UNIVERSITY OF JAMMU

NOTIFICATION

(19/Aug/Adp/29)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of revised Syllabus of **Bachelor of Engineering (Electrical Engineering)** for Semester III & IV under the **Choice Based Credit System** as per the model curriculum of the **AICTE (as given in the Annexure)** for the candidates of **all (Govt./Pvt./UIET) Engineering Colleges affiliated with the University of Jammu** for the Examinations to be held in the years indicated against each Semester as under :-

Branch	Semester	For the Examination to be held in the years
Electrical	**Semester-III**	**December 2019, 2020, 2021 and 2022**
	Semester-IV	**May 2020, 2021, 2022 and 2023**

The Syllabi of the course is available on the University Website: *www.jammuuniversity.in.*

Sd/-
DEAN ACADEMIC AFFAIRS

No. F.Acd/III/19/4757-4768
Dated:20/08/2019
Copy for information & necessary action to:-

1. Dean Faculty of Engineering
2. Principal, GCET/MIET/MBSCET/UIET/BCET/YCET
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Section Officer (Confidential)
6. Incharge University Website

Assistant Registrar (Academics)

19/8 19/8 19/08/19

B.E. Electrical Engineering 3rd Semester **Contact Hours: 28**

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits	% change
			L	T	P	Internal	External			
PEE-301	Professional Core Courses	Electrical Machines-I	3	1	0	50	100	150	4	100
PEE-302	Professional Core Courses	Electrical Circuit Analysis	3	1	0	50	100	150	4	100
EEC-302	Engineering Science Course	Electronic Circuits- I	2	1	0	50	100	150	3	100
BSC -301	Engineering Science Course	Numerical Methods & Transform Calculus	3	1	0	50	100	150	4	100
PEE- 306	Professional Core Courses	Energy Conservation	2	1	0	50	100	150	3	100
PEE-311	Professional Core Courses	Electrical Machine Lab-I	0	0	2	75	-	75	1	100
PEE-312	Professional Core Courses	Electrical Circuit Analysis Lab	0	0	2	50	-	50	1	100
PEE-313	Professional Core Courses	Electrical Workshop	0	0	2	75	-	75	1	100
EEC-312	Engineering Science Course	Electronic Circuits- I Lab	0	0	2	50	-	50	1	100
NCC-304	Non Credit Courses	Engineering Mechanics	2	0	0	0	-	0	0	100
Total			**15**	**5**	**8**	**500**	**500**	**1000**	**22**	

Annexure-I

3rd Semester Examination to be held in the year December 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER **CREDIT-4**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-301
TITLE: ELECTRICAL MACHINES-I
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
3	1	0	100	50

COURSE OUTCOMES:- At the end of the Course the Student will be able to	
CO1	Understand the concepts of magnetic circuits
CO2	Understand the operation of dc machines
CO3	Analyse the differences in operation of different dc machine configurations.
CO4	Analyse single phase and three phase transformers circuits.

Detailed Syllabus

SECTION-A

Module 1: Magnetic fields and magnetic circuits
Review of magnetic circuits–MMF, flux, reluctance, inductance; review of Ampere Law and BiotSavart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines. **(6Hours)**

Module 2: Electromagnetic force and torque
B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. **(8 Hours)**

Module 3: DC machines
Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.
(8 Hours)

SECTION-B

Module 4: DC machine - Motoring and Generation
Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed.V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control of dc motor. Losses, load testing and back-to-back testing of DC machines.Starters- 3point and 4-point starters of dc machine. **(7 Hours)**

Module 5: Transformers
Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, harmonics in magnetization current, Phase conversion - Scott connection, Tap-changing transformers - No-load and on-load tap-changing of transformers. Cooling of transformers. **(9Hours)**

Text / References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011. 5. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

3rd Semester Examination to be held in the year December 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER **CREDIT-4**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-302
TITLE: ELECTRICAL CIRCUIT ANALYSIS
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
3	1	0	100	50

COURSE OUTCOMES: -At the end of the course the student will be able to:	
CO1	Apply the knowledge of basic circuital law, dot convention and topological description of Electrical networks.
CO2	Acquire knowledge about the application of differential equation method and Laplace transform in electrical circuits.
CO3	Understand pole-zero configuration and determine parameters of two port network.
CO4	Understand concept and design of filters and synthesize circuits using Foster and Cauer forms.

Detailed Syllabus

SECTION-A

Module1: Conventions for describing networks

Reference directions for currents and voltages, Conventions for Magnetically Coupled Circuits, Circuit Topology. **(5hours)**

Module2: First order differential equation &Laplace Transformations:

Differential equations as applied in solving networks, Application of initial conditions, evaluating initial conditions in networks. Laplace Transformations: Initial and final value theorems, convolution integral, convolution as summation, Solution of network problems with Laplace transformation. **(7 hours)**

Module3: Network Functions-poles and zeroes

Ports or terminal pairs, Network functions for one port and two port networks, Poles and Zeros of network functions, Restriction on pole and Zero locations for driving point and transfer functions. Time domain behaviour from pole-Zero plot. **(7 hours)**

SECTION-B

Module4: Two port parameters

Impedance ,Admittance , transmission and hybrid parameters, Relationship between parameter sets, parallel, series & Cascade connection of two port Networks, Characteristics impedance of two-port networks**.** **(7 hours)**

Module5: Filters

Filter fundamentals, filter classification, Constant K & m Derived Filters, Design of filters**.** **(6 hours)**

Module6: Network Synthesis:

Synthesis problem formulation, properties of positive real functions, Hurwitz polynomials properties of RC, LC and RL driving point, functions. Foster and Cauer synthesis of LC, RL and RC circuits. **(6 hours)**

RECOMMENDED BOOKS:

1. Network Analysis — Van Valkenberg
2. Network Analysis & Synthesis — F.F. Kuo
3. Introduction to Circuit Synthesis & Design — Temes& La Patra
4. Fundamentals of Network Analysis & Synthesis — Perikari
5. Network Theory & Filter Design — V. Atre
6. Network analysis and Synthesis — SudhakarShyam Mohan
7. Circuit Theory analysis and Synthesis — A. Chakrabarti

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

3rd Semester Examination to be held in the year December 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER **CREDIT-3**
BRANCH: ELECTRICAL ENGINEERING

COURSE NO: EEC-302	**L**	**T**	**P**	**MARKS**	
COURSE TITLE: ELECTRONIC CIRCUITS -I				**External**	**Internal**
DURATION OF EXAM: 3 HOURS	**2**	**1**	**0**	**100**	**50**

COURSE OUTCOMES: At the end of the course the student will be able to:	
CO1	Understand the operation of semiconductor devices, rectifiers, concept of noise removal using filters and their applications.
CO2	Understand the fundamental concepts of different types of transistors, its biasing conditions along with concept of load lines and operating points.
CO3	Identify the need for cascading, frequency response and different coupling methods of multistage amplifiers
CO4	Apply the concept of series, shunt, monolithic and IC regulators in circuit design.

Detailed Syllabus

SECTION -A

Module1: Semiconductor Diodes

Introduction, pn junction biasing conditions, Volt-ampere characteristics, breakdown mechanism(Avalanche, Zener breakdown), Zener diode, tunnel diode, schottky diode, LED, photodiode, varactor diode, Pn junction diode as rectifiers, filters, clippers and clampers**.** **(8 Hours)**

Module2: Transistors

Working principle, generalized transistor equation, transistor configurations (CE,CC,CB) and characteristics, early effect, Need for biasing, types of biasing circuit, load line concept (AC/DC), Bias stabilization, Introduction to JFET,characteristics, symbol and operation, Biasing of FET with necessary derivations, MOSFET. **(8 Hours)**

SECTION B

Module 3: Single and Multistage Amplifiers

H-parameters, principle of operation of CE amplifier, need for cascading, N-stage cascaded amplifiers, method of coupling multistage amplifiers (RC coupling, DC coupling, transformer coupling), Analysis and frequency response of amplifiers.
(8Hours)

Module 4: Voltage Regulators

Introduction and necessity of Voltage regulators, types of Voltage regulators (Shunt and Series), monolithic and IC regulators (78XX,79XX,LM317,LM337). **(8 Hours)**

Books Recommended:

1. Integrated Electronics — MillmanHalkais
2. Electronics Devices — Bolystead
3. Electronics Devices — Malvino Leach
4. Microelectronics — Sedra& Smith

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

3rd Semester Examination to be held in the year Dec 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER **CREDIT-4**
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE - NUMERICAL METHODS AND TRANSFORM CALCULUS
COURSE CODE – BSC 301
DURATION-3 HOURS

L	T	P	MARKS	
			External	Internal
3	1	0	100	50

COURSE OUTCOMES:-At the end of the semester the Student will be able to	
CO1	Learn the basics of operators, their types and interpolation.
CO2	Find out the exact real root of algebraic, transcendental equations and differential equations.
CO3	Learn the concept of Laplace Transform, inverse Laplace transform of various functions and its applications.
CO4	Understand the idea of Fourier transform, Fourier sine and cosine transform and their property.

Detailed Syllabus
SECTION A

Module 1: NUMERICAL METHODS

Definition of operators, Finite and divided difference, Interpolation using Newton's and Lagrange's formulas. Numerical differentiation, numerical integration: Trapezoidal rule and Simpson's 1/3rd rule.
Numerical solutions of algebraic and Transcendental equations by RegulaFalsi, Newton-Raphson and direct iterative methods, solution of differential equations by Taylor's method, Picard's method, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. **(20 hours)**

SECTION B

Module 2: LAPLACE TRANSFORM

Laplace Transform, Properties of Laplace Transform: Linear property, change of scale property, first shifting property, second shifting property, Multiplication by t property, division by t property, convolution property, Laplace transform of periodic functions, Laplace transform of derivatives. Finding inverse Laplace transform by different methods. Evaluation of integrals by Laplace transform, solving differential equations of higher order by Laplace Transform. **(12 hours)**

Module 3: FOURIER TRANSFORM

Fourier Integrals, Fourier transforms, Fourier integral theorem, Fourier sine and cosine integrals, and their inverses. Properties of Fourier transforms. Application of Fourier transform to solve integral equations. Fourier sine and cosine integrals, and their inverses. **(8 hours)**

Text / References:

1. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2008.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2010.
3. Dr.Bhopinder Singh,'' ENGINEERING MATHEMATICS III"
4. Dr.Bhopinder Singh,'' A textbook on Complex analysis and Numerical Methods", Kirti Publications.

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

3rd Semester Electrical Exam to be held in the year December2019, 2020, 2021, 2022

CLASS: B.E. 3rdSEMESTER **CREDIT-3**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-306
TITLE: ENERGY CONSERVATION
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
2	1	0	100	50

COURSE OUTCOMES: -At the end of the semester the Students will be able to	
C01	Obtain knowledge about energy conservation policy, regulations and business practices.
C02	Recognize opportunities for enabling rational use of energy audit.
CO3	Apply knowledge of Energy Conservation Opportunities in a range of contexts and Developing innovative energy efficiency solutions and demand management strategies.
CO4	Analyze energy systems from a supply and demand perspective.

Detailed Syllabus

SECTION A

Module 1: Energy Conservation

Introduction, Motivation for Energy Conservation, Principles of Energy Conservation, Energy Conservation Planning and its importance. Classification of Energy, Indian energy scenario, Sectorial energy consumption, Energy intensity, long term energy scenario, Energy security, energy conservation and, energy strategy for the future**. (8 hours)**

Module 2: Energy Audit

Aim of Energy Audit, Energy Flow Diagram, Strategy of Energy Audit, Comparison with Standards, Energy Management Team, Considerations in Implementing Energy with Conservation Programmes, Instruments for Energy Audit, Energy Audit of Illumination System, Energy Audit of Electrical System, Energy Audit of Buildings. **(10 hours)**

SECTION B

Module 3: Demand Side Management

Introduction, Scope of Demand Side Management, Evolution of DSM Concept, DSM Planning and Implementation, Load Management as a DSM Strategy, Applications of Load Control, End use Energy Conservation, Tariff Options , Customer Acceptance, Implementation Issues and Strategies, DSM and Environment, International Experience with DSM. **(10 hours)**

Module 4: Economics

Importance and role of energy management, Energy economics, Payback period, Energy needs of growing economy, Energy pricing, Internal rate of return, life cycle costing**. (6 hours)**

Texts/References

1. Gupta B. R.: Generation of Electrical Energy, Eurasia Publishing House Pvt. Ltd., New Delhi, 2001 IV Edition.
2. Durgesh Chandra &: Energy Scope, South Asian Publishers Pvt. Ltd, New Delhi.
3. M.V. Deshpande: Electrical Power System, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. J. Nanda and D.P. Kothari: Recent Trends in Electric Energy Systems, Prentice Hall of India Pvt. Ltd, New.

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

3rd Semester Examination to be held in the year Dec 2019,2020,2021,2022

CLASS : B.E. 3rd SEMESTER **CREDITS: 0**

BRANCH: ELECTRICAL ENGINEERING

COURSE TITLE: ENGINEERING MECHANICS	**L**	**T**	**P**	**MARKS**	
COURSE NO. NCC-304				**External**	**Internal**
DURATION OF EXAM: 3 HOURS	**2**	**0**	**0**		

Satisfactory/Unsatisfactory

COURSE OUTCOMES: Student will be able to	
CO1	Draw free body diagrams and determine the resultant of forces and/or moments.
CO2	Determine the centroid and second moment of area of sections. Apply laws of mechanics to determine efficiency of simple machines with consideration of friction..
CO3	Analyse statically determinate planar frames.
CO4	Analyse the motion and calculate trajectory characteristics and Apply Newton's laws and conservation laws to elastic collisions and motion of rigid bodies.

SECTION-A
(STATICS)

MODULE I: Scope and basic concepts , concept of free body diagram, Resultant of Co-planar concurrent forces in a plane and space, moment of force, Principle of Moments, Coplanar and spatial applications. Virtual work method and its applications.

MODULE II: Equilibrium and its equations for planar and spatial systems, Analysis of trusses, Method of joints and sections.

MODULE III: Theory of friction, its laws and applications. Square threaded screws, Bolt friction, Centroids and centre of gravity, centroids of lines and composite areas, centroids determined by integration.

SECTION-B
(DYNAMICS)

MODULE IV: Moment of inertia, Area M.O.I, Transfer theorems, Polar M.O.I, Product of inertia, Principal M.O.I, Mohr's circle for area M.O.I, Transfer theorems and axes M.O.I of composite bodies.

MODULE V: Kinematics of a particle rectilinear motion, motion curves, Rectangular components of curvilinear motion, Flight of Projectile, Normal and tangential components of acceleration, Radial and transverse components.

MODULE VI: Kinematics of rigid bodies: Types of rigid body motion, Angular motion, fixed axis rotation, Analysis of plane motion and its applications, Instantaneous centre and Instantaneous axis of rotation.

RECOMMENDED BOOKS:

1. Engineering Mechanics (Statics & Dynamics) — Dr.Sarbjeet Singh &Er. Pardeep Singh
2. Engineering Mechanics (Statics & Dynamics) — Mariam and Kraige
3. Engineering Mechanics (Statics and Dynamics) — Timoshenko and Young
4. Engineering Mechanics (Statics and Dynamics) — Ferdinand L Singer.

NOTE:

There will be internal evaluation based on the two sessional tests. The out come of thesessional test will be in the satisfactory/unsatisfactory form.

3rd Semester Examination to be held in the year Dec 2019,2020,2021,2022

CLASS: B.E. 3rd SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-311
TITLE: ELECTRICAL MACHINES LAB-I

L	T	P	MARKS PRACTICAL
0	0	2	75

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Identify the parts of cut-sectional model of D.C. machines.
CO2	Study the operating characteristics of D.C. machines.
CO3	Determine the voltage regulation and efficiency of Transformer.
CO4	Perform the various tests on single-phase Transformer.

LIST OF EXPERIMENTS:

1. To study the cut-sectional model of D.C. machines.
2. To study the magnetic characteristics of a D.C. Machines at various operating speeds and finds the operating point of D.C. shunt machine from the same.
3. To determine the load characteristics of a D.C. Shunt generator and find its overall efficiency.
4. To determine the Torque speed characteristics of a D.C. Shunt motor and compound motor (Short & long shunt). Also study of these using armature control and field control.
5. To study the torque/speed characteristics of a D.C. series motor using various field tapings.
6. To find the efficiency and study various losses of D.C. Machines using Hopkinson test.
7. To study the starting methods of DC machine.
8. To study a single phase transformer, its Voltage ratio and turns ratio relationship. Perform open & short circuit test to determine losses, efficiency and voltage regulation and also its various parameters.
9. To perform polarity test on single phase transformers for parallel operation and study the load sharing of two parallel operated transformers.
10. Conversion of three-phase to two-phase using Scott Connection.
11. Determination of losses and efficiency of transformer using sumpner's test.

Note: Each student has to perform at least nine experiments out of which 40% shall be simulation based. Additional Practical / Experiments will be performed based on the course content requirements.

3rd Semester Examination to be held in the year Dec 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER **CREDIT:-1**

BRANCH: ELECTRICAL ENGINEERING	**L**	**T**	**P**	**MARKS**
COURSE CODE: PEE-312				**PRACTICAL**
TITLE: ELECTRICAL CIRCUIT ANALYSIS LAB	**0**	**0**	**2**	**50**

COURSE OUTCOMES: - At the end of the semester the Student will be able to	
CO1	Determine Z,Y, h and ABCD parameters
CO2	Acquire knowledge of designing passive filter circuit
CO3	Understand the step response of RL, RC and RLC circuits

LIST OF EXPERIMENTS:

1. To determine Z parameters of two-port networks.
2. To determine Y parameters of two-port networks.
3. To determine ABCD parameters of two-port networks.
4. To determine h parameters of two-port networks.
5. Design and frequency response of Passive filter circuit.
6. Determination of transient response of RL circuits with step input voltage.
7. Determination of transient response of RC circuits with step input voltage.
8. Determination of transient response of RLC circuits with step input voltage.
9. Determination of driving point and transfer function of a two port ladder network.

Note: Each student has to perform atleast seven experiments out of which 40% shall be simulation based. Additional Practical's / Experiments will be performed based on the course content requirements.

3rd Semester Examination to be held in the year Dec 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-313
TITLE: ELECTRICAL WORKSHOP

L	T	P	MARKS
			PRACTICAL
0	0	2	75

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Understand and apply the general lab safety rules.
CO2	Familiarize with different types of wirings and joints.
CO3	Study different methods of earthing.
CO4	Analyse different electronic components.

List of experiments:

1. Study of various type of wiring.
2. Study of various joints of Wires & Cables.
3. Power & ordinary circuits suitable for domestic wiring.
4. Cost estimation for wiring of a single storied building having light & power circuits.
5. Method of Earthing& measurement of Earth Resistance.
6. Electrical shock precautions & treatment.
7. Identification of components.
8. Soldering of Joints.
9. Wiring practices in PVC, Conduit system of wiring.
10. Control of fluorescent lamp circuit.

BOOK RECOMMENDED:

1. Electrical Wiring & Estimation — S.I. Uppal
2. Lab. Manual for Electric Circuits — David A. Bell
3. Textbook of Practicals in Electrical Engineering — Dr. N.K. Jain
4. Electrical Installation & Costing — J.B. Gupta

NOTE : The Electrical circuit diagrams will be provided to the students. The operation of the circuits will be explained. The purpose of the exercise is to familiarize the students Fabrication/Assembling of the given Electrical circuits and to solder the different components to form different Circuits.

3rd Semester Examination to be held in the year Dec 2019,2020,2021,2022

CLASS: B.E. 3RD SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINNERING
COURSE NO: EEC-312
COURSE TITLE: ELECTRONIC CIRCUITS I LAB

L	T	P	MARKS PRACTICAL
0	0	2	50

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Plot forward and reverse characteristics of silicon and Zener diodes.
CO2	Fabricate half and full wave rectifiers and evaluate their performance parameters.
CO3	Plot the characteristics of FET using trainer kits.
CO4	V-I characteristics of transistor for various configurations using trainer kit.

LIST OF PRACTICALS

1. To study the operation characteristics of the P.N. junction, Ge /Si (Forward & Reverse Characteristics).
2. To study the operation characteristics of Zener diode (Forward & Reverse Characteristics).
3. Half wave Rectifier.
4. Full wave / Bridge Rectifier.
5. To study the operation characteristics (Input/Output) of PNP/
6. NPN Transistor (Common Emitter/Common Base).
7. To study the frequency response of signal amplifier (CE/CB).
8. To study the characteristics of FET.
9. Determination of h parameter from transistor characteristics.
10. Design of self -bias circuits using BJT.
11. Design of self -bias circuits using FET.

Note: Each student has to perform atleast nine experiments out of which 40% shall be simulation based. Additional Practical's / Experiments will be performed based on the course content requirements.

B.E. Electrical Engineering 4th Semester **Contact Hours: 26**

Course Code	Course Type	Course Title	Load Allocation			Marks Distribution		Total Marks	Credits	% change
			L	T	P	Internal	External			
PEE-401	Professional Core Courses	Electric Machines II	3	1	0	50	100	150	4	100
PEE-402	Professional Core Courses	Control System	3	1	0	50	100	150	4	100
PEE-403	Professional Core Courses	Signal and Systems	3	1	0	50	100	150	4	100
EEC-402	Engineering Science Course	Digital Electronics	2	1	0	50	100	150	3	100
EEC-403	Engineering Science Course	Electromagnetic Waves	2	1	0	50	100	150	3	100
PEE-411	Professional Core Courses	Electric Machines Lab II	0	0	2	75	-	75	1	100
PEE-412	Professional Core Courses	Control System Lab	0	0	2	75	-	75	1	100
EEC-412	Engineering Science Course	Digital Electronics Lab	0	0	2	50	-	50	1	100
PEE-413/ 414	Professional Core Courses	Mini Project/ MOOCs	0	0	2	50	-	50	1	100
Total			**13**	**5**	**8**	**500**	**500**	**1000**	**22**	

Annexure-II

4th Semester Examination to be held in the year May 2020,2021,2022,2023

CREDIT-4

CLASS: B.E. 4TH SEMESTER
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-401
TITLE: ELECTRICAL MACHINES-I1
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
3	1	0	100	50

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Understand the concepts of rotating magnetic fields.
CO2	Understand the operation of ac machines.
CO3	Acquire knowledge of starting and braking of ac machines
CO4	Analyse performance characteristics of ac machines

Detailed Syllabus

SECTION A

Module 1: Fundamentals of AC machine windings

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil, full-pitch coils, concentrated winding, distributed winding, Air-gap MMF distribution with fixed current through winding, distribution factor. **(6 hours)**

Module 2: Pulsating and revolving magnetic fields

Magnetic field produced by a single winding - fixed current and alternating current ,Pulsating fields produced by spatially displaced windings, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field. **(6 hours)**

Module 3: Induction Machines

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque.Equivalentcircuit.Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines. **(10 hours)**

SECTION B

Module 4: Single-phase Induction Motors

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications. **(6 hours)**

Module 5: Synchronous Machines

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves.Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators.

(10 hours)

Text/References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
4. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
5. A. S. Langsdorf, "Alternating current machines", McGraw Hill Education, 1984.
6. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

4th Semester Examination to be held in the year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDIT- 4**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-402
TITLE: CONTROL SYSTEM
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
3	1	0	100	50

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Understand the concept of open loop and closed loop system, transfer functions and modelling of physical systems
CO2	Obtain transfer function using block diagram technique and signal flow graph and time domain analysis of control system.
CO3	Understand stability criterions and design of feedback control system.
CO4	Understand the concept of state space analysis and non linear system.

Detailed Syllabus

SECTION-A

Module 1: Introduction to Linear Control System

Control Systems, types of control systems, feedback and its effects, mathematical modelling of physical systems.**(6 hours)**

Module2: System Representation

Block diagrams, representation of control systems, transfer functions, signal flow graphs, Time Domain Analysis of Control Systems: Time domain analysis of first & 2nd order Control systems. Typical test signals for time response of control systems, time domain performance of first and second order control systems (steady state response and transient response). **(7 hours)**

Module 3: Control Components

AC and D.C. Servomotors, a.c. tachometer, synchro transmitter and receiver, synchro pair as control transformer, a.c. and d.c. position control system, stepper motor, magnetic amplifier and adaptive control. **(6 hours)**

SECTION-B

Module 4: Frequency Domain Analysis of Control System

Stability characteristic equation, stability of linear time invariant systems, Routh-Hurwitz stability Criterion, Root locus plot, Bode plot, Polar Plot, Nyquest Criterion. **(7hours)**

Module 5: Design of Feedback Control Systems

Approaches to system design, phase lead, and phase lag design using Bode-plot and root locus techniques. Introduction to P, PI and PID controllers. **(6 hours)**

Module 6: State space analysis and nonlinear systems

Types of non linearities, analysis of non-linear systems- Linearization method, phase plane method, describing functions and its application to system analysis. **(6 hours)**

RECOMMENDED BOOKS:

1. Modern Control Engineering — K.Ogatta
2. Automatic Control Systems — B.C. Kuo
3. Control System Engineering — Nagrath and Gopal
4. Linear Control System — B.S.Manke

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator and semi log graph paper is allowed.

4th Semester Examination to be held in the year May 2020,2021,2022,2023

CLASS: B E 4TH SEMESTER **CREDIT-4**
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE: SIGNAL AND SYSTEMS
COURSE CODE: PEE-403
DURATION OF EXAM-3 HOURS

			MARKS	
L	**T**	**P**	**External**	**Internal**
3	**1**	**0**	**100**	**50**

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Understand the concepts of signal and systems.
CO2	Understand the concepts of continuous time and discrete time systems.
CO3	Analyse systems in complex frequency domain.
CO4	Understand sampling theorem and its implications

Detailed Syllabus

SECTION A

Module 1: Introduction to Signals and Systems

Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, random and characteristics signals, energy and power signals some special time-limited signals; continuous and discrete time signals, continuous (CT, DT). **(10 hours)**

Module 2: Behaviour of continuous time signals

Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of system. **(10 hours)**

SECTION B

Module 3: Fourier, Laplace and z- Transforms

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis. **(12 hours)**

Module 4: Sampling and Reconstruction

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems. **(6 hours)**

Text/References:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms,and Applications", Pearson, 2006.
3. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.

NOTE: There shall be total eight questions, four from each section. Five questions have to be attempted selecting at least two questions from each section. Use of calculator is allowed.

4th Semester Examination to be held in the Year May 2020,2021,2022, 2023

CLASS: B.E. 4th SEMESTER **CREDIT-3**
BRANCH: ELECTRICAL ENGINEERING
COURSE NO: EEC-402
COURSE TITLE: DIGITAL ELECTRONICS
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
2	1	0	100	50

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Understand and examine various number systems to be used in digital design
CO2	Minimize the expressions using karnaugh map and implement them using logic gates in different logic families.
CO3	Analyse and design various combinational.
CO4	Analyze and design various sequential circuits.

Detailed Syllabus

SECTION-A

Module 1: Number System, Radix conversion, Arithmetic with base other than ten, Binary codes –weighted/Non weighted codes, Error detecting & correcting code (Hamming code), alphanumeric code, Subtraction of signed/unsigned number. (**8 Hours)**

Module 2: Logic Gates, Boolean algebra, Simplification of Boolean expressions, Minimization techniques, Karnaugh map (up to five variables) , Quine Mc-Clusky method, Simplification of Logic families – RTL, DTL, TTL, ECL & MOS families and their characteristics. (**8 Hours)**

SECTION-B

Module 3:Combinational logic circuits:Half and Full adders, Subtractors, BCD Adder, Comparators, Multiplexer, Realization of function using MUX, Demultiplexer, Decoder, Encoder, Code converters, General problems, PLA, Design of combinational circuit using PLA & PAL. (**8 Hours)**

Module 4: Introduction to sequential logic circuits, Synchronous and Asynchronous operation, Flip-Flops- R-S, J-K, D, T & Master-Slave flip-flop, Conversion of flip-flops, Shift registers, Analysis of asynchronous & synchronous sequential counter.

(**8 Hours)**

Books Recommended:

01. Digital Electronics — R.P Jain
02. Digital Electronics & Microcomputer — R.K. Gaur
03. Computer System Architecture — M.M. Mano
04. Digital Electronics — Jamini& K.M. Backward

NOTE: There shall be total 8 questions, four from each section. Five questions have to be attempted by the students selecting atleast two questions from each section.UseofCalculator is allowed.

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4th SEMESTER **CREDIT:-3**
BRANCH: ELECTRICAL ENGINEERING
COURSE NO: EEC-403
COURSE TITLE: ELECTROMAGNETIC WAVES
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS	
			External	Internal
2	1	0	100	50

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Attain knowledge about the vector analysis, coordinate system, electric and magnetic fields and calculation of flux density, potential and energy densities.
CO2	Analyse the Maxwell's equations and the wave propagation equation in free space and in different media
CO3	Able to compute dominant modes, degenerate modes for particular waveguide.
CO4	Understand the principle of pattern multiplication and apply this to find the radiation pattern of antenna array

Detailed Syllabus

SECTION - A

Module 1: Electrostatics

Revision of vector analysis with rectangular, cylindrical, Spherical & polar coordinates, Electrostatic Potential, Potential gradient, Method of images, Energy density in electrostatics field, Electric field in dielectric media, Capacitance, Solution of Electrostatic problems using Poisson's & Laplace equation. **(6 Hours)**

Module 2: Magnetostatics

Magnetic flux density, & Magnetic potential, Torque on a closed circuit, Energy density in the magnetic field. **(3 Hours)**

Module 3: Maxwell Equation Uniform Plane Wave

Application of Maxwell equation to circuits, Wave motion in perfect dielectric, Plane wave in lossy dielectric, Propagation in good conduction, Standing wave ratio, Polarization, Reflection of uniform plane wave. **(6 Hours)**

SECTION – B

Module 4: Waveguides

Parallel plane waveguide: Transverse Electric (TE) mode, transverse Magnetic(TM) mode, Cut-off frequency, Phase velocity and dispersion. Transverse Electromagnetic (TEM) mode, Analysis of waveguide-general approach, Rectangular waveguides.**(8 hour)**

Module 5: Antennas

Radiation parameters of antenna, Potential functions, Solution for potential functions, Radiations from Hertz dipole, Near field, Far field, Total power radiated by a dipole, Radiation resistance and radiation pattern of Hertz dipole, Hertz dipole in receiving mode. **(7 Hours)**

BOOK RECOMMENDED:

01.	Engineering Electromagnetic	Jseph A. Edminister
02.	Introduction to Electromagnetic	Griffith
03.	Engineering Electromagnetic	Jr. Hyat
04.	Network Line & Filter	J. D. Ryder
05.	Antenna & Wave Propagation	K. D. Prasad

NOTE: There will be eight questions of 20 marks each, four from each section. Students are required to attempt five questions selecting at leasttwo questions from each section. Use of Calculator is allowed.

4th Semester Examination to be held in the year May 2020,2021,2022,2023

CLASS: B.E. 4th SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-411
TITLE: ELECTRICAL MACHINES-II LAB

L	T	P	MARKS
			PRACTICAL
0	0	2	75

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Familiarize with different cut-sectional model of AC Machines.
CO2	Determine the voltage regulation3-phase Synchronous Generator by various methods.
CO3	Understand the characteristics of Induction and Synchronous Machines.
CO4	Perform the various tests on Induction Motor.

LIST OF EXPERIMENTS:

1. To Study the cut-sectional model of AC Machines.
2. Determination of voltage regulation of a 3-phase synchronous generator/alternator by E.M.F., M.M.F. & A.S.A. method (Non-Salient Pole type).
3. Determination of positive, negative and zero sequence Reactance of 3-phase synchronous machine.
4. Determination of V curves of a 3- phase synchronous Motor.
5. Power Angle characteristics of a 3-phase synchronous machine..
6. Study of parallel operation & synchronization of 3-phase synchronous generators.
7. Speed control of 3-phase Induction motor by varying supply frequency & of 3-phase slip Ring Induction motor by Rotor Impedance Control.
8. Determination of complete Torque/Slip or Torque/Speed characteristics of a 3-phase Induction-motor.
9. Starting of 3-phase Induction Motor.
10. Determination of parameters of Induction Motor using No-load and Blocked Rotor Test.

Note: Each student has to perform atleast eight experiments out of which 40% shall be simulation based. Additional Practicals / Experiments will be performed based on the course content requirements.

4th Semester Examination to be held in the year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-412
TITLE: CONTROL SYSTEM LAB

L	T	P	MARKS
			PRACTICAL
0	0	2	75

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Calculate the frequency response of first and second order system.
CO2	Verify the torque/speed characteristics of servo motors.
CO3	Study of synchro, transmitter and receiver.
CO4	Study PID controller.

LIST OF EXPERIMENTS:

1. To study the characteristics of the synchro transmitter and receiver
2. To study the torque synchro pair operation
3. To study the performance of various types of controllers used to control the temperature of an oven
4. To study the open loop system and its subsystems of an dc motor
5. To study the closed loop system and its subsystems of an dc motor
6. To study the bode plot of a plant
7. To study lag network design
8. To study lead network design
9. To study low frequency response of a motor
10. To study stepper motor motion using microprocessor interface

Note: Each student has to perform at least six experiments out of which 40% shall be simulation based. Additional Practicals / Experiments will be performed based on the course content requirements.

4th Semester Examination to be held in the year May 2020,2021,2022,2023

CLASS: B.E. 4TH SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINEERING
COURSE NO: EEC-412
COURSE TITLE: DIGITAL ELECTRONICS LAB
DURATION OF EXAM: 3 HOURS

L	T	P	MARKS PRACTICAL
0	0	2	50

COURSE OUTCOMES: - Student will be able to	
CO1	Implementation and verification of Boolean expressions using logic gates.
CO2	Design and implementation of various combinational circuits using digital IC's.
CO3	Design seven segment decoder using logical gates.
CO4	Design and implementation of various sequential circuits using digital IC's

LIST OF PRACTICAL :

1. Verification of truth tables of logical gates AND / OR / NOT, NAND, NOR, EXOR, EXNOR, gates.
2. Implementation of Boolean expression using AND, OR, NOT, NAND, & NOR logic.
3. Implementation of Decoder, Encoder using IC's & gates.
4. To implement half adder, half subtractor, full adder, full subtractor using different IC's & gates.
5. Implementation of multiplexer, Demultiplexer using IC's & gates.
6. Design of BCD to seven segment display using logical gates & IC's.
7. To design & verification of truth table of SR, JK, MS-JK Flip Flops.
8. To design various asynchronous counters using flip flops, gates & IC's.
9. To design various synchronous counters using flip flops, gates & IC's.
10. To design & verify the Truth tables of shift Registers.

Note: Each student has to perform atleast eight experiments and additional Practicals / Experiments will be performed based on the course content requirement.

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4th SEMESTER **CREDIT-1**
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE: MINI PROJECT
COURSE NO: PEE-413

L	T	P	MARKS PRACTICAL
0	0	2	50

COURSE OUTCOMES:- At the end of the semester the Student will be able to	
CO1	Complete their assigned mini project work initiated in the beginning of the semester.
CO2	Demonstrate the mini project work followed by question answer session.
CO3	Present and submit the detailed mini project report.

The mini-project is a team activity having 3-4 students in a team. This is electrical product design work with a focus on electrical circuit design. Mini Project should cater to a small system required in laboratory or real life. It should help students to familiarize with electrical components, devices and equipment's. After interactions with course coordinator and based on comprehensive literature survey/need analysis, the student shall identify the title and define the aim and objectives of Mini-Project. Complete Mini project and Documentation in the form of Mini Project Report is to be submitted at the end of Semester.

To evaluate a Mini project following is the scheme proposed:

Distribution of Marks:

Report file: 15 marks (30%)
Actual work done: 20 marks (40%)
Viva-voce: 15 marks (30%)

4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

CLASS: B.E. 4th SEMESTER **CREDIT: 1**
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE: MOOCs
COURSE NO: PEE-414

L	T	P	MARKS INTERNAL
0	0	2	50

MOOCS: A massive open online course (MOOC) is a model for delivering learning content to any person who wants to take a course by means of the web. It has been incorporated in the 4 th semester.
To evaluate a MOOCS course following is the scheme proposed:

Breakup of Marks:

Attendance- 10 marks
Students will have to visit the lab as per the time table and pursue their respective online course.

Report file-15 marks
A detailed report of about 20-25 pages has to be submitted to the department at the end of the semester. It should contain details about the course that was undertaken by the student. A copy of the assignments with solutions that have been uploaded on the MOOC platform should also be included in the final report. A copy of the certificate if awarded
Should also be appended to the report.

Presentation- 15 marks
The presentation should be given to the peers/students focusing on the key points of the course with an aim to share the knowledge.

Certification- 10 marks
The students awarded with the certificate will be given 10 marks.(Copy to be attached in the report.)