
5. Describing a scene, picture, situation, etc. **(10 hours)**

Evaluation Scheme of Examination:
Internal Viva-Voce: 50

Body Language & Voice Modulation	*Time Management*	*Knowledge of the Topic*	*You Approach*	*Confidence & Attitude*	*Total*
10	10	10	10	10	50

External Viva-Voce: 50
External viva will be conducted by external faculty or faculty member of other college of TMU.

Body Language & Voice Modulation	*Time Management*	*Knowledge of the Topic*	*You Approach*	*Confidence & Attitude*	*Total*
10	10	10	10	10	50

Semester II
Engineering Physics Lab

Course Code: EAS262/162 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list.

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light by Michelson-Morley experiment.
3. To determine the wavelength of monochromatic light by Fresnel's Bi-prism.
4. To determine the Planck's constant using LEDs of different colours.
5. To determine the specific rotation of cane sugar solution using Polarimeter.
6. To verify Stefan's Law by electrical method.
7. To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up.
8. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment.
9. To compare Illuminating Powers by a Photometer.
10. To determine the frequency of A.C. mains by means of a Sonometer.
11. To determine refractive index of a prism material by spectrometer.
12. To determine the Flashing & Quenching of Neon bulb.
13. Determination of Cauchy's constant by using spectrometer.
14. To study the PN junction characteristics.
15. To determine the resolving power and dispersive power by a prism.
16. To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode.
17. Study the characteristics of LDR.
18. To study the characteristics of a photo-cell.

Books:

1. B.Sc. Practical Physics, Gupta and Kumar, Pragati prakashan.
2. B.Sc. Practical Physics, C.L. Arora, S.Chand & Campany Pvt. Ltd.

***Latest editions of all the suggested books are recommended.**

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester II
Engineering Chemistry Lab

Course Code: EAS263/163 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS

Note: Select any ten experiments from the following list.

1. Determination of Total Hardness of a given water sample.
2. Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate
3. To determine the pH of the given solution using pH meter and pH-metric titration.
4. Determination of dissolved oxygen content of given water sample.
5. To find chemical oxygen demand of waste water sample by potassium dichromate
6. Determination of free chlorine in a given water sample.
7. To determine the chloride content in the given water sample by Mohr's method.
8. To prepare the Bakelite resin polymer.
9. To determine the concentration of unknown sample of iron spectrophotometrically.
10. To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer.
11. To determine the flash & fire point of a given lubricating oil.
12. Determination of calorific value of a solid or liquid fuel.
13. Determination of calorific value of a gaseous fuel.
14. Determination of % of O2, CO2 % CO in flue gas sample using Orsat apparatus.
15. Proximate analysis of coal sample.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester II
Basic Electrical Engineering Lab

Course Code: EEE261/161 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS-

Note: Select any ten experiments from the following list.

1. To verify the Kirchhoff's current and voltage laws.
2. To study multimeter.
3. To verify the Superposition theorem.
4. To verify the Thevenin's theorem.
5. To verify the Norton's theorem.
6. To verify Tellegens theorem
7. To verify the maximum power transfer theorem.
8. To verify current division and voltage division rule.
9. To measure energy by a single phase energy meter.
10. To measure the power factor in an RLC by varying the capacitance
11. To determine resonance frequency, quality factor, bandwidth in series resonance.
12. To measure the power in a 3-phase system by two-wattmeter method
13. To measure speed for speed control of D.C. Shunt Motor.
14. To determine the efficiency of single-phase transformer by load test.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester II
Basic Electronics Engineering Lab

Course Code: EEC261/161 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS-

Note: Minimum eight experiments should be performed-

1. To study the V-I characteristics of p-n junction diode.
2. To study the diode as clipper and clamper.
3. To study the half-wave rectifier using silicon diode.
4. To study the full-wave rectifier using silicon diode.
5. To study the Zener diode as a shunt regulator.
6. To study transistor in Common Base configuration & plot its input/output characteristics.
7. To study the operational amplifier in inverting & non inverting modes using IC 741.
8. To study the operational amplifier as differentiator & integrator.
9. To study various logic gates & verify their truth tables.
10. To study half adder/full adder & verify their truth tables.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester II
Computer Basics & C Programming Lab

Course Code: ECS251 **L T P C**
0 0 2 1

LIST OF EXPERIMENTS-

1. To write a program to calculate Sum & average of N numbers.
2. To write a program to convert integer arithmetic to a given number of day and month.
3. To write a program to find maximum and minimum out of 3 numbers a, b & c.
4. To write a program to find factorial of positive integer.
5. To write a program to find sum of series up to n number, 2+5+8+…..... +n.
6. To write a program to print all the number between 1 to 100 which are dividing by 7.
7. To write a program to generate Fibonacci series up to n.
8. To write a program to implement a function to calculate area of a circle.
9. To write a program to implement a recursive function to calculate factorial of given number.
10. To write a program to find whether number is prime or not.
11. To write a program to find that the enter character is a letter or digit.
12. To write a program to find addition of two matrix of n*n order.
13. To write a program to find multiplication of two matrix of n*n order.
14. To write a program to add 6 digit numbers in even case & multiple 6 digit number in odd case.
15. To write a program to find even or odd up to a given limit n.
16. To write a program to find whether a given no is palindrome or not.
17. To write a program to joining & Comparing the 2 string.

Evaluation of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
EXPERIMENT (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester II
Engineering Drawing Lab

Course Code: EME261/161 **L T P C**
0 0 4 2

LIST OF EXPERIMENTS-(All to be performed)

1. To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions.
2. To draw the types of lines and conventions of different materials.
3. To draw and study dimensioning and Tolerance.
4. To construction geometrical figures of Pentagon and Hexagon
5. To draw the projection of points and lines
6. To draw the Orthographic Projection of given object in First Angle
7. To draw the Orthographic Projection of given object in Third Angle
8. To draw the sectional view of a given object
9. To draw the development of the lateral surface of given object
10. To draw the isometric projection of the given orthographic projection.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	TOTAL INTERNAL (50 MARKS)
Drawing Sheet (10 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)			

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Drawing Sheet (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: The drawing sheet could be manual or in Auto CAD.

Semester II
Workshop Practice Lab

Course Code: EME262/162 **L T P C**
0 0 4 2

List of Experiments:
(Perform any ten experiments selecting at least one from each shop.)
Carpentry Shop:
1. To prepare half-lap corner joint.
2. To prepare mortise & tenon joint.
3. To prepare a cylindrical pattern on woodworking lathe.
Fitting Bench Working Shop:
1. To prepare a V-joint fitting
2. To prepare a U-joint fitting
3. To prepare a internal thread in a plate with the help of tapping process
Black Smithy Shop:
1. To prepare a square rod from given circular rod
2. To prepare a square U- shape from given circular rod
Welding Shop:
1. To prepare a butt and Lap welded joints using arc welding machine.
2. To prepare a Lap welded joint Gas welding equipment.
3. To prepare a Lap welded joint using spot welding machine.
Sheet-metal Shop:
1. To make round duct of GI sheet using 'soldering' process.
2. To prepare a tray of GI by fabrication
Machine Shop:
1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c.
2. To perform the following operations on Centre Lathe:
Turning, Step turning, Taper turning, Facing, Grooving and Knurling
3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine.
Foundry Shop:
1. To prepare core as per given size.
2. To prepare a mould for given casting.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

<table>
<tr><td colspan="3">PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)</td><td rowspan="2">ATTENDANCE (10 MARKS)</td><td rowspan="2">VIVA (10 MARKS)</td><td rowspan="2">TOTAL INTERNAL (50 MARKS)</td></tr>
<tr><td>EXPERIMENT (10 MARKS)</td><td>FILE WORK (10 MARKS)</td><td>VIVA (10 MARKS)</td></tr>
</table>

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester III
Analog and Digital Communication System

Course Code: EEC314	L	T	P	C
	3	1	0	4

Objective:

- To study the concepts of analog and digital communication &compare the various communication techniques.

Course Contents:

UNIT I **(Lectures 06)**

Introduction: Basics of Communication, Basic elements of communication system, Definition of modulation, Need of modulation, Basic concept of demodulation.

UNIT II **(Lectures 09)**

Amplitude Modulation: General expressions and waveforms of Double side band with Carrier (DSB-C), Double side band suppressed Carrier (DSB-SC), Single Side Band (SSB) modulation, AM spectrum, DSB-SC, DSB-C, SSB Modulators and Demodulators, Total power in AM, Vestigial Side Band (VSB) modulation.

UNIT III **(Lectures 08)**

Angle Modulation: Basic definition of Frequency Modulation, Classification of FM on the basis of modulation index, General expression of Narrow band FM, Power of Narrow band FM, Carson's rule, Generation of FM by direct and indirect methods, Demodulation of FM by slope detector, Basic definition of Phase Modulation.

UNIT IV **(Lectures 10)**

Pulse Modulation & Digital Transmission of Analog Signals: Sampling Theorem, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, FDM, TDM.

UNIT V **(Lectures 07)**

Introduction to Pulse Code Modulation (PCM), ASK, FSK, PSK, Delta modulation, Adaptive delta modulation.

Text Book:

1. H. Taube, D L Schilling, Goutam Saha, "Principles of Communication", Tata McGraw-Hill Publishing Company Ltd.

Reference Books:

1. B.P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press.
2. Simon Haykin, "Communication Systems",4th Edition, Wiley India.
3. H. P. HSU & D. Mitra, "Analog and Digital Communications", Tata McGraw-Hill Publishing Company Ltd.

***Latest editions of all the suggested books are recommended.**

Semester III
Electrical Machines-I

Course Code: EEE311 **L T P C**
3 1 0 4

Objective:

- To understand the principles of electromechanical energy conversion.
- To study the principles of operation of DC Machines, Transformers etc.

Course Contents

Unit I **(Lectures 08)**

Principles of Electromechanical Energy Conversion: Flow of Energy in Electromechanical Devices; Energy in Magnetic Systems; Singly Excited Systems, Determination of Mechanical Force, Mechanical Energy, Torque Equation; Doubly Excited Systems, Energy Stored in Magnetic Field, Electromagnetic Torque; Generated EMF in Machines; Torque in Machines with Cylindrical Air Gap.

Unit II **(Lectures 08)**

D.C. Machines: Construction of DC Machines, Armature winding; Emf and Torque equation; Armature reaction; Commutation, Interpoles and Compensating windings; Performance characteristics of D.C. generators.

Unit III **(Lectures 08)**

D.C. Machines (Contd.): Performance characteristics of D.C. motors; Starting of D.C. motors, Concept of starting (3 point and 4 point starters); Speed control of D.C. motors, Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test).

Unit IV **(Lectures 08)**

Transformer: Three-phase transformer Construction; Three-phase unit transformer and Bank of three single-phase transformers with their advantages; Three-phase transformer Groups (Phasor groups) and their connections; Y-Connection, Open delta connection, Three-phase/ 2 phase Scott connection and its application.

Unit V **(Lectures 08)**

Transformer (Contd.): Sumpner's test; All day efficiency; Polarity test; Excitation Phenomenon in Transformers, Harmonics in single-phase and 3-phase transformers; Parallel operation and load sharing of single-phase and three-phase transformers; Three-winding transformers, Tertiary winding.

Text Books:

1. I. J Nagrath. & D.P. Kothari, Electrical Machines, Tata McGraw Hill.
2. Ashfaq Husain, Electrical Machines, Dhanpat Rai & Sons.
3. Irving L. Kosow, Electric Machine and Transformers, Prentice Hall of India.
4. B.R Gupta & Vandana Singhal, Fundamentals of Electrical Machines, New Age International.

Reference Books:

1. A.E Fitggerald. C. Kingsley Jr & Alexander Kusko, Electric Machinery, McGraw Hill.
2. A.E Clayton, The Performance and Design of DC Machines, Pitman & Sons.
3. M.G. Say, "The Performance and Design of AC Machines". Pit man& Sons.
4. A.S Langsdorf, "Theory of Alternating Current Machinery", Tata McGraw Hill.

***Latest editions of all the suggested books are recommended.**

Semester III
Circuit Theory

Course Code: EEE312 **L T P C**
3 1 0 4

Objective:

- To study the basics of circuit theory laws and their applications.
- To understand the AC & DC circuit theory concepts and its solutions.
- To gain the knowledge on transient analysis.

Course Contents

Unit I **(Lectures 08)**

Basics of Circuits: Ideal sources, Dependent and Independent sources; Linear relation between voltage and current of Network elements; Source Transformation; Types of Networks, Network reduction; Voltage division, Current division; Star – delta transformation; Concept of duality, Dual networks.

Unit II **(Lectures 08)**

Coupled Circuits: Self Inductance, Mutual Inductance, Coefficient of coupling; Dot rule; Ideal transformer; Effective inductance of coupled coils in series & parallel, Analysis of coupled circuits.

Unit III **(Lectures 08)**

Single -Phase Circuits: Inductors and capacitors in series & parallel combination; Voltage, current and power relations in RL, RC, and RLC circuits; Nodal and mesh analysis in AC circuits.

Unit IV **(Lectures 08)**

Three- Phase Circuits: Three phase circuits, Balanced circuits, Star and delta connected loads; phase sequence; unbalanced circuits, solution of unbalanced star and delta connected loads; Power measurement by two wattmeter method.

Unit V **(Lectures 08)**

Transient Analysis: Source free and forced response of RL, RC & RLC circuits; Time constant and natural frequency of oscillations; Applications of Laplace transformation to RL, RC & RLC circuits.

Text Books:

1. W H Hayt, J E Kemmerly, Engineering Circuit Analysis, McGraw Hill.
2. R C Dorf, J Svoboda, An Introduction to Electric Circuits, Wiley.

Reference Books:

1. S D Senturia, B.D Wedlock, “Electronic Circuits and Applications”, Wiley.
2. J W Nilsson, S A Riedel, “Electric Circuits”, Prentice Hall.

***Latest editions of all the suggested books are recommended.**

Semester III
Engineering Electromagnetics

Course Code: EEC311 **L T P C**
3 1 0 4

Objective:

- To study the electromagnetic field theory comprising of electrostatics, electrodynamics, plane waves, waveguides, transmission line & cavity resonators.

Course Contents:

UNIT I **(Lectures 08)**

Coordinate systems and transformation: Cartesian coordinates, Cylindrical coordinates, Spherical coordinates; Vector calculus: Differential length, area and volume; Line, surface and volume integrals; Del operator; Gradient of a scalar; Divergence; Curl, Stokes' theorem, green's theorem,

UNIT II **(Lectures 10)**

Electrostatics: Electrostatic fields; Coulomb's law and field intensity; Electric field due to charge distribution; Electric flux density; Gauss' Law; Electric dipole and flux lines; energy density in electrostatic fields.

Electric field in material space: Properties of materials; Convection and conduction currents; Conductors; Polarization in dielectrics; Dielectric constants; Continuity equation and relaxation time; Boundary conditions.

UNIT III **(Lectures 08)**

Plane Waves: Maxwell's equations; Wave equation in an isotropic homogeneous medium and its solution, Phasor notation, Polarization of waves, Reflection and refraction of plane waves at plane Boundaries, Pointing vector.

Unit IV **(Lectures 06)**

Waveguides: Electromagnetic fields: Parallel-plate, Rectangular and circular waveguides; TE and TM modes; Wave impedance; Wave velocities; Attenuation in waveguides.

Unit V **(Lectures 08)**

Planar Transmission Line: Electromagnetic fields: Strip-lines, Micro-strip-lines, Co-planar Waveguides, Transmission line parameters; Transmission line equations; Input impedance; Standing wave ratio and power;

Cavity Resonators: Rectangular and cylindrical resonators.

Text books:

1. E.C. Jordan, K.G. Balmain, E. M. Waves & Radiating Systems, Pearson Education.
2. William H. Hayt, John A. Buck, Engineering Electromagnetics, McGraw-Hill Publishing Co..
3. Kraus, J.D. and Fleisch, D.A., Electromagnetics with Applications, McGraw Hill.
4. Matthew N.O. Sadiku, Principles of Electromagnetics, Oxford University Press.

Reference Book:

1. Kaduskar, Principles of Electromagnetics, Wiley India
2. Ida, N., Engineering Electromagnetics, Springer
3. Kodali, Engineering Electromagnetic Compatibility, John Wiley & sons.

***Latest editions of all the suggested books are recommended.**

Semester III
Digital Logic & Circuits

Course Code: EEC312

L	T	P	C
3	1	0	4

Objective:

- To study the various aspects of switching theory & learn about logic family circuits, flip flop, sequential circuits also study the memory details.

Course Contents:

UNIT I **(Lectures 06)**

Codes: BCD codes, 8421 code, Excess-3 code, Gray code, error detection and correction, Hamming code.

UNIT II **(Lectures 10)**

SR, JK, D, T flip-flops & latches, Master-Slave flip-flop. Flip-flop excitation table, Classification of sequential circuits, Registers, Counters, Sequence Detector and Sequence Generator, state diagram and state reduction assignment.

UNIT III **(Lectures 06)**

RTL, DTL, TTL, IIL and ECL working and their characteristics, Propagation delay, Fan-In, Fan-Out, Noise Margin.

UNIT IV **(Lectures 10)**

Binary adder and subtractor, Multiplexers, Decoders, Demultiplexers, Implementation of Combinatorial Logic using these devices.

UNIT V **(Lectures 08)**

Semiconductor Memories, RAM, SRAM, DRAM, ROM, PROM, EPROM and EEPROM. Memory System design, Charged-Coupled device memory, PLA, PAL.

Text Books:

1. Godse A.P, Switching Theory Technical Publication.
2. M. Morris Mano, Digital Design, Prentice Hall of India.
3. Thomas Downs and Mark F Schulz, Logic Design with Pascal, Van Nostrand Reinhold.

Reference Books:

1. Malvino and Leach, Digital principle and applications, McGraw Hill
2. Cheung, Modern digital systems design (WPC)

***Latest editions of all the suggested books are recommended.**

Semester-III
English Communication and Soft Skills-III

Course Code: EHM349/449/BHM349 **L T P C**
1 1 2 2

Objectives:

1. To enable the learners to upgrade their knowledge of grammar and vocabulary to address competitive exams like GATE.
2. To enable the learner to improve their listening.
3. To enable the learners to improvise their voice modulation in reading and speaking.
4. To enable the learners to enhance their writing and comprehensive skills in English
5. To enable the learners to proactively participate in activities in situational context.

Course Contents:

Unit – I Grammar & Vocabulary **(14 hours)**

- Correction of Common Errors (with recap of English Grammar with its usage in practical context.)
- Synthesis of sentences: Simple, complex and compound Sentences
- Transformation of sentences
- Commonly used Idiom & Phrases (Progressive learning whole semester)

Unit – II Essence of Effective listening & speaking **(12 hours)**

- Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned*
- Voice Modulation: Five P's - Pace, Power, Pronunciation, Pause, and Pitch.
- Impromptu
- Power Point Presentation (PPt) Skills**:** Nuances of presenting PPTs

Unit – III Reading and Comprehension Skills **(08 hours)**

- Strategies of Reading comprehension: Four S's
- How to solve a Comprehension (Short unseen passage: 150-200 words)
- Reading Newspaper (Progressive learning whole semester)

Unit – IV Writing Skills **(06 hours)**

- Essentials of a paragraph
- Paragraph writing (100-120 words)

Reference Books:

1. Allen, W. *"Living English Structure*" Pearson Education, New Delhi.
2. Joseph, Dr C.J. & Myall E.G. "*A Comprehensive Grammar of Current English*" Inter University Press, Delhi
3. Wren & Martin "*High School English Grammar and Composition*" S.Chand & Co.Ltd., New Delhi.

4. Norman Lewis "*Word Power Made Easy*" Goyal Publications & Distributers, New Delhi.
5. Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.
6. Kumar Sanjay & Pushplata "*Communication Skills*" Oxford University Press, New Delhi.
7. Agrawal, Malti "*Professional Communication*" Krishana Prakashan Media (P) Ltd. Meerut.

Note:

- For effective communication practice, groups will be changed weekly
- Class (above 30 students) will be divided in to two groups for effective teaching.

Evaluation Scheme

<table>
<tr><th colspan="2">Internal Evaluation</th><th colspan="2">External Evaluation</th><th>Total Marks</th></tr>
<tr><td colspan="2">40 Marks</td><td colspan="2">60 Marks</td><td rowspan="2">100</td></tr>
<tr><td>30 Marks
(Progressive Evaluation)
After each unit-completion:
Assignments / oral Presentation</td><td>10 Marks
(Attendance)</td><td>20 Marks
Midway external assessment
(Oral Presentation) *</td><td>40 Marks
(Written Examination)</td></tr>
</table>

*** Parameters of Midway external assessment Oral Presentation**

Content	Pronunciation	Delivery of Content	Question responsiveness	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note:
Midway Assessment*: To take corrective actions, midway assessment will be conducted by 2-member committee of Director's nominee (not by the faculty teaching English courses) and average of the two would be the 20 marks obtained by the students after two units are completed. The marks in sealed envelope will be send to Examination Department.*
Written Examination*: There would be four questions with internal choice one from each unit of 10 marks.*

Semester III
Electrical Machines - I (Lab)

Course Code: EEE361 **L T P C**

0 0 3 2

LIST OF EXPERIMENTS

Note: Minimum ten experiments should be performed from the following:

1. To obtain load characteristics of a dc shunt generator.
2. To obtain load characteristics of a dc series generator.
3. To obtain load characteristics of a dc compound generator
   (a) Cumulatively compounded.
   (b) Differentially compounded.
4. To obtain speed – torque characteristics of a dc shunt motor
5. To obtain speed – torque characteristics of a dc shunt motor
6. To determine the efficiency of the DC machines by Hopkinson test.
7. To plot the characteristics of a DC shunt motor using armature & field control methods.
8. To determine the efficiency and losses by O.C. and S.C. tests on a single phase transformer
9. To determine the efficiency & voltage regulation of a single-phase transformer using Sumpner's (back to back) test.
10. To perform the open circuit (O.C.) and short circuit (S.C.) tests on a single-phase transformer.
11. To perform the open circuit (O.C.) and short circuit (S.C.) tests on a three-phase transformer.
12. To obtain 3-phase to 2-phase conversion by Scott connection.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester III
Digital Logic & Circuits (Lab)

Course Code: EEC361

L	T	P	C
0	0	3	2

List of Experiments-

Note: Minimum eight experiments should be performed.

1. To verify truth tables of various Gates AND, OR, NOT, NAND, NOR, Ex-OR and Ex-NOR.
2. To verify truth table of half adder and full adder.
3. To verify truth table of half subtractor and full subtractor.
4. To study Multiplexer, Demultimplexer.
5. To study encoder, decoder.
6. To study flip flops.
7. To study magnitude comparator.
8. To study registers, counters.
9. To study BCD to binary converter.
10. To study & test the digital IC by automatic digital IC trainer.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester III
DISCIPLINE & GENERAL PROFICIENCY

Course Code: EGP311 **C-1**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester IV
Electrical Machines - II

Course Code: EEE411 **L T P C**
3 1 0 4

Objective: To study the alternating current machines such as alternators, induction motors etc.

Course Contents

Unit I **(Lectures 08)**

Three-Phase Induction Motor: Principle of operation; Slip; Equivalent circuit; Torque equations, Slip-torque characteristics; Constructional details, Types of rotors; Losses and efficiency; Load test: No load and blocked rotor tests; Circle diagram; Separation of no load losses; Crawling and Cogging; Double cage rotors; Induction generator.

Unit II **(Lectures 08)**

Starting and speed control of Three-Phase Induction Motor: Need for starting, Types of starters: Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters; Speed control by changes of voltage, Frequency, Poles and rotor resistance, Cascaded connection.

Unit III **(Lectures 08)**

Alternator: Constructional details, Types of rotors; EMF equation; Synchronous reactance; Armature reaction; Voltage regulation: EMF, MMF and Zero Power Factor methods; Synchronizing and parallel operation, synchronizing power, Change of excitation and mechanical input; Blondel's theory, Determination of Xd and Xq using slip test.

Unit IV **(Lectures 08)**

Synchronous Motor: Principle of operation; Torque equation; Starting methods; Operation on infinite bus bars, V and inverted V curves; Power input and power developed equations, Power/power angle relations; Hunting; Synchronous condenser; Applications.

UNIT V **(Lectures 08)**

Special Machines: introduction to Stepper motor, servo motor, BLDC motor and electric vehicle motors with their applications.

Text Books:

1. D.P. Kothari and I. J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd.
2. Ashfaq Husain, "Electric Machines", Dhanpat Rai.
3. K. Murugesh Kumar, 'Induction & Synchronous Machines', Vikas Publishing House Pvt. Ltd.

Reference Books:

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill Publishing Company Ltd.
2. Dr. P.S. Bhimbra, "AC machines", Khanna Publishers.

***Latest editions of all the suggested books are recommended.**

Semester IV
Electrical Measurements & Measuring Instruments

Course Code: EEE412 **L T P C**
3 1 0 4

Objective:

- To study electrical instruments like ammeters, voltmeters, wattmeter, AC Potentiometer, CRO etc.
- To gain knowledge potential and current transformers etc.
- To understand the working principles and constructions of digital instruments.
- To study the various display devices and recorders.

Course Contents:

Unit I **(Lectures 08)**

Philosophy of Measurement: Methods of Measurement, Measurement Systems; classification of Instruments; Characteristic of Instruments & Measurement systems; Errors in Measurement.

Unit II **(Lectures 08)**

Analog Measurement of Electrical Quantities: Galvanometer& its types, Electrodynamic type Ammeters, Voltmeters & Wattmeter, Three Phase Wattmeter, Power in three Phase System, Errors in Wattmeter.

Potential Transformer (PT) & Current Transformer (CT): Phase Angle and Ratio errors; Construction and design considerations; Applications.

Unit III **(Lectures 08)**

Measurement of Resistance, Capacitance and Inductance: Measurement of resistances, Inductance &Capacitance ; Q Factor Measurement.

AC Potentiometer: Polar type & Co-ordinate type AC potentiometers; Applications of AC Potentiometers in Electrical Measurement.

Unit IV **(Lectures 08)**

Cathode Ray Oscilloscope: Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) &its principal of operation, its component, Application of CRO and Lissajous Patterns in measurement.

Digital Instruments and Measurements: Concept of Digital Measurement, Block Diagram: Digital Voltmeter, Frequency meter, multi-meter and their applications.

Unit V **(Lectures 08)**

Transducers: Classification and selection of transducers; Measurement of mechanical variables: Displacement, Force, Strain, Measurement of temperature, pressure, flow and level.

Display Devices and recorders: Display devices: LED, LCD, & 7 Segment Display, Analogue recorders: Strip chart, u-v light and x-y Recorders, their tracings and marking mechanisms.

Text Book:

1. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India.

2. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India.

Reference Books:

1. Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India.

2.W.D. Cooper, "Electronic Instrument & Measurement Technique", prentice hall International.

3. Rajendra Prashad, "Electrical Measurement &Measuring Instrument", Khanna Publisher.

***Latest editions of all the suggested books are recommended.**

Semester IV

Network Analysis and Synthesis

Course Code: EEE413 **L T P C**
3 1 0 4

Objective: To gain the knowledge about network theorems, network functions, filters etc.

Course Contents

Unit I **(Lectures 08)**

Graph Theory: Graph of a Network, Definitions, Tree, Co-tree, Link, Basic loops and basic cut sets, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Node methods of analysis.

Unit II **(Lectures 08)**

Network Theorem: Superposition theorem; Thevenin's theorem; Norton's theorem; Maximum power transfer theorem; Reciprocity theorem; Millman's theorem; Compensation theorem; Tellegen's theorem.

Unit III **(Lectures 08)**

Network Functions: Concept of Complex frequency; Transform Impedances; Network functions of one-port and two-port networks; Concept of poles and zeros; Properties of driving point and transfer functions; Time response and stability from pole zero plot; Frequency response and Bode plots.

Unit IV **(Lectures 08)**

Two Port Networks: Characterization of LTI two-port networks Z, Y, ABCD and h parameters; Reciprocity and Symmetry; Inter-relationships between the parameters; Inter-connections of two port networks; Image parameters and characteristic impedance; Ladder and Lattice networks; T & π representation.

Unit V **(Lectures 08)**

Network Synthesis: Positive real function, Definition and properties; Properties of LC, RC and RL driving point functions; Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. Filters: Fundamentals of Passive and active filters; Low pass, High pass, Band pass, and Band elimination filters.

Text Books:

1. M.E. Van Valkenburg “Network Analysis”, Prentice Hall of India
2. D. Roy Choudhary “Networks and Systems”, Wiley Eastern Ltd.
3. Donald E. Scott “An Introduction to Circuit analysis: A System Approach”, McGraw Hill Book Company.
4. A. Chakrabarti “Circuit Theory”, Dhanpat Rai & Co.

Reference Books:

1. M.E. Van Valkenburg “An Introduction to Modern Network Synthesis”, Wiley Eastern Ltd.
2. W.H. Hayt & Jack E-Kemmerly “Engineering Circuit analysis”, Tata McGraw Hill.
3. Soni, Gupta “Circuit Analysis”, Dhanpat Rai & Sons.

***Latest editions of all the suggested books are recommended.**

Semester IV
Object Oriented Programming using JAVA

Course Code: ECS412/ECS312 **L T P C**
3 1 0 4

Objective:

- This course provides an introduction to object oriented programming (OOP) using the Java programming language.
- Its main objective is to teach the basic concepts and techniques which form the object-oriented programming paradigm.

Course Contents:

Unit I **(Lecturer 8)**

Introduction to Java: Advantages of Java, Byte Code, Java Virtual Machine, Data types, Variables, Control Statements: if, else, switch, loops; Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, Synchronization, String handling,

Unit II **(Lecturer 8)**

Applets: Configuring applets, Applet capabilities and restrictions
Abstract Window Toolkit (AWT): Controls, Layout managers, Menus, Images, Graphics. Java Class: Structure of a Class, Constructors, Polymorphism: Overloading and overriding methods, Garbage collection, Making methods and classes final, Abstract classes and methods.

Unit III **(Lecturer 8)**

Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

Unit IV **(Lecturer 8)**

Packages: Package access.
Basic concepts of networking: Working with URLs, Concepts of URLs, Sockets Cloning objects, **Wrapper classes:** Enumeration interface.

Unit V **(Lecturer 8)**

JDBC: Connectivity Model, JDBC/ODBC Bridge, java. sql package, Connectivity to remote database, navigating through multiple rows retrieved from a database.

Reference books:

1. Kogent, “Object Oriented Programming Methodology” Kogent Learning Solutions Inc.
2. Booch Grady, “Object-Oriented Analysis & Design with Applications”
3. Jana, “Java and Object-Oriented Programming Paradigm.

***Latest editions of all the suggested books are recommended.**

Semester IV

Electrical Machines - II (Lab)

Course Code: EEE461 **L T P C**

0 0 3 2

List of Experiments:

Note: Minimum ten experiments should be performed from the following:

1. To determine the voltage regulation of three-phase alternator by EMF, MMF and ZPF methods.
2. To perform the load test on three-phase alternator.
3. To determine voltage regulation of three-phase salient pole alternator by slip test.
4. To plot 'V' and Inverted' V' curves of Three Phase Synchronous Motor.
5. To perform the load test on three-phase squirrel cage induction motor.
6. To perform the load test on three-phase slip ring induction motor.
7. To perform No load and blocked rotor test on three-phase induction motor.
8. To perform No load and blocked rotor test on single-phase induction motor
9. To measure the efficiency of the three-phase induction motor using loss summation method.
10. To plot characteristics of three phase induction motor by V/f method
11. To perform load test on single-phase induction motor.
12. To determine the parameters of single phase induction motor using open circuit and short circuit test.

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester IV

Electrical Measurements & Measuring Instruments (Lab)

Course Code: EEE462 **L T P C**

0 0 3 2

List of Experiments:

Note: Minimum ten experiments should be performed from the following:

1. To calibrate the ammeter and voltmeter.
2. To measure the self-inductance by Maxwell's Bridge.
3. To measure the self-inductance by Hay's Bridge.
4. To measure the self-inductance by Anderson's Bridge.
5. To measure the self-inductance by Owen's Bridge.
6. To measure the self-capacitance by Schering Bridge.
7. To measure the self-capacitance by De-Sauty's Bridge.
8. To measure the low resistance by Kelvin's Double Bridge.
9. To trace out the transient response of RLCseries circuits using storage type CRO.
10. To trace out the transient response of RLC parallel circuits using storage type CRO
11. To Measure the frequency of sine, triangular, square wave signal generated by a function generator and verify its frequency at 100 Hz tap point using "labview" software.
12. To Measure the voltage and current level of the signal generated by programmable power supply.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester IV

Network Analysis & Synthesis (Lab)

Course Code: EEE463 **L T P C**

0 0 3 2

List of Experiments:

Note: Minimum ten experiments should be performed from the following:

1. To verify the superposition theorem with DC and AC sources.
2. To verify the Thevenin's theorem with DC and AC sources.
3. To verify the Norton's theorem with DC and AC sources.
4. To verify the Maximum power transfer theorem with DC & AC sources.
5. To verify the Tellegen's theorem for two networks of the same topology.
6. To verify the reciprocity theorem in a given network.
7. To plot the pole-zero diagram of the given network.
8. To determine the transient response for RL and RC circuits with step voltage input, under critically damped and over damped cases.
9. To determine the frequency response for RLC (series& parallel) circuits with sinusoidal AC input Signal.
10. To Study loading effect in the cascade connected Networks.
11. To determine the frequency response of a Twin – T notch filter.
12. To determine attenuation characteristics of a low pass/high pass active filters.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester IV
Object Oriented Programming using JAVA (Lab)

Course Code: ECS461/ECS361 **L T P C**

0 0 3 2

List of Experiments:

1. To write a program in Java for illustrating overloading.
2. To write a program in Java for illustrating over riding.
3. To write a program in Java for illustrating Inheritance.
4. To write programs to create packages and multiple threads in Java.
5. To write programs in Java for event handling Mouse and Keyboard events.
6. To create different applications using Layout Manager.
7. To write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.
8. To create Applets using Java.
9. To write program for Client Server Interaction with stream socket connections.
10. To write a program in java to read data from disk file.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester IV
DISCIPLINE & GENERAL PROFICIENCY

Course Code: EGP411 **C-1**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester V
Control Systems

Course Code: EEE511 **L T P C**

3 1 0 4

Objective:

- To learn about the open and closed loop control systems.
- To understand the time response analysis, frequency response analysis and study control system component etc.

Course Contents

Unit I **(Lectures 08)**

Control Systems: Open loop & closed control; Servomechanism; Physical examples; Transfer functions: Block diagram algebra, and Signal flow graph, Mason's gain formula; Reduction of parameter variation and effects of disturbance by using negative feedback.

Unit II **(Lectures 08)**

Time Response Analysis: Standard test signals; Time response of first and second order systems; Time response specifications; Steady state errors and error constants; Design specifications of second order systems; Derivative errors, Derivative output, Integral error and PID compensation; Design specifications for higher order systems; Performance indices.

Unit III **(Lectures 08)**

Control System Components: Constructional and working concept of AC Servomotor; Synchronous and stepper motor; Stability and Algebraic Criteria, Concept of stability and necessary conditions; Routh-Hurwitz criteria and limitations; Root Locus technique: Root Locus concepts, Construction of Root Loci.

Unit IV **(Lectures 08)**

Frequency response Analysis: Frequency response, Correlation between time and frequency responses; Polar and inverse polar plots; Bode plots; Stability in frequency domain: Nyquist stability criterion, Assessment of relative stability, Gain margin and phase margin; Constant M&N circles.

Unit V **(Lectures 08)**

Introduction to Design: The design problems and preliminary considerations of lead, Lag and Lead-lag networks; Design of closed loop systems using compensation techniques in time and frequency domains.

Review of state variable technique: Review of state variable technique, conversion of state variable model to transfer function model and vice-versa; Diagonalization; Controllability and Observability and their testing.

Text Book:

1. I.J. Nagrath & M. Gopal "Control System Engineering", New age International.

2. K. Ogata "Modern Control Engineering", Prentice Hall of India.

Reference Books:

1. Norman S. Nise “Control System Engineering”, Wiley Publishing Co.
2. M. Gopal “Control System; Principle and design”, Tata McGraw Hill.
3. M. Gopal “Modern Control system”, Tata McGraw Hill.

***Latest editions of all the suggested books are recommended.**

Semester V
Power Electronics

Course Code: EEE512 **L T P C**
3 1 0 4

Objective:

- To create an awareness of the general nature of power electronic equipment.
- To study the principles of operation of power electronic devices.
- To understand the applications of power electronic devices as converters, inverters etc.

Course Contents:

Unit I **(Lectures 08)**

Power Semiconductor Devices: Types of power semiconductor devices, their symbols and static characteristics; Characteristics and specifications of switches; Types of power electronic Circuits; BJT operation: Steady state and switch characteristics, Switching limits; Operation and steady state characteristics of MOSFET and IGBT; Thyristor operation: V-I characteristics, Two transistor model, Methods of turn-on; Operation of GTO, MCT and TRIAC.

Unit II **(Lectures 08)**

Power Semiconductor Devices (Contd.): Protection of devices; Series and parallel operation of thyristors; Commutation techniques of thyristor; DC-DC Converters: Principles of step-down chopper, step down chopper with R-L load, Principle of step-up chopper, Operation with RL load, classification of choppers.

Unit III **(Lectures 08)**

Phase Controlled Converters: Single-phase half-wave controlled rectifier with resistive and inductive loads, Effect of freewheeling diode; Single-phase fully-controlled and half-controlled bridge converters.

Unit IV **(Lectures 08)**

AC Voltage Controllers: Principle of on-off and phase control single-phase ac voltage controller with resistive and inductive loads; Three-phase ac voltage controllers (various configurations and comparison); Single-phase transformer tap changer; Cyclo Converters: Basic principle of operation, Single-phase to single-phase, Three-phase to single-phase and three-phase to three-phase cyclo converters, output voltage equation.

Unit V **(Lectures 08)**

Inverters: Single phase series resonant inverter; Single phase bridge inverters; Three phase bridge inverters; Voltage control of inverters; Harmonics reduction techniques; Single phase and three phase current source inverters.

Text Books:

1. M. H. Rashid, "Power Electronics: Circuits, Devices & Applications", Prentice Hall of India, Ltd., 2004.

2. M.D. Singh & K.B. Khanchandani, "Power Electronics", Tata McGraw Hill, 2005

Reference Books:

1. M.S Jamil Asghar, "Power Electronics", Prentice Hall of India Ltd., 2004

2. A Chakrabarti, "Fundamentals of Power Electronics & Drives", Chanpat Rai & Co.

3. Babu K.Hari, "Power Electronics", Switch Publications.

***Latest editions of all the suggested books are recommended.**

Semester V

Power System Analysis - I

Course Code: EEE513 **L T P C**

3 1 0 4

Objective:

- To study the power system elements and basics of power transmission &distribution systems.

Course Contents

Unit-I **(Lectures 08)**

Power System Components: Single line Diagram of Power system; Brief description of power system Elements: Synchronous machine, Transformer, Transmission line, Bus bar, Circuit breaker and isolator. **Supply System:** Different kinds of supply system and their comparison, Choice of transmission voltage. **Transmission Lines:** Configurations; Types of conductors; Resistance of line; Skin and proximity effects.

Unit-II **(Lectures 08)**

Over Head Transmission Lines: Calculation of inductance and capacitance of single-phase, three-phase, single-circuit and double-circuit transmission lines; Representation and performance of short, medium and long transmission lines; Ferranti effect; Surge impedance loading.

Unit-III **(Lectures 08)**

Corona and Interference: Phenomenon of corona: Corona formation, Calculation of potential gradient, Corona loss, Factors affecting corona, Methods of reducing corona and interference; Electrostatic and electromagnetic interference with communication lines. **Overhead line Insulators:** Type of insulators and their applications; Potential distribution over a string of insulators: Methods of equalizing the potential, String efficiency.

Unit-IV **(Lectures 08)**

Mechanical Design of transmission line: Catenary curve; Calculation of sag & tension; Effects of wind and ice loading; Sag template; Vibration dampers. **Insulated cables:** Type of cables and their construction; Dielectric stress; Grading of cables; Insulation resistance; Capacitance of single-phase and three-phase cables; Dielectric loss; Heating of cables.

Unit-V **(Lectures 08)**

Neutral grounding: Necessity of neutral grounding: Various methods of neutral grounding, Earthing transformer, grounding practices. **Distribution systems**: Radial and Ring main system, Current and voltage calculation in distributors with concentrated and distributed loads.

Text Books:

1. W. D. Stevenson, "Element of Power System Analysis", McGraw Hill,
2. C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition
3. Asfaq Hussain, "'Power System", CBS Publishers and Distributors,
4. B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co.
5. M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill.

Reference Books:

1. M. V. Deshpandey, "Elements of Power System Design", Tata McGraw Hill,
2. Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons

***Latest editions of all the suggested books are recommended.**

Semester V
English Communication and Soft Skills – IV

[EHM599/EHM699/BHM499 amended vide approval dt. July 23, 2018 of V.C]

Course Code: EHM599/699/BHM499 **L T P C**

1 1 2 2

Objectives:

1. To enable the learners to inculcate the skills of technical writing.
2. To enable the learners to proactively participate in Job Oriented activities.
3. To enable the learners to be aware of corporate Skills.

Course Contents:

Unit – I: Job Oriented Skills **(10 Hours)**

- Cover Letter
- Preparing Resume and Curriculum-Vitae
- Writing Joining Report

Unit – II: Technical Communication **(12 Hours)**

- Technical description of engineering objects
- Data Interpretation: Tables, Charts, & Graphs
- Preparing Agenda & Minutes of the Meeting
- Technical Proposal: Types, Significance, Structure & AIDA
- Report Writing: Types, Structure& Steps towards Report writing

Unit- III: Interview Skills **(10 Hours)**

- Branding yourself
- Interview: Types of Interview, Tips for preparing for Interview and Mock Interview
- Group Discussion: Do's and Don'ts of Group Discussion
- Negotiation skills

Unit – IV: Corporate Skills **(8 Hours)**

- Corporate Expectation
- Service mindset: Selling a product - Ad made shows
- Goal setting
- Team Building & Leadership
- Professional Ethics

Reference Books:

- Raman Meenakshi & Sharma Sangeeta, *"Technical Communication-Principles & Practice"* Oxford University Press, New Delhi.
- Mohan K. & Sharma R.C., "*Business Correspondence of Report Writing",* TMH, New Delhi.
- Chaudhary, Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.
- Kumar Sanjay & Pushplata "*Communication Skills*" Oxford University Press, New Delhi.
- Agrawal, Malti "*Professional Communication*" Krishana Prakashan Media (P) Ltd. Meerut.

Methodology:

1. The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.
2. Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips)
3. Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.

Note:

- For effective communication practice, groups will be changed weekly.
- Class (above 30 students) will be divided in to two groups for effective teaching.

Evaluation Scheme

Internal Evaluation		External Evaluation		Total Marks
50 Marks		50 Marks		100
40 Marks (Progressive Evaluation) After each unit-completion: Assignments /Oral Presentation	10 Marks (Attendance)	25 Marks Midway external assessment (Viva) *	25 Marks (External Viva)* *	

Note: 1. *Midway external assessment of 25 marks will be submitted and considered with external evaluation with a total of 50 marks.*
2. Assignments & Oral Presentation (Progressive Evaluation) will be designed to test learning outcomes unit wise.

*Parameters of Midway external assessment (Viva)

Knowledge of frequently asked questions	Body Language	Communication skills	Confidence	Voice Modulation	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	05 Marks	25 Marks

Note*: To take corrective actions, midway assessment will be conducted by 2-member committee of Director's nominee (not by the faculty teaching English courses) and average of the two would be the 25 marks obtained by the students after two units are completed.*

**Parameters of External Viva

Knowledge of frequently asked questions	Body Language	Communication skills	Confidence	Voice Modulation	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	05 Marks	25 Marks

Note: *External Viva will be conducted by 3-member committee comprising*

a) *Faculty teaching the class*
b) *English faculty from other college of the University (As approved by VC).*
c) *T&P officer of other colleges of the University (As approved by VC).*

Each member will evaluate on a scale of 25 marks and the average of three would be the 25 marks obtained by the students.

Semester V
Microprocessor & Applications

Course Code: EEC511 **L T P C**

3 1 0 4

Objective

- To study the evolution of microprocessors & how to do assembly language programming with the help of interfacing.

Course Contents

Unit I **(Lectures 08)**

Introduction to Microprocessor: 8085 Evolution of Microprocessor, Register Structure, ALU, Bus Organization, Timing and Control, instruction set. Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.

Unit II **(Lectures 08)**

Assembly Language Programming: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call), Loop and string instructions, Assembler Directives.

Unit III **(Lectures 08)**

CPU Module: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode and Maximum Mode Operations.

Unit IV **(Lectures 08)**

Peripheral Interfacing: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.

Unit V **(Lectures 08)**

Peripheral Interfacing (Contd.): 8259 Programmable Interrupt controller, 8237 DMA controller Concept of Advanced 32 bit Microprocessors: Pentium Processor.

Text Books:

1. Gaonkar Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing.
2. Ray, A.K. & Burchandi, K. M. "Advanced Microprocessors and Peripherals: Architecture Programming and Interfacing", Tata McGraw Hill.
3. Hall D.V, "Microprocessors Interfacing", Tata McGraw Hill.
4. B.P. Singh & Renu Singh, "Microprocessors and Microcontrollers", New Age International.
5. U.S. Shah, "Microprocessor" Tech Max Publications

Reference Books:

1. Liu and Gibson G.A., "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India).
2. Brey, Barry B., "INTEL microprocessors", Prentice Hall (India).
3. Ram B., "Advanced Microprocessor & Interfacing", Tata McGraw Hill.

***Latest editions of all the suggested books are recommended.**

Semester V
Control Systems (Lab)

Course Code: EEE561 **L T PC**
0 0 3 2

List of Experiments:
Note: Minimum ten experiments should be performed from the following:

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD).
4. To design Lag compensator using Bode plot.
5. To design Lead compensator using Bode plot.
6. To design Lag, Lead and Lag-Lead compensators using Bode plot.
7. To study DC position control system.
8. To study synchro-transmitter and receiver and obtain output vs. input characteristics.
9. To determine speed-torque characteristics of an ac servomotor.
10. To study performance of a servo voltage stabilizer at various loads using load bank.
11. To study the behavior of separately excited dc motor in open loop and closed loop conditions at various loads.
12. To simulate second order system using PID controller and explore transportation lag.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester V
Power Electronics (Lab)

Course Code: EEE562 **L T P C**
0 0 3 2

List of Experiments:

Note: A minimum of 10 experiments has to be performed out of which at least three should be from software based experiments.

1. To study V-I characteristics of SCR and measure latching and holding currents.

2. To study UJT trigger circuit for half wave and full wave control.

3. To study single-phase half wave controlled rectifier with (i) Resistive load (ii) Inductive load with and without freewheeling diode.

4. To study single phase (i) Fully controlled rectifier (ii) Half controlled bridge rectifier with resistive and inductive loads.

5. To study three-phase (i) Fully controlled rectifier (ii) Half controlled bridge rectifier with resistive and inductive loads.

6. To study single-phase AC voltage regulator with resistive and inductive loads.

7. To study single phase Cyclo-converter.

8. To study triggering of (i) IGBT (ii) MOSFET (iii) Power Transistor

9. To study operation of (i) IGBT (ii) MOSFET with Chopper circuit

10. To study MOSFET/IGBT based single-phase series-resonant inverter.

11. To study MOSFET/IGBT based single-phase bridge inverter.

SOFTWARE BASED EXPERIMENTS (PSPICE/MATLAB)

1. To simulate single-phase fully-controlled bridge rectifier using SCR and draw load voltage and load current waveforms for inductive load/RL load.

2. To simulate single-phase fully-controlled bridge rectifier using GTO and draw load voltage and load current waveforms for inductive load/RL load.

3. To simulate single-phase fully-controlled bridge rectifier using IGBT and draw load voltage and load current waveforms for inductive load/RL load.

4. To simulate single-phase full-wave AC voltage controller SCR and draw load voltage and load current waveforms for inductive load/RL load.

5. To simulate single-phase full-wave AC voltage controller MOSFET and draw load voltage and load current waveforms for inductive load/RL load.

6. To simulate step down dc chopper with L-C output filter for inductive load and determine steady-state values and ripple contents of output voltage.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester V
Microprocessor & Applications (Lab)

Course Code: EEC561 **L T P C**
0 0 3 2

List of Experiments:
Note: Minimum 8 experiments should be performed from the following:

1. Study of 8085 Microprocessor kit.
2. Write a program using 8085 and verify for addition of two 8-bit numbers.
3. Write a program using 8085 and verify for addition of two 8-bit numbers (with carry).
4. Write a program using 8085 and verify for 8-bit subtraction (display borrow).
5. Write a program using 8085 and verify for 16-bit subtraction (display borrow)
6. Write a program using 8085 for multiplication of two 8- bit numbers by successive addition method.
7. Study of 8086 microprocessor kit.
8. Write a program using 8086 for multiplication of two 8- bit numbers.
9. Write a program using 8086 for multiplication of two 16- bit numbers.
10. Write a program using 8086 and verify for finding the smallest number from an array

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester V
DISCIPLINE & GENERAL PROFICIENCY

Course Code: EGP511 **C-1**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester VI
Electrical Drives & Controls

Course Code: EEE611 **L T P C**
3 1 0 4

Objective:

- To study the applications of power electronics as a tool to control the electrical machines.
- To study the control of DC motor drives with single-phase and three-phase converters and choppers.
- To control the AC motor drives with variable frequency converters.

Course Contents:

Unit I **(Lectures 08)**

Fundamentals of Electric Drives: Generalized block diagram; Choice of Electrical Drives; Dynamics of Electrical Drives; Four-Quadrant Operation of Drive Systems; Nature and Classification of Load Torques; Steady State and Transient Stability of Electrical Drive.

Unit II **(Lectures 08)**

DC Motor Drives: DC Motors and their characteristics, starting; Electrical braking of dc motors; Speed control, Control of DC motors by Single Phase Converters; Thyristor controlled Drives, Single Phase semi- and fully-controlled converters connected to DC separately excited and DC series Motors, Continuous and
discontinuous current operation; Chopper Controlled DC drives, Speed control of DC separately excited and DC series Motors, Industrial applications. Microprocessor based control of DC Motor drives; PLL based Speed control of DC motor (Block Diagrams only).

Unit III **(Lectures 08)**

Induction Motor Drives: Three-phase induction motor analysis and Starting performance; Braking of induction motor; Speed control, Stator voltage control, Control of Induction Motor by AC voltage controllers, Waveforms, Speed torque characteristics, Variable frequency control.

Unit IV **(Lectures 08)**

Induction Motor Drives (Contd.): Rotor Resistance Control, Rotor side Static rotor resistance control, Slip power recovery: Static Scherbius drive, Static Kramer Drive, Performance and speed torque characteristics, Advantages, Applications, and Problems; Rotor voltage injection method; Vector Control of induction motor.

Unit V **(Lectures 08)**

Control of Synchronous Motors: Separate control & Self-control of synchronous motors; Operation of self-controlled synchronous motors by VSI and CSI cyclo converters; Load commutated CSI fed Synchronous Motor, Operation, Waveforms, Speed torque characteristics, Applications, Advantages and Numerical Problems; Closed Loop control operation of synchronous motor drives (Block Diagram Only).

Text Books

1. M.D. Singh & K.B. Khanchandani, "Power Electronics", Tata McGraw Hill.
2. G.K. Dubey, "Fundamentals of Electric Drives", Narosa Publications
3. M.H. Rashid, "Power Electronic Circuits, Devices and Applications", Prentice Hall of India.

Reference Books

1. B.K. Bose, "Modern Power Electronics and AC Drives", Prentice Hall of India.
2. Vedam Subramanyam, "Thyristor Control of Electric Drives", Tata McGraw Hill.
3. S. K. Pillai, "A First course on Electrical Drives", New Age International (P) Ltd. 2nd Edition.

***Latest editions of all the suggested books are recommended.**

Semester VI
Power System Analysis - II

Course Code: EEE612 **L T P C**
3 1 0 4

Objective:

- To provide basic knowledge to analyze the power system.
- To understand Symmetrical and unsymmetrical fault analysis.
- To study the load flow analysis and power system stability.

Course Contents:

Unit I **(Lectures 08)**

Representation of Power System Components: Synchronous machines; Transformers; Transmission lines; One-line diagram: Impedance and reactance diagram, p.u. System.

Symmetrical components: Symmetrical Components: Unbalanced phasors, Power; Sequence impedances and sequence networks.

Symmetrical fault analysis: Transient in R-L series circuit; Calculation of 3-phase short circuit current and Reactance of synchronous machine; Internal voltage of loaded machines under transient conditions.

Unit II **(Lectures 08)**

Unsymmetrical faults: Analysis of L-G fault, L-L fault and L-L-G fault on an unloaded generators and power system network with and without fault impedance; Formation of Z bus using singular transformation and algorithm; Algorithm based methods for short circuit calculations.

Unit III **(Lectures 08)**

Load Flows Analysis: Bus classifications; Nodal admittance matrix (Y bus); Development of load flow equations: Load flow solution using Gauss-Siedel and Newton-Raphson methods, approximation to N-R method; Line flow equations and fast decoupled method.

Unit IV **(Lectures 08)**

Power System Stability: Stability and Stability limit: Steady state stability study, Derivation of swing equation, Transient stability studies by equal area criterion and step-by-step method, Dynamic stability studies, Factors affecting steady state and transient stability, Methods of improvement of stability.

Unit V **(Lectures 08)**

Traveling Waves: Wave equation for uniform Transmission line; Velocity of propagation; Surge impedance; Reflection and transmission of traveling waves under different line loadings; Bewlay's lattice diagram; Protection of equipment and line against traveling waves.

Text Books:

1. W.D. Stevenson, Jr. "Elements of Power System Analysis", McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. D. P. Kothari & Nagrath, "Modern Power System Analysis", Tata McGraw Hill.
4. A. Chakrabarti, M.L. Soni, P.V. Gupta & U.S. Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.

***Latest editions of all the suggested books are recommended.**

Semester VI
Signals & Systems

Course Code: EEC611 **L T P C**

3 1 0 4

Objective:
To learn the main techniques of continuous time signals analysis using Laplace Transform & Fourier-Transform and the analysis of systems in time & frequency domain.

Course contents:

UNIT I **(Lectures 08)**

Signals: Definition, Continuous time signals, Periodic and non-periodic, Even and odd, Energy and power, Deterministic and random, continuous time signals & discrete time signals, one-dimensional & multi-dimensional; Unit impulse, Unit step, Unit ramp, Rectangular, Exponential, Sinusoidal; Operations on continuous time signals.

UNIT II **(Lectures 08)**:
Continuous time systems**,** causal and non-causal, linear and non-linear; Time-invariance, static and dynamic systems, Impulse response and properties, Characterization of Linear-Time invariant (LTI) systems, Step response of discrete time systems; BIBO Stability, Convolution integral, Co-relations.

UNIT III **(Lectures 08)**

Laplace-Transform (LT): One-sided LT and Bilateral LT of some common signals, properties and important theorems of LT, Regions of convergence (ROC) and its properties, Inverse LT.

UNIT IV **(Lectures 08)**

Continuous Time Fourier Transforms (CTFT): Definition, Conditions of existence of CTFT, Properties, Magnitude and phase spectra, Some important CTFT theorems, Parseval's theorem, Inverse FT, Relation between LT and FT

UNIT V **(Lectures 08)**

Z-Transform: One sided and two-sided Z-transforms, properties and theorems, Parseval's theorem, ROC and its properties, Z-transform of some common signals.

Text Book:

1. P. Ramakrishna Rao, "Signal and Systems", Tata McGraw Hill, New Delhi.

Reference Books:

1. Chi-Tsong Chen, `Signals and Systems', 3rd Edition, Oxford University Press.
2. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, "Signals & Systems", Pearson Education.

***Latest editions of all the suggested books are recommended.**

Semester VI
Embedded system

Course Code: EEC612 **L T P C**

3 1 0 4

Objective:

 To develop aspect of embedded system, architecture, interfacing & programming concepts

Course Contents

Unit I **(Lectures 08)**

Basic difference between microprocessor, microcontroller and embedded, Introduction to AVR**,** General purpose registers in AVR, AVR data memory, AVR status registers.

Unit II **(Lectures 08)**

Instructions with data memory, Branch instructions and looping, call instructions and stack, AVR time delay and instruction pipelining & RISC architecture in AVR

Unit III **(Lectures 08)**

Introduction to AVR assembly programming, Input output programming in AVR, Input output bit manipulation programming, Arithmetic, logic instructions and programmes.

Unit IV **(Lectures 08)**

AVR programming in C: Data types and time delays in C, Input /output programming in C, Logic operations in C, Data conversion programs in C, Data serialization in C, Memory allocation in C.

Unit V **(Lectures 08)**

AVR timer programming in assembly and C programming timers 0,1,2, counter programming, AVR interrupts & programming, AVR serial ports& programming.

Text Books:

1. Muhhmad Ali Mazidi, Sarmad Naimi, Sepehr Naimi. "The AVR Microcontroller and Embedded Systems using Assembly and C"Pearson Education .

2. DR.K.V.K.K. Prasad, Embedded/Real Time System, Dreamtech

3. Iyer, Gupta, Embedded Real Systems Programming, TMH

References Books:

1. Rajkamal Embedded Systems, TMH.

2. David Simon Embedded systems software primer, Pearson

3. Steve Furber, ARM System-on-Chip Architecture, Pearson

4. Jean J Labrose, Micro C/OS-II, Indian Low Price Edition

***Latest editions of all the suggested books are recommended.**

Semester VI

Microcontroller Hardware, Programming & its Application (Arduino)

[EEC617 amended vide approval dt. January 23, 2019 of V.C]

Course Code: EEC 617 **L T P C**

2 2 0 4

Objective:

- To understand Arduino microcontroller, architecture, interfacing and programming concepts.

Unit-I **(Lectures 08)**

Getting started with Arduino: Introduction and Familiarization to Arduino, pin structure of Arduino Uno, different types of Arduino, Setup your computer to use Arduino, Download and Install the Arduino IDE, Arduino IDE and Sketch Overview, Understanding Arduino Syntax Module, Understanding and Using Variables, Reading Analog Pins and Converting the Input to a Voltage Understanding electronics elements – Resistors, capacitors, transistors, relays. Arduino & LEDs interfacing, Blinking of LEDs, Fading of LED, Circling of LEDs. Blinking of EVEN and ODD states of LEDs, Traffic light system.

Unit-II **(Lectures 08)**

Serial monitoring: Controlling of LEDs from your computer, reading analog and digital inputs, Controlling LED using push button, Switching ON a relay. If-Else Statement, Comparison Operators and Conditions, For Loop Iteration, how to Use Arrays, Switch Case Statement, While Statement.

Unit-III **(Lectures 08)**

Analog inputs: Controlling of LEDs using a joystick, controlling a DC motor, PWM, Changing the brightness of LEDs using potentiometers.

LCD displays: Wiring of LCD screen with Arduino, displaying a message in LCD screen, Screen navigation on LCD, Turn ON a LED by entering the password, Knowing the status of the LED, scrolling of text, Displaying room temperature.

Unit-IV **(Lectures 08)**

Seven segment display: Simple automatic countdown and count up. Increment or decrement a number by using push button. Introduction to servo motor, Controlling Servo Motor with Joystick, Indexing of Servo motor, Direction control of Servo Motor, Synchronizing 2 Servo Motors.

Unit-V **(Lectures 08)**

Interfacing with Sensor modules: HC-SR04 Ultrasonic Module, IR Infrared Obstacle Avoidance Sensor Module, Soil Hygrometer Detection Module Soil Moisture Sensor, Microphone Sensor, Digital Barometric Pressure Sensor Board, Photoresistor Sensor Module

Light Detection , Digital Thermal Sensor Module Temperature Sensor Module, MQ-2Gas Sensor Module Smoke Methane Butane Detection, SW-420 Motion Sensor Module Vibration Switch Alarm, Humidity and Rain Detection Sensor Module, Passive Buzzer Module, Speed Sensor Module, IR Infrared Flame Detection Sensor Module, 5V 2-Channel Relay Module, HC-SR501 Pyroelectric Infrared Sensor Module, Accelerometer Module, DHT11 Temperature and Humidity Sensor, HC-05 Bluetooth module.

Text Book:

1. Jeremy Blum "Exploring Arduino", Wiley Publishing Co.
2. Simon Monk "Programming Arduino; Getting started with sketchs", Tata McGraw Hill.

Reference Books:

1.J.M. Hughes "Arduino: A technical reference", O'Reilly Media, Inc.

Note-To introduce experimental and project learning the CT1 evaluation will be based on theoretical and programming knowledge and CT2 ,CT3 evaluation will be based on small working projects.

External exam will be the test for theoretical and programming evaluation on embedded C specific to arduino.

*Tutorial will be programming exercise with hands-on work on small projects.
*Advice- In group of 3 to 5 students will get arduino boards & laptop for practice during tutorial.

Semester VI

Database Management System

Course Code: ECS611/411/511/MSC014/BCS311	L	T	P	C
	3	1	0	4

Objective: Introducing the fundamental concepts necessary for designing, using, and implementing database systems and applications. The goal of this course is for students to become well-grounded in basic concepts necessary for understanding DB and their users, DBMS concepts, architecture , the concepts of the Entity Relationship(ER) model, the data abstraction and semantic modeling concepts leading to EER data model, describe the basic relational model, its integrity constraints and update operations, and the operation of relational algebra, describe relational schema design, and it covers the normalization and functional dependency algorithm.

Course Contents:

Unit I: **(Lectures 08)**

Introduction: Scope and purpose of database system, view of data, relational databases, database architecture, transaction management, database system Vs filesystem, Database system concept and architecture, data definitions language, DML.

Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction

Unit II: **(Lectures 08)**

Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity etc, Codd's rules, Relational Schemas, Introduction to UML, Relational database model: Logical view of data, keys, integrity rules.

Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF)

Unit III: **(Lectures 08)**

Relational data Model and Language: Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, Relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, Computational capabilities, constraints, Views.

Introduction on SQL: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, and Procedures in SQL/PL SQL.

Unit IV: **(Lectures 08)**

Usage of Oracle:

1. Installing oracle
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE
4. MYSQL: a) Writing basic SQL SELECT statements.
   b) Restricting and sorting data.
   c) Displaying data from multiple tables.
   d) Aggregating data using group function.
   e) Manipulating data.
   f) Creating and managing tables.
5. Normalization in ORACLE.
6. Creating cursor in oracle.
7. Creating procedure and functions in oracle.
8. Creating packages and triggers in oracle.

Unit V: **(Lectures 08)**

Transaction management: ACID properties, serializability and concurrency control Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

Text Books:

1. Elmasri, R., Navathe, S., Fundamentals of Database Systems, Addison-Wesley.
2. G. K. Gupta, "Data Base Management", Tata Mc Graw Hill.
3. Atul Kahate, "Introduction to Database Management Systems" Pearson Education, New Delhi, 2006.

***Latest editions of all the suggested books are recommended.**

Semester VI
Electrical Drives & Controls (Lab)

Course Code: EEE661 **L T P C**
0 0 3 2

List of Experiments:
Note: Minimum ten experiments should be performed from the following:

1. To measure the magnetization and short-circuit characteristics of the synchronous machine.
2. To examine the external characteristics of the synchronous machine operating as a torque-controlled machine.
3. To explore the field-weakening capabilities of the synchronous machine at higher speeds.
4. To measure the basic operating characteristics of PM synchronous machines for comparison with those of the wound-field synchronous machine.
5. To explore the characteristics of PM synchronous machines under torque control, including dynamic performance.
6. To demonstrate the basis for flux weakening in PM machine in comparison to field weakening.
7. To study the speed control of dc motor using dc chopper.
8. To study the speed control of dc motor using single-phase converter.
9. To study the speed control of dc motor using 3-phase converter.
10. To study the speed control of single-phase induction motor using ac regulator.
11. To study the speed control of three-phase induction motor using ac regulator
12. To study the static rotor resistance control method in three-phase induction motor

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VI
Control Systems Using MATLAB

Course Code: EEC662

Total Contact: 44 Hrs.
Tutorial: 22 Hrs., Practical: 22 Hrs.

L	T	P	C
0	2	2	2

Objective: How to use MATLAB as a programming tool and how to write a program that is well documented and easy to read.

LIST OF EXPERIMENTS

1. **MATLAB** - History & Introduction: Introduction to MATLAB - Overview of the MATLAB Environment - Current Trends in MATLAB - MATLAB in Various Departments - Examples for MATLAB Applications Various Departments - Advantages and Disadvantages of MATLAB - Scope Of MATLAB.

2. **MATLAB Software Working Environment:** MATLAB Initializing & Ending - Quick Access Tool Bar - Command Window - Command History - Workspace Browser - Current folder window - Editor Window - Help Browser - Figure Window - Simulink Window - Creating Command Shortcuts - MATLAB Path Options MATLAB Programming – Debugging MATLAB codes**.**

3. **MATLAB Input Entry & Executing Commands & Methods:** Input and Output - Symbolic Mathematics - Arithmetic - Algebra - Symbolic Expressions - Variable Precision and Exact Arithmetic - Errors in Input - Variables and Assignments - Predefined Variables - Operators & Special Characters - Control Structures - Input & Output Commands.

4. **Matrices**: Arrays – Matrix Representation-Matrix & Inverse of Matrix - Entry Retrieving - Matrix Division – Eigen values and vectors – Special matrices.

5. **Polynomials**: Polynomial Overview - Representing Polynomials – Arithmetic operations on polynomials-Polynomial Roots - Polynomial coefficients - Polynomial Evaluation - Convolution and Deconvolution.

6. **Solving Equations: Solving Systems of Linear Equations -** Solution to Differential Equations- Solving Second Order Differential Equations - Partial Fraction Expansion.

7. **MATLAB Graphics:** 2D 2-D Plot - Plotting Process - Creating a Graph - Exploring Data - Editing the Graph Components - Annotating Graphs - Printing and Exporting Graphs - Accessing Properties with the Property Inspector - Plotting Two Variables with Plotting Tools - Changing the Appearance of Lines and Markers - Placing Markers at Every Tenth Data Point ,Adding More Data to the Graph - To add data using the Plot Browser - Changing the Type of Graph - Modifying the Graph Data Source –Providing New Values for the Data Source - Figure Windows - Clearing the Figure for a New Plot - Controlling the Axes - Setting Axis Limits - Setting the Axis Aspect Ratio - Setting Axis Visibility - Setting Grid Lines**.**

8. **MATLAB Graphics:** 3D Mesh and Surface Plots - Visualizing Functions of Two Variables - Making Surfaces Transparent - Illuminating Surface Plots with Lights - Manipulating the Surface**,** Annotating Graphics for Presentation - Adding Comments - M-File functions - Anatomy of an M-File function - Data brushing.

9. **Simulink:** Working with Lib. Elements - Create a new Simulink model - Blocks - Lines - The various steps taken to make a complete model - Collecting blocks to create a model - Observing Variables During Simulation**,** Work with Data Import & Export - Interfacing MATLAB Simulink & Script Files - Examples with electrical calculations using MATLAB & MATLAB Simulink - Masking Process Using Images in Simulink - Simulink Solution For Second Order Differential Equations.
10. **Control and Symbolic math toolbox**: Basic commands of control system toolbox and Symbolic math toolbox.
11. **Simulation:** Feedback System simulation, transfer function manipulation, system response.
12. **Time response and LTI viewer**: LTI viewer, Time response in characteristic in MATLAB Window, Time response characteristic in Simulink Window.
13. **Root Locus**: Plotting root locus, Root locus analysis, Stability analysis in root locus, stability analysis in state space.
14. **Compensator design:** Design using root locus: Design using MATLAB Dialogues, design using SISO design tool.
15. **Frequency domain plots**: Nyquist plot, Bode plot, Stability analysis of Bode and Nyquist Plot, Stability Margins.
16. **Frequency response characteristic**: Frequency response characteristics, Non unity feedback systems.
17. **Frequency response design:** Design using MATLAB dialogues, design using SISO design tool, Robustness analysis.

Learning outcomes:

- Write simple program modules to implement single numerical methods and algorithms
- Test program output for accuracy using hand calculations and debugging techniques
- Synthesize multiple program modules into larger program packages
- Able to generate plots and export this for use in reports and presentations.
- Able to use basic flow controls (if-else, for, while)

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VI
DISCIPLINE & GENERAL PROFICIENCY

Course Code: EGP611 **C-1**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester VII
Switchgear & Protection

Course Code: EEE711 **L T P C**
3 0 0 3

Objective:

- To study about relays and circuit breakers for the protection of transmission lines etc.

Course Contents:

Unit I **(Lectures 08)**

Introduction to Protection System: Introduction to protection system and its elements: Functions of protective relaying, Protective zones, Primary and backup protection, Desirable qualities of protective relaying, Basic terminology; Relays: Electromagnetic, attracted armature type and induction type relays, Thermal relay, Gas actuated relay, Design considerations of electromagnetic relay.

Unit II **(Lectures 08)**

Relay Applications and Characteristics: Amplitude and phase comparators: Over current relays, Directional relays, Distance relays, Differential relays,
Static relays: Comparison with electromagnetic relays, Classification and their description, Over current relays, Directional relay, Distance relays, Differential relay.

Unit III **(Lectures 08)**

Protection of Transmission Line: Over current protection; Distance protection; Pilot wire protection; Carrier current protection; Protection of bus; Auto reclosing.

Unit IV **(Lectures 08)**

Circuit Breakers: Properties of arc: Arc extinction theories, Restricting voltage transient, Current chopping, Resistance switching, Capacitive current interruption, Short line interruption; Circuit breaker ratings; Classification; Circuit Breakers: Operating modes, Selection of circuit breakers, Constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF_6, Vacuum and D. C. circuit breakers.

Unit V **(Lectures 08)**

Apparatus Protection and testing of Circuit Breakers: Protection of transformers, generators and motors; Testing of Circuit Breakers: Testing station and equipment, Testing procedure, Direct and indirect testing.

Text Books:

1. S. S Rao., "Switchgear and Protection", Khanna Publishers.
2. B. Ravindranath. &M. Chander, "Power System Protection and Switchgear", Wiley Eastern.

Reference Books:

1. B. Ram& D. N. Vishwakarma, "Power System Protection and Switchgear", Tata McGraw.
2. Y. G. Paithankar. & S.R. Bhide, "Fundamentals of Power System Protection", Prentice Hall.

***Latest editions of all the suggested books are recommended.**

Semester VII

Non-Conventional Energy Resources

Course Code: EEE712/EEE614 **L T P C**
3 1 0 4

Objective: To make the students aware about the types of turbines & site selection for installation of various types of power plants.

Course Contents:

Unit I **(Lectures 08)**
Introduction: World energy use; Reserves of energy resources; Energy cycle of the earth; Environmental aspects of energy utilization; Renewable energy resources and their importance.

Unit II **(Lectures 08)**
Solar Energy: Introduction; Extra-terrestrial solar radiation; Radiation at ground level; Collectors; Solar cells; Applications of solar energy. Biomass Energy: Introduction; Biomass Conversion; Biogas Production; Ethanol Production; Pyrolysis and Gasification; Direct Combustion; Applications.

Unit III **(Lectures 08)**
Wind, Geo-Thermal and Hydro Energy Sources: Introduction; Basic theory; Types of turbines; Geothermal Energy Resources; Resource based applications for heating and electricity generation; Hydropower basic concepts; Site selection; Types of turbines; Small scale hydropower.

Unit IV **(Lectures 08)**
Tidal Energy: Introduction; Origin of tides; Power generation schemes; Basic theory of Wave energy; Wave power Devices; Open and Closed OTEC cycles.

Unit V **(Lectures 08)**
Other Renewable Energy Sources: Ocean Currents; Salinity Gradient Devices; Environmental Aspects; Potential impacts of harnessing the different renewable energy resources.

Text Books:

1. G D Rai, Non-Conventional Energy Sources, Khanna publishers

Reference Books:

1. A. Duffie and W. A. Beckmann, "Solar Engineering of Thermal Processes", John Wiley

2. F. Kreith and J. F. Kreider, "Principles of Solar Engineering", McGraw-Hill

3. T. N. Veziroglu, "Alternative Energy Sources", McGraw-Hill.

***Latest editions of all the suggested books are recommended.**

Semester VII
Facts Technology

Course Code: EEE713 **L T P C**
3 0 0 3

Objective:

- To study the Flexible AC Transmission Systems (FACTS) technology concepts and their applications in power system transmission & distribution.

Course Contents:

Unit-I **(Lecture 08)**

Introduction to FACTS: Electrical Transmission Network: Necessity, Power flow in AC system; Relative importance of controllable parameter; Opportunities for FACTS: Possible benefits for FACTS, Power Semiconductor Devices, Perspective on Power Devices, Types of High-Power Devices, Principal High-Power Device Characteristics and Requirements: Voltage and Current Ratings, Losses and Speed of Switching, Parameter Trade-Off of Devices; Power Device Material, Diode (PN Junction)Transistor, MOSFET, Thyristor (without Turn-Off Capability), Gate Turn-Off Thyristor (GTO), Turn-On and Turn-Off Process, MOS Turn-Off Thyristor (MTO), Insulated Gate Bipolar Transistor (IGBT), MOS-Controlled Thyristor (MCT)

Unit-II **(Lecture 08)**

Static VAR Compensation: Need for compensation: Shunt & series compensation, Objectives of shunt & series compensation, Configuration & operating characteristics; Thyristor controlled reactor(TCR); Thyristor Switched Capacitor (TSC); Comparison of TCR & TSC.

Unit-III **(Lecture 08)**

Voltage-Sourced Converters: Basic Concept of Voltage-Sourced Converters, Single-Phase Full-Wave Bridge Converter Operation, Single Phase-Leg Operation, Square-Wave Voltage Harmonics for a Single-Phase Bridge, Three-Phase Full-Wave Bridge Converter, Converter Operation, Fundamental and Harmonics for a Three-Phase Bridge Converter, Sequence of Valve Conduction Process in Each Phase-Leg, Transformer Connections for 12-Pulse Operation, Three-Level Voltage-Sourced Converter, Operation of Three-Level Converter, Fundamental and Harmonic Voltages for a Three-Level Converter, Three-Level Converter with Parallel Legs, Pulse-Width Modulation (PWM) Converter

Unit-IV **(Lecture 08)**

Series Compensation: Variable impedance type series compensation; Thyristor switched series capacitor (TSSC); Thyristor controlled series capacitor (TCSC); Basic operating control schemes for TSSC & TCSC.

Static Voltage Phase Angle Regulator: Objectives of voltage & phase angle regulators: approaches to Thyristor, Controlled Voltage & Phase Angle Regulator.

Unit-V (Lecture 08)

Emerging FACTS Controller: STATCOM; Unified Power Flow Controller (UPFC); Interline Power Flow Controller (IPFC); Basic operating principles of UPFC; Sub-synchronous resonance.

Text Books-

1. Narain G. Hingorani & Laszlo Gyugyi, "Understanding FACTS – Concepts & Technology offlexible AC Transmission Systems", Standard Publishers, New Delhi.
2. Mohan Mathur, R. & Rajiv K. Varma, "Thyristor Based FACTS Controller for Electrical Transmission Systems", Wiley Inter science Publications.

Reference Books-

1. T.J.E Miller., "Reactive Power Control in Electric System", John Wiley & Sons.
2. G.K Dubey., "Thyristorized Power Controller", New Age international (P) Ltd., New Delhi.
3. Narain G. Hingorani, "High Power Electronics in Flexible AC Transmission", IEEE Power Engineering Review.

***Latest editions of all the suggested books are recommended.**

Semester VII
Power Generation Systems

Course Code: EEE714 **L T P C**
3 0 0 3

Objective:

- To learn the generation of electrical power from different types of power plants like thermal nuclear and hydro power plants.
- To understand the concepts of generation of electrical power using non-conventional energy resources.
- To learn the economics connected with power generation.

Course Contents:

Unit I **(Lectures 08)**

Economics of Generation: Load and load duration curve: Load, Demand and diversity factors, Plant capacity and plant use factors; Choice of type of generation; Choice of size and number of units; Cost of energy generated: Tariffs.

Unit II **(Lectures 08)**

Hydro power plants: Layout and working; Types of turbines for high, medium and low head plants; Advantages of hydro generation; Environmental issues; Hydro-Thermal scheduling problem.

Unit III **(Lectures 08)**

Thermal power plants: Location, Layout and working of steam and diesel power plants; Types of boilers and turbines and other accessories for steam and gas power plants; Environmental issues.

Unit IV **(Lectures 08)**

Nuclear power plants: Principles of nuclear power generation; Types of nuclear power plants and their comparative study; Layout and working of nuclear power plants; Advantages and disadvantages of nuclear energy; Reactor control; Reactor safety; Environmental issues.

Unit V **(Lectures 08)**

Non-conventional power plants (Explanation of Power Generation through Block Diagrams): Basic concepts; Principle of working and layout of MHD; Solar; Wind; Tidal; Biomass and Geothermal Power Generating Systems.

Text Books:

1. S.L. Uppal, "Electrical Power", Khanna Publishers, New Delhi.
2. M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, Delhi.

Reference Books:

1. I. J. Nagrath and D.P. Kothari, "Modern Power System Analysis", Tata Mc Graw Hill.
2. C. L. Wadhwa, "Generation, Distribution and Utilization of Electric Energy", New Age International Ltd.
3. M.V. Deshpande, "Elements of Electrical Power Station design", Pitman, New Delhi.

***Latest editions of all the suggested books are recommended.**

Semester VII
Switchgear & Protection (Lab)

Course Code: EEE761 **L T P C**
0 0 2 1

List of Experiments:

Note: Minimum ten experiments should be performed from the following:

1. To study the relaying and control circuits components.
2. To plot operating characteristics of inverse time over-current relay.
3. To plot operating characteristics of the differential relay.
4. To plot operating characteristics of the MHO distance relay.
5. To **s**tudy the combined over-current & earth fault protection scheme of alternator.
6. To study the transformer protection using differential relay.
7. To plot the characteristic of Kit-Kat fuses and MCB.
8. To study the oil arc extinction phenomenon.
9. To demonstrate the microprocessor base protection for 3-phase induction motor.
10. Todemonstrate the microprocessor base protection for 1-phase induction motor.
11.Todemonstrate the microprocessor base protection for 3-phase alternator motor.
12. To **s**tudy the different types of fuses.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VII
Electronics Devices & Circuits (Lab)

Course Code: EEC761 **L T P C**
0 0 3 2

Note: Select any 10 out of the following list of experiments.

LIST OF EXPERIMENTS

1. To Study the lab equipment and components: CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. To study the characteristics of Zener diode.
3. To study the characteristic of BJT.
4. To study the characteristic of FET.
5. To study the applications of Op-amp.
6. To study & plot the gain in dB Vs frequency of FET.
7. To study the design of single RC coupled amplifier.
8. To study & plot the gain Vs frequency of two stage amplifier.
9. To study the common collector configuration-emitter follower using Darlington pair.
10. To study the power amplifier and its gain characteristics.
11. To study & implement the transistor differential amplifier and plot its non ideal characteristics.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VII
Design and Installation of Solar Photovoltaic System

Course Code: EEC762/BAS464 **L T P C**
0 2 2 2

Objective: To learn students-

- Basics of solar energy
- Installation, Maintenance and Service of solar power plant.
- Designing in AutoCAD
- Risk Management and to ensure safety and performance.

Course Contents:

Unit-1 **(T Hrs-4.5, P Hrs - 3.5)**

Basics of PV Technology: What is Solar Energy, Solar Collectors, Photovoltaic Systems, History of Photovoltaics, Photovoltaic Effect, Photovoltaic Cells, PV Modules and Arrays.

Solar PV technology overview: How does PV technology work, Other Types of Photovoltaic Technology, Costs of Solar Photovoltaics, Modern Photovoltaics.

Fundamentals of Solar Components Solar PV System: Solar Radiation, Solar Cell Parameters and Equivalent Circuit, Losses and Efficiency Limits, Crystalline Silicon Solar Cells, Thin-film solar cells, PV System Design.

Site survey, assessment & feasibility study: PV Site Location, Assumptions and Input Data for Analysis, Potential Rate Increases, Conclusions and Recommendations.

Unit-2 **(T Hrs-4, P Hrs-5)**

Assess the customer's Solar PV requirement: pv cost considerations, permits and covenants, stand-alone small solar electric systems, grid-connected small solar electric systems, estimating energy cost savings for net-metered pv system.

Capacity or system sizing approach: Solar PV system sizing, determine power consumption demands, Inverter sizing, Battery sizing, available area for installation of SPV.

Design of SPV Plants: Load estimation, Estimation of number of PV panels, Estimation of battery bank, Cost estimation of the system.

Unit-3 **(T Hrs-4, P Hrs-5)**

Preparation of Bill of Materials (BoM): Mechanical or electrical components used to assemble or integrate major components, Size of the Plant, Type of Roof, Module Make and Specs, Inverter Make and Specs, Whether Remote Monitoring is separately required.

Installation, Maintenance and Service of SPV Plants: Modularity & scalability, Flexible location.

Civil and Mechanical parts of Solar PV System: Get Equipment Foundation constructed, Install Mounting System, Install Photovoltaic modules, Install Battery Bank Stand and Inverter Stand.

Unit-4 **(T Hrs-6, P Hrs-5)**

Electrical components of Solar PV System: Install Array JB, cost effective wiring, Using MCCBs and other essential components.

Advanced Solar Power plant Engineering: Photovoltaic Inverter Topologies for Grid Integration Applications, Advanced Control Techniques for PV Maximum Power Point Tracking, Maximum Power Point Tracking Methods for PV Systems, Photovoltaic Multiple Peaks Power Tracking Using Particle, Swarm Optimization with Artificial Neural Network Algorithm

Intro – Google Sketchup, PV Syst, AutoCAD: Creation of a grid-connected project, Construction and use of 3D shadings scenes, Meteorological data in PV-syst.

Unit-5 **(T Hrs-7, P Hrs -1)**

Solar project development phases and issues: Initiation phase, Definition phase, Design phase, Development phase, Implementation phase, Follow-up phase.

Project planning and schedule of activities: Management activities**,** Project planning, Project scheduling, Risk management, Risk identification, Risk analysis, Risk planning, Risk monitoring

Best practices in design & installation to ensure safety and performance: Work History, Financial Transparency, Health and Safety, Insurance.

Evaluation of Practical Examination:

Internal Evaluation (50 marks)

Each experiment (Min. 06 experiment) would be evaluated by external trainer or by faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by external trainer or the faculty concerned. The marks shall be entered on the index sheet of the practical file. Each experiment will be evaluated in 5 marks as per given distribution.

Evaluation scheme:

S. No.	Experiment (10 marks)	Attendance (10 marks)	Test result (20 marks)	Viva (10 MARKS)	Average in 5 Marks
Experiment 1					
Experiment 2					
:					
Experiment 10					

External Evaluation (50 marks)

The external evaluation would also be done by the external trainer or industrial expert or by faculty based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VII
Industrial Training & Presentation

Course Code: EEE792 **L T P C**
0 0 0 4

Students will have to undergo industrial training of six weeks in any industry or reputed organization after the VI semester examination in summer. The evaluation of this training shall be included in the VII semester evaluation.

The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the VI semester and shall be the nodal officer for coordination of the training.

Students will prepare an exhaustive technical report of the training during the VII semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college.

The student at the end of the VII semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.

The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned.

Not more than three students would form a group for such industrial training/ project submission.

The marking shall be as follows.

Internal: 50 marks
By the Faculty Guide – 25 marks.
By Committee appointed by the Director/Principal – 25 marks.

External: 50 marks
By Officer-in-charge trainee in industry – 25 marks.
By External examiner appointed by the University – 25 marks.

Technical report will consist five chapter as per given format:

Chapter 1: Brief about organization
Chapter 2: Detail of business carried out by organization
Chapter 3: Specific contribution during the industrial training (not more than 500 words)
Chapter 4: Learning during the industrial training (not more than 200 words)
Chapter 5: Conclusion

Plagiarism will check of technical report in chapter 3, 4 & 5 only.

Semester VII
PROJECT WORK PHASE-I

Course Code: EEE798

L	T	P	C
0	0	8	4

A group of students, not more than three, will be assigned a faculty guide who would be the supervisor of the group. The faculty would be identified in the starting of the VII semester.

The group will carry out the literature search and collect required material for carrying out the project.

The group will prepare a report not exceeding 15 pages at the end of semester.

The assessment of performance of students should be made at least twice in each semester i.e. VII and VIII. In this semester, the student shall present the progress of project live as also using overheads project (30% Project completion) or power point presentation on LCD to the internal committee.

The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.

The marking shall be as follows.

Internal: 100 marks
By the Faculty Guide - 50 marks
By Committee appointed by the Director/Principal – 50 marks

Semester VII
DISCIPLINE & GENERAL PROFICIENCY

Course Code: EGP711 **C-1**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester VII
Open Elective-I

Course: Principle of Management
Course Code: FOE011 **L T P C**
3 1 0 4

Objective:
To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the applications of principles in an organization.
Course Contents:

Unit I: Introduction To Management And Organizations (Lectures 08)
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

Unit II: Planning (Lectures 08)
Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques –Decision making steps and process.

Unit III: Organising (Lectures 08)
Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

Unit IV: Directing (Lectures 08)
Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

Unit V: Controlling (Lectures 08)
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Textbooks:

1. Stephen P. Robbins & Mary Coulter, “Management”, Prentice Hall (India) Pvt. Ltd.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management: Pearson Education.

References:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra.
3. Harold Koontz & Heinz Weihrich "Essentials of Management" Tata Mc Graw Hill.
4. Tripathy PC & Reddyu Pn," Principles of Management", Tata Mc Graw Hill.

***Latest editions of all the suggested books are recommended.**

Course: Artificial Neural Network

Course Code: FOE012 **L T P C**

3 1 0 4

Objective: This course aims at introducing the fundamental theory and concepts of computational intelligence methods, Presentation of artificial intelligence as a coherent body of ideas and methods to acquaint the student with the basic programs in the field and their underlying theory. Students will explore this through problem-solving paradigms, logic and theorem proving, language and image understanding, search and control methods and learning.

Unit I **(Lecture 08)**

Artificial Intelligence: Issues, Techniques, Problems, Problem solving state space search; DFS; BFS Production: System, Problem characteristics; Heuristic Search Techniques; generate and Test; Hill Climbing; Best First Search; Constraint satisfaction.

Unit II **(Lecture 08)**

Knowledge representation: Approaches; Issues; Representing simple facts in logic; Resolution and natural deduction; Representing knowledge using rules; Procedural vs. Declarative knowledge; Forward v/s Backward chaining.

Slot and Filler Structures: Semantic nets; Frames; Conceptual dependency; Scripts; parsing techniques.

Unit III **(Lecture 08)**

Introduction to Neural Network: Introduction, Organization of the Brain, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Potential Applications of ANN.

Essentials of Artificial Neural Networks: Artificial Neuron Model, Types of Neuron Activation Function, ANN Architectures, Learning Strategy (Supervised, Unsupervised, Reinforcement).

Unit IV **(Lecture 08)**

Single Layer Feed Forward Neural Networks: Introduction, Perceptron Models and Training Algorithms.

Multilayer feed forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training.

Unit V **(Lecture 08)**

Expert System: Definition and Characteristics; Expert system life cycle & Expert system tools; MYCIN & DENDRAL.

Associative Memories: Paradigms of Associative Memory, Pattern Engineering, Hebbian Learning, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Architecture of Hopfield Network.

Text Books:

1. E Rich. and K Knight, "Artificial Intelligence", Tata McGraw Hill.

2. S. Rajasekharan and G. A. Vijayalakshmi pai, Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications, PHI Publication.

Reference Books:

1. "Simon Haykin, Neural Networks- A comprehensive foundation, Pearson Education.
2. S.N. Sivanandam, S. Sumathi,S. N. Deepa, Introduction to Neural Networks using MATLAB 6.0", TMH.
3. James A Freeman and Davis Skapura, Neural Networks Pearson Education, 2002.
4. Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill Inc.
5. V.S. Janakiraman, K Sarukesi, "Foundation of Artificial Intelligence & Expert System", Macmillan.

***Latest editions of all the suggested books are recommended.**

Course: Industrial Sociology (old name: Industrial Psychology)
Course Code: FOE013 **L T P C**
3 1 0 4

Objective: Students will learn core psychological competencies including:

1. History of I/O Psychology and its integration into the broader discipline
2. Various fields of psychology from which I/O shares a great deal with (i.e. Social Psychology, Psychometrics, Motivation, Learning theory, Personality)

Unit I **(Lectures 08)**

Sociology in the industrial Perspective: Concept of Sociology, Sociology as a Science, Sociology of work & industry, Perspectives for sociological analysis of work, Class- Conflict in Industry, Social impact of industrialization, Corporate skills in the fast growing multinational set up.

Unit II **(Lectures 08)**

Work and Social change: Nature of modern societies, emergence of industrial capitalism, Technology & Social change, the information society after the industrial society, post-modernity, globalization & Convergence, Significance of the service sector today, work restructuring and corporate management.

Unit III **(Lectures 08)**

Work experience in Industry: The concept of alienation, Work satisfaction, Technology & work experience, and Social background of workers, Work orientations, Stress & anxiety of the worker, Work & Leisure, Unemployment, Conflicts in the work place.

Unit IV **(Lectures 08)**

General and Applied Ethics- Ethics and the professions – Standard of right and wrong, problems of Ethical Certainty, Significance of professional Ethics for Engineers, New Technology and Ethics, Applied Ethics - Cases in professional Engineering Practice, Principles of business ethics, Individual in the organization.

Unit V **(Lectures 08)**

Ethical Leadership: Decision making, corporate culture and reputation management, corporate social responsibility and social reporting.

Text Books:

1. Sheth N.R., Social Frame Work of Indian Factory, O.U.P. Bombay.
2. Gisbert P., Fundamentals of Industrial Sociology, O.U.P. New Delhi.
3. Watson Tony J., Sociology: Work & Industry, New York. Routledge.
4. Schinzinger, Roland & Mike W. Martin, Introduction to Engineering Ethics- Boston, McGraw Hill.

Reference Books:

1. Fleddermann Charles, Engineering Ethics, Upper Saddle River- N.J. Prentice Hall.
2. Miller & Form, Industrial Sociology, London Harper & Row.
3. Parsons Richard D., The Ethics of Professional Practice- Allyn & Bacon, London.
4. Govindarajan - Engineering Ethics- Prentice Hall (India) New Delhi.

***Latest editions of all the suggested books are recommended.**

Course: Organizational Behaviour
Course Code: FOE014 **L T P C**
3 1 0 4

Objective: This course is to understand the concept of Organizational Behaviour.

Course Contents:

Unit – I **(Lecture 08)**

Concept, Nature, Characteristics, Models of Organizational Behaviour, Management Challenge, Organizational Goal. Global challenges and Impact of culture.

Unit – II **(Lecture 08)**

Perception: Concept, Nature, Process, Importance. Attitudes and Workforce Diversity.
Personality: Concept, Nature, Types and Theories of Personality Shaping, Learning: Concept and Theories of Learning.

Unit – III **(Lecture 08)**

Motivation: Concepts and Their Application, Principles, Theories, Motivating a Diverse Workforce.
Leadership: Concept, Function, Style and Theories of Leadership-Trait, Behavioural and Situational Theories. Analysis of Interpersonal Relationship.

Unit – IV **(Lecture 08)**

Organizational Power and Politics: Concept, Sources of Power, Approaches to Power, Political Implications of Power. Knowledge Management & Emotional Intelligence in Contemporary Business Organization.
Organizational Change: Concept, Nature, Resistance to change, Managing resistance to change, Implementing Change.

Unit –V **(Lecture 08)**

Conflict: Concept, Sources, Types, Functionality and Dysfunctional of Conflict, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organizational, Resolution of Conflict, Stress: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress.

Text Books:

1. Dwivedi, D. N, Managerial Economics, Vikas Publishing House.
2. Varshney & Maheshwari, Managerial Economics, Sultan Chand & Sons.

Reference Books:

1. Robbins Stephen P., Organizational Behavior Pearson Education
2. Hersey Paul, "Management of Organizational Behavior: Leading Human Resources" Blanchard, Kenneth H and Johnson Dewey E., Pearson Education
3. Khanka S. S. "Organizational Behavior

***Latest editions of all the suggested books are recommended.**

Course: Engineering and Managerial Economics
Course Code: FOE015 **L T P C**
3 1 0 4

Objective:

1. To understand the concepts of Economics, Managerial Economics and its scope in engineering perspective
2. To study demand analysis, demand forecasting and market structure.

Course Contents:

Unit-I **(Lectures 08)**

Introduction: Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology; Managerial Economics and its scope in engineering perspective.

Unit-II **(Lectures 08)**

Demand: Basic Concepts Demand Analysis; Law of Demand; Determinates of Demand; Elasticity of Demand-Price, Income and cross Elasticity; Uses of concept of elasticity of demand in managerial decisions.

Unit-III **(Lectures 08)**

Forecasting: Demand forecasting; Meaning, significance and methods of demand forecasting; production function; Laws of returns to scale & Law of Diminishing returns scale.
Short and Long run Cost curves: fixed cost, variable cost, average cost, marginal cost, Opportunity cost.

Unit-IV **(Lectures 08)**

Market Study: Market Structure Perfect Competition; Imperfect competition: Monopolistic competition, Monopoly, Oligopoly, Duopoly Sorbent features of price determination and various market conditions.

Unit-V **(Lectures 08)**

Inflation: National Income; Concept of N.I. and Measurement; Inflation: Meaning of Inflation; Type, causes & prevention methods; Business Cycles, Phases of business cycle.

Text Books:

1. Koutsoyiannis, A : Modern Microeconomics, ELBS.
2. Kakkar, D.N., Managerial Economics for Engineering, New Age International Publication.

Reference Books:

1. Dwivedi, D.N., Managerial Economics, Vikas Publishing.
2. Maheshwari, Y., Managerial Economics, Prentice Hall of India.

***Latest editions of all the suggested books are recommended.**

Course: Network security & cryptography
Course Code: FOE016 **L T P C**
3 1 0 4

Objective: The goal is to become familiar with basic techniques to protect data in computer and communication environments against several different varieties of fraud.

Course Contents:

Unit I **(Lectures 08)**

Network Security: Attacks; Services & Mechanisms; Conventional Encryption: Classical Encryption Techniques, Steganography.

Unit II **(Lectures 08)**

Encryption Schemes: DES: Standard, Strength; Block Cipher Design Principles; Block Cipher Modes of Operation: Triples DES; Key Distribution, Random Number Generation.

Unit III **(Lectures 08)**

Public-Key Cryptography: Principles; RSA Algorithm; Key Management; Fermat's & Euler's Theorems; Primarily Miller Test; Chinese Remainder Theorem.

Unit IV **(Lectures 08)**

Message Authentication & Hash Functions: Authentication: Requirements, Protocols, Introduction to Message Authentication Codes and Hash Functions, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signature.

Unit V **(Lectures 08)**

IP Security: Electronic Mail Security; Pretty Good Privacy (PGP); S/MIME; Authentication Header; Encapsulating Security Payloads.
Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set);

Text Books:

1. Stallings, W., Cryptography and Network Security: Principles and Practice, Prentice Hall.
2. Kahate, A., Cryptography and Network Security, Tata McGraw Hill.

Reference Books:

1. Johannes, A. B., Introduction to Cryptography, Springer.

***Latest editions of all the suggested books are recommended.**

Semester VIII
Electric Power System Operation

Course Code: EEE811 **L T P C**
3 0 0 3

Objective:

- To study the operation of electrical power systems and their control.

Course Contents

Unit I **(Lecture 08)**

Introduction: Structure of power systems; Power system control center and real-time computer control; SCADA system; Level decomposition in power system; Power system security; Various operational stages of power system; Power system voltage stability.

Unit II **(Lecture 08)**

Economic Operation: Concept and problems of unit commitment; Input-output characteristics of thermal and hydroplanes, System constraints; Optimal operation of thermal units without and with transmission losses: Penalty factor, Incremental transmission loss, Transmission loss formula (without derivation); Hydrothermal scheduling: Long and short terms; Concept of optimal power flow.

Unit III **(Lecture 08)**

Load Frequency Control: Concept of load frequency control: Load frequency control of single area system; Turbine speed governing system and modeling; Block diagram representation of single area system: Steady state analysis, Dynamic response, Control area concept, P-I control; Load frequency control and Economic dispatch control: Load frequency control of two area system, Tie line power modeling, Block diagram representation of two area system, Static and dynamic response.

Unit IV **(Lecture 08)**

Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their control. **Voltage and Reactive Power control: V**oltage control: Methods of voltage control, Control by tap changing transformer; Compensation: Shunt compensation, Series compensation, Phase angle compensation.

Unit V **(Lecture 08)**

Computer Control of Power System: Energy control center; Various levels: National, Regional and State level; SCADA system: Computer configuration, Monitoring, Data acquisition and controls; **EMS System**-System operating states: Normal, Alert, Emergency, In-extremis, Restorative-Control strategies.

Text Books:

1. D.P. Kothari & I. J. Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill.
2. P.S.R., Murty, "Operation and control in Power Systems", B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, "Understanding Facts Concepts and Technology of Flexible AC Transmission Systems", Wiley India.

Reference Books:

1. O. I Elgerd. "*Electric Energy System Theory*", Tata McGraw Hill.
2. P. Kundur, "*Power System Stability and Control*", McGraw Hill.
3. M.H. Rashid *"Power Electronics: Circuits, Devices and Applications*", Prentice Hall of India.
4. A. J. Wood & B.F. Wollenburg, "*Power Generation, Operation and Control*", John Wiley & Sons

***Latest editions of all the suggested books are recommended.**

Semester VIII
High Voltage Engineering

Course Code: EEE812 **L T P C**
3 0 0 3

Objective:

- To study breakdown mechanisms in gaseous, liquid and solid dielectrics etc.
- To study generation and measurement of high voltages.

Course Contents:

Unit-I **(Lecture 08)**

Conduction and Breakdown of Gaseous Insulation Materials: Ionization process and current growth; Townsend's criterion for breakdown; Breakdown in electronegative gases; Time lags for breakdown; Paschen's law; Corona discharges; Breakdown in non-uniform fields; Selection of insulating gases.

Unit-II **(Lecture 08)**

Conduction and Breakdown in Liquid and Solid Dielectrics: Breakdown mechanisms in liquid dielectrics; Liquid dielectrics used in practice; Various processes of breakdown in solid dielectrics; Solid dielectrics; Solid dielectrics used in practice.

Unit-III **(Lecture 08)**

Generation of High Voltages and Currents: Generation of high DC voltages: Multiplier circuits, Van de Graff generator; High alternating voltage generation using cascade transformers; Production of high frequency AC high voltages; Standard impulse wave shapes; Marx circuit; Generation of switching surges; Impulse current generation; Tripping and control of impulse generators.

Unit-IV **(Lecture 08)**

Measurement of High Voltages and Currents: HVDC measurement techniques; Measurement of power frequency A.C. voltages: Sphere gap measurement technique, Potential divider for impulse voltage measurements; Measurement of high D.C, A.C and impulse currents; Use of CRO for impulse voltage and current measurements.

Unit-V **(Lecture 08)**

High Voltage Testing: Testing: Insulators, Bushings, Cables, Isolators, Circuit Breakers and Transformers; Surge diverter testing; Radio interference measurement; Use of I.S. for testing.

Text Books:

1. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Limited.
2. M. S. Naidu, and V. Kamaraju, "High Voltage Engineering", Tata McGraw Hill.

Reference Books:

1. E. Kuffel. and M. Abdullah, "High Voltage Engineering", Pergamon Press.
2. Dieter Kind, "An Introduction to High Voltage Experimental Techniques", Wiley Eastern Limited.

***Latest editions of all the suggested books are recommended.**

Semester VIII
Electronic Circuits

Course Code: EEC814 **L T P C**
3 0 0 3

Objective:

- To understand the basic concept of amplifier & oscillators.
- To study the characteristics of Operational Amplifiers.
- To study the 555 Timer IC and its application.

Course Contents

Unit I **(Lecture 10)**

Amplifiers and Oscillators: Class A, B, AB and C amplifiers and respective Q-Points, Push-Pull and Darlington amplifier.
Voltage and Current feedback systems, Positive and Negative feedback systems, Wein bridge oscillator, RC-phase shift oscillator; Hartley and Colpitts oscillators; Crystal oscillators

Unit II **(Lecture 08)**

Characteristics of Op-Amp: Ideal OP-AMP characteristics: DC characteristics, AC characteristics; Offset voltage and current; Differential amplifier; Frequency response of OP-AMP.

Unit III **(Lecture 08)**

Applications of OPAMP: Basic applications of op-amp: Summer, Differentiator and Integrator. Low Pass and High Pass Filters; V/I & I/V converters; Comparators; Multivibrator; Peak detectors, S/H circuits, D/A and A/D converters, Successive Approximation.

Unit IV **(Lecture 06)**

Special ICs: 555 Timer circuit; Functional block; Characteristics & applications; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

Unit V **(Lecture 08)**

Application ICs: IC voltage regulators: 78XX, 79XX Series, LM317, 723 regulators, SMPS, LM 380 power amplifier.

Text Books

1. J. Millman, C. C. Halkias, and Satyabratha Jit, Electronic Devices and Circuits, Tata McGraw Hill.
2. R. L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, Pearson, Prentice Hall.
3. Ramakant A. Gayakward, "Op-amps and Linear Integrated Circuits", Pearson Education.
4. D. Roy Choudhary, Sheil B.Jani, "Linear Integrated Circuits", II edition, New Age.

Reference Books

1. T.F. Bogart Jr., J. S. Beasley and G. Rico, Electronic Devices and Circuits, Pearson Education.
2. S. G. Burns and P. R . Bond, Principles of Electronic Circuits, Galgotia Publications.
3. Millman and Grabel, Microelectronics, Tata McGraw Hill.
4. Jacob Millman, Christos C. Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill
5. Robert F. Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", Pearson Education, PHI.
6. David A. Bell, "Op-amp & Linear ICs", Prentice Hall of India, 2nd edition.

***Latest editions of all the suggested books are recommended.**

Semester VIII
Power System Simulation (Lab)

Course Code: EEE861 **L T P C**
0 0 3 2

List of Experiments (MATLAB Based Experiments)-
Note: Minimum ten experiments should be performed from the following:

1. To study the various power system simulation commands.
2. To perform load power flow analysis by NR method.
3.To perform load power flow analysis by fast decoupled NR method.
4. To perform load power flow analysis by Gauss elimination method.
5. To study the symmetrical fault analysis.
6. To study the L-L fault analysis.
7. To study the L-G fault analysis.
8. To control the voltage level in a power system by automatic voltage regulator.
9.To control the voltage level in a power system by tape changing transformer.
10. To control the voltage level in a power system by tab changing transformer.
11. To study the load frequency control in single area system.
12. To study the load frequency control in two area system.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VIII
PLC Programming (Lab)

Course Code: EEC861

L	T	P	C
0	0	4	2

Objective: To understand and learn how system and process are automated in industry and how automated monitoring and control function are performed.

List of Experiments-

1. **Introduction to PLC:** Introduction to PLC hardware and role in automation ,Architectural Evolution of PLC, Introduction to the field devices attached to PLC,PLC Fundamentals - (Block diagram of PLC's),Detail information about PLC components ,Power supply, CPU, I/Os, Communication bus, Various ranges available in PLC's, Types of Inputs & outputs modules , Source Sink Concepts for connecting external devices, Electrical Signal levels used in industrial application, Wiring of the I/O devices to PLCs, Concept of flags and Scan cycle execution, Selection of control system to suit the local requirement, Setting up PLCs / Connecting CPU, I/O modules, Rack, Backplane and Communication bus.
2. **PLC Programming software:** Introduction to PLC programming software, Advanced Feature of PLC programming software, Starting the programming terminal and configuring the PLCs, Addressing concepts in various PLCs, PLC programming types– Ladder Diagram (LD), Instruction List(IL), Functional Block Diagram (FBD) Sequential Function Charts (SFC), Structured Text (ST), Information on the PLC & its Software and Language, Upload / Download and Monitoring of program
3. **PLC Programming:** Starting the programming terminal, Creating & Modifying an R S Logix new project, Introduction to Bit Byte and Word Concept, Programming instructions arithmetic and logical , Load /and /or/out / and Read / Write , Compare / Add / Sub /And /Or – Blocks, Leading edge / trailing edge instructions, MOVE block application, Programming instructions arithmetic and logical ,Timer and Counter Blocks programming, Comments in the PLC programs, Handling Analog I/Ps, Advanced Programmers ,Conversion, Jump Shift instructions, Accumulator functions, Extended mathematical functions, Indirect Addressing, PLC Project Development, Creating various Tasks & Organizing Data, Programming Program Control Instructions, Upload, Download and Monitoring of program.
4. **Operation, Maintenance and Troubleshooting:** Managing R S Logix 500 Project Files, Back up of the programs and reloading, Interpreting Project Organization & Execution, Documenting & Searching for Project Components, Online operations, Monitoring Arrays & Tags of User-Defined Data , Forcing of the I/O's and Toggling Bits, Editing Ladder Logic Online, Identifying the status of PLC and communication bus, Troubleshooting Controller, I/O Modules, PS Problems, CPU, I/O module replacements, Fault detection and error handling, Online editing of the program, Forcing the I/Os, Backup and Restoring programs, Cold, Warm, and Hot Restarts in Siemens PLCs ,Troubleshooting and fault diagnostics of PLC, Fault Detection using Semantic S 7 software ,Hardware fault detection, Replacing CPU, Digital or Analog Modules, battery, Power Supply, Clearing the faults.
5. **SCADA:** Introduction and Applications of SCADA Technology, Architectural evolution of SCADA, Introduction to SCADA software, Features supported by RS View Software, Start up Option and application management, Licensing – No. of I/Os, Screens, Creating a new application, Creating tags and address assignments, Creating & Editing graphic display with animation, Data Entry / Start Stop command, Analog entry, Sizing, Movement, Blinking, Visibility, Filling, Create navigational tools between various pages for user, Trends -

Configuring & Accessing Real-time and Historical data. Guide to the alarm pag, Alarm Classes, Configuring, Retrieving and Acknowledgement, Logic writing in SCADA software.

Text Books: Garry Dunning "Introduction to Programmable Logic Controller" Thomson 3rd Edition.

***Latest editions of all the suggested books are recommended.**

Evaluation of Practical Examination:

Internal Evaluation (50 marks)

Each experiment (Min. 10 experiment) would be evaluated by external trainer or by faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by external trainer or the faculty concerned. The marks shall be entered on the index sheet of the practical file. Each experiment will be evaluated in 5 marks as per given distribution.

Evaluation scheme:

S. No.	Experiment (10 marks)	Attendance (10 marks)	Test result (20 marks)	Viva (10 MARKS)	Average in 5 Marks
Experiment 1					
Experiment 2					
:					
Experiment 10					

External Evaluation (50 marks)

The external evaluation would also be done by the external trainer or industrial expert or by faculty based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: External exam will be conducted at the end of the training.

Semester VIII
Electronic Circuits (Lab)

Course Code: EEC862 **L T P C**
0 0 3 2

List of Experiments:

Note: Minimum ten experiments should be performed.

1. To study the characteristics of Operational Amplifier (IC741).
2. To generate the waveform using Operational Amplifier (IC741).
3. To study the Operational Amplifier (IC741) as comparator.
4. To study the Operational Amplifier (IC741) as differentiator.
5. To study the Operational Amplifier (IC741) as integrator.
6. To Implement the S/H circuit using Operational Amplifier (IC741)**.**
7. To study the DAC (ladder type) and ADC (successive approximation type).
8. To study applications of Timer IC555 as Multivibrators (monostable and bistable).
9. To study LM 380 as power amplifier.
10. To implement the S/H circuit using Operational Amplifier (IC741)**.**
11. To implement PLL using IC555.
12. To study the voltage Regulator-IC 723.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Semester VIII
Project Work Phase-II

Course Code: EEE898

L	T	P	C
0	0	14	7

Students should devote themselves to prepare something tangible, which could be a working model of their thoughts based on their subject of choice.

The project shall be finalized by the students based on the VII semester project work report and shall be completed (100% working condition) and submitted at least one month before the last teaching day of the VIII semester, date of which shall be notified in the academic calendar.

The assessment of performance of students should be made at least twice in each semester i.e. VII and VIII. In this semester student shall present the final project live as also using overheads project or power point presentation on LCD to the internal committee as also the external examiner.

The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.

The marking shall be as follows.

Internal: 50 marks
By the Faculty Guide - 25 marks.
By Committee appointed by the Director/Principal – 25 marks.

External: 50 marks
By External examiner appointed by the University – 50 marks.

Semester VIII
DISCIPLINE & GENERAL PROFICIENCY

Course Code: EGP811 **C-1**

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Semester VIII
Open Elective-II

Course: Machine learning & Data Analytics
Course Code: FOE021 **L T P C**
3 1 0 4

Objective:

1. Be able to formulate machine learning problems corresponding to different applications.

2. Understand a range of machine learning algorithms along with their strengths and weaknesses.

Course Contents:

Unit I **(Lectures 08)**

Introduction, Different Types of Learning, Hypothesis Space & Inductive Bias, Evaluation and Cross-Validation, Linear Regression, Introduction to Decision Trees, Learning Decision Tree, Overfitting

Unit II **(Lectures 08)**

K- Nearest Neighbour, Feature Selection, Feature Extraction, Collaborative Filtering, Bayesian Learning, Naïve Bayes, Bayesian Network

Unit III **(Lectures 08)**

Logistic Regression, Introduction of Support Vector machine, The Dual Formulation, Maximum Margin with Noise, Nonlinear SVM & Kernel Function, Solution to the Dual Problem.

Unit IV **(Lectures 08)**

Multilayer Neural Network, Neural Network and Backpropagation Algorithm, Deep Neural Network

Introduction to Computational Learning Theory, Sample Complexity: Finite Hypothesis Space, VC Dimension

Unit V **(Lectures 08)**

Introduction to Ensembles, Bagging and Boosting, Introduction to Clustering, Kmeans Clustering, Agglomerative Hierarchical Clustering,

Test Books:

1. Machine Learning by Tom M. Mitchell, Mc Graw Hill Publication.
2. Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning series) by Kevin P. Murphy, MIT Press.
3. Deep Learning (Adaptive Computation and Machine Learning series) by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.
4. Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas Muller.

***Latest editions of all the suggested books are recommended.**

Course: Total Quality Management
Course Code: FOE022 **L T P C**
3 1 0 4

Objective: To study about quality concepts, management policies, control charts.

Course Contents:

Unit I **(Lectures 08)**

Quality Concepts: Introduction; Meaning; Quality characteristics of goods and services; Evolution of Quality control, TQM; Modern concept, Basic concepts of quality; Dimensions of quality; Juran's quality trilogy; Deming's 14 principles; PDCA cycle; Total quality management (TQM) models.

Unit II **(Lectures 08)**

Quality Management: Organizational structure and design; Quality function; Decentralization; Designing and fitting organization for different types products and company; Human Factor in Quality: Attitude of top management; Co-operation of groups; Operators attitude, responsibility; Causes of operators error and corrective methods; Quality circles.

Unit III **(Lectures 08)**

Quality improvement and cost reduction: 7 QC tools and new QC tools; Economics of quality value and contribution; Quality cost; Optimizing quality cost; Quality assurance.

Unit IV **(Lectures 08)**

Control Charts: Theory of control charts; Control charts construction: Construction of Mean & Range charts, fraction defective chart and number of defective charts; Attributes control charts: Defects, construction and analysis of c-chart.

Unit V **(Lectures 08)**

IS0-9000, Six sigma and TPM: ISO 9000 series; Concept of Six Sigma and its application; Total Productive Maintenance (TPM).

Text Books:

1. Sharma D. D Total Quality Management, S. Chand.
2. LaI H., Total Quality Management, Wiley Eastern Limited.
3. Greg Bounds, Beyond Total Quality Management, McGraw Hill.

Reference Books:

1. Menon, H.G., TQM in New Product Manufacturing, McGraw Hill.

***Latest editions of all the suggested books are recommended.**

Course: Entrepreneurship
Course Code: FOE023 **L T P C**
3 1 0 4

Objectives: To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Unit I : **(Lectures 08)**
Entrepreneurship:
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

Unit II: **(Lectures 08)**
Motivation:
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

Unit III: **(Lectures 08)**
Business:
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Unit IV: **(Lectures 08)**
Financing and Accounting:
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

Unit V: **(Lectures 08)**
Support to Entrepreneurs:
Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

Text Books:

1. Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd., Ram Nagar, New Delhi.
2. Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", Cengage Learning.

References:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill.
2. Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech.
3. Rajeev Roy, 'Entrepreneurship', Oxford University Press.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad.

***Latest editions of all the suggested books are recommended.**

Course: Big Data & Hadoop
Course Code: FOE024 **L T P C**
3 1 0 4

Course Objective: This course will cover the basic concepts of big data, methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and the business needs.

(Lectures 08)

Introduction – distributed file system – Big Data and its importance, Four Vs Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.

UNIT II – INTRODUCTION HADOOP **(Lectures 08)**

Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT- III HADOOP ARCHITECTURE **(Lectures 08)**

Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT-IV HADOOP ECOSYSTEM AND YARN **(Lectures 08)**

Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT-V HIVE AND HIVEQL, HBASE **(Lectures 08)**

Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Text Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley.
2. 2.Chris Eaton, Dirk deroos et al., “Understanding Big data”, McGraw Hill.
3. 3.Tom White, “HADOOP: The definitive Guide”, O Reilly.
4. 4.Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing.

Reference Books:

1. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press.
2. http://www.bigdatauniversity.com/
3. Jy Liebowitz, “Big Data and Business analytics”, CRC press.

***Latest editions of all the suggested books are recommended.**

Course: Financial Management
Course Code: FOE025 **L T P C**
3 1 0 4

Objective: The basic objective of this course to understand the functions, roles, goals and the processes of financial management.

Course Contents:

Unit I **(Lectures 08)**

Introduction: Concept of finance, scope and objectives of financial management; Functions of Finance Manager in Modern Age; Financial decision areas; Time value of money; Risk and Return analysis; Valuation of Securities.

Unit II **(Lectures 08)**

Investment Decision; Appraisal of project; Techniques of capital budgeting and its applications; Risk and Uncertainty in Capital Budgeting; Leverage analysis: Financing, operating and combined leverage and its implications; EBIT-EPS analysis.

Unit III **(Lectures 08)**

Financing Decision: Long-term sources of finance, Concept and approaches of capital structure decision: NI, NOI, Traditional and Modigliani Miller Approach; Cost of capital equity share, preference share, debentures, weighted average cost of capital.

Unit IV **(Lectures 08)**

Working Capital: Concept of Gross Working Capital and Net Working Capital, Various Approaches to Working Capital Management, Factors affecting working capital requirement and sources of working capital financing, Management of inventory, receivables and cash.

Unit V **(Lectures 08)**

Dividend Decision: Dividend policies; Factors affecting dividend policies, Dividend Theories, Bonus policy guidelines relating to dividend declaration and payment.

Text Books:

1. Pandey I.M., Financial Management, Vikas Publications.
2. Khan & Jain, Financial Management, Tata McGraw-Hill.
3. Chandra Prasanna, Fundamentals of Financial Management TMH.

Reference Books:

1. Smith K.V., Management of Working Capital, 2nd edition, Harper Collins Publications.
2. Agarwal J.D., Working Capital Management, Tata McGraw-Hill.

***Latest editions of all the suggested books are recommended.**