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 :

<table>
<thead>
<tr>
<th>Branch</th>
<th>Semester</th>
<th>For the Examination to be held in the years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical</td>
<td>Semester-III</td>
<td>December 2019, 2020, 2021 and 2022</td>
</tr>
<tr>
<td></td>
<td>Semester-IV</td>
<td>May 2020, 2021, 2022 and 2023</td>
</tr>
</tbody>
</table>

*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/MBSCE/UEET/BCET/YCET
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Section Officer (Confidential)
6. Incharge University Website

[Signature]
Assistant Registrar (Academics)
# B.E. Electrical Engineering 3rd Semester

Contact Hours: 28

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Type</th>
<th>Course Title</th>
<th>Load Allocation</th>
<th>Marks Distribution</th>
<th>Total Marks</th>
<th>Credits</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEE-301</td>
<td>Professional Core Courses</td>
<td>Electrical Machines-I</td>
<td>3</td>
<td>50 Internal, 100 External</td>
<td>150</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>PEE-302</td>
<td>Professional Core Courses</td>
<td>Electrical Circuit Analysis</td>
<td>3</td>
<td>50 Internal, 100 External</td>
<td>150</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>EEC-302</td>
<td>Engineering Science Course</td>
<td>Electronic Circuits I</td>
<td>2</td>
<td>50 Internal, 100 External</td>
<td>150</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>BSC-301</td>
<td>Engineering Science Course</td>
<td>Numerical Methods &amp; Transform Calculus</td>
<td>3</td>
<td>50 Internal, 100 External</td>
<td>150</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>PEE-306</td>
<td>Professional Core Courses</td>
<td>Energy Conservation</td>
<td>2</td>
<td>50 Internal, 100 External</td>
<td>150</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>PEE-311</td>
<td>Professional Core Courses</td>
<td>Electrical Machine Lab-I</td>
<td>0</td>
<td>75 Internal, 25 External</td>
<td>75</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>PEE-312</td>
<td>Professional Core Courses</td>
<td>Electrical Circuit Analysis Lab</td>
<td>0</td>
<td>50 Internal, 25 External</td>
<td>50</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>PEE-313</td>
<td>Professional Core Courses</td>
<td>Electrical Workshop</td>
<td>0</td>
<td>75 Internal, 25 External</td>
<td>75</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>EEC-312</td>
<td>Engineering Science Course</td>
<td>Electronic Circuits I Lab</td>
<td>0</td>
<td>50 Internal, 25 External</td>
<td>50</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>NCC-304</td>
<td>Non Credit Courses</td>
<td>Engineering Mechanics</td>
<td>2</td>
<td>0 Internal, 0 External</td>
<td>0</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>15</strong></td>
<td><strong>500 Internal, 500 External</strong></td>
<td><strong>1000</strong></td>
<td><strong>22</strong></td>
<td></td>
</tr>
</tbody>
</table>
### COURSE OUTCOMES:
At the end of the course the student will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>Understand the concepts of magnetic circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>Understand the operation of dc machines</td>
</tr>
<tr>
<td>CO3</td>
<td>Analyse the differences in operation of different dc machine configurations.</td>
</tr>
<tr>
<td>CO4</td>
<td>Analyse single phase and three phase transformers circuits.</td>
</tr>
</tbody>
</table>

### Detailed Syllabus

#### SECTION-A

**Module 1: Magnetic fields and magnetic circuits**
Review of magnetic circuits—MMF, flux, reluctance, inductance; review of Ampere Law and Biot-Savart 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. *(6 Hours)*

**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- 3 point and 4 point starters of dc machine. *(7 Hours)*

**Module 5: Transformers**

### Text / References:

### 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
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-302
TITLE: ELECTRICAL CIRCUIT ANALYSIS
DURATION OF EXAM: 3 HOURS

COURSE OUTCOMES:

| 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. (5 hours)

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 Sudhakar Shyam 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    BRANCH: ELECTRICAL ENGINEERING
COURSE NO: EEC-302    COURSE TITLE: ELECTRONIC CIRCUITS -I
DURATION OF EXAM: 3 HOURS

CREDIT-3
L    T    P    MARKS
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 clammers. (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. (8 Hours)

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
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE - NUMERICAL METHODS AND TRANSFORM CALCULUS
COURSE CODE – BSC 301
DURATION-3 HOURS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

COURSE OUTCOMES: - At the end of the semester the Student will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>CO2</th>
<th>CO3</th>
<th>CO4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn the basics of operators, their types and interpolation.</td>
<td>Find out the exact real root of algebraic, transcendental equations and differential equations.</td>
<td>Learn the concept of Laplace Transform, inverse Laplace transform of various functions and its applications.</td>
<td>Understand the idea of Fourier transform, Fourier sine and cosine transform and their property.</td>
</tr>
</tbody>
</table>

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

Text / References:
3. Dr. Bhopinder Singh,””ENGINEERING MATHEMATICS III”

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 December 2019, 2020, 2021, 2022

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

COURSE OUTCOMES:

C01 Obtain knowledge about energy conservation policy, regulations and business practices.
C02 Recognize opportunities for enabling rational use of energy audit.
C03 Apply knowledge of Energy Conservation Opportunities in a range of contexts and Developing innovative energy efficiency solutions and demand management strategies.
C04 Analyze energy systems from a supply and demand perspective.

Detailed Syllabus

SECTION A

Module 1: Energy Conservation

Module 2: Energy Audit

SECTION B

Module 3: Demand Side Management

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

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
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE: ENGINEERING MECHANICS
COURSE NO. NCC-304
DURATION OF EXAM: 3 HOURS

CREDITS: 0

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
<th>External</th>
<th>Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>100</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

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

NOTE:

1. Question paper will be of 3 Hours’ duration
2. There will be 8 questions in all, four from Section- A (each of 20 marks) and four from Section - B.
3. Students are required to attempt five questions in all, at least two question from each section. Use of scientific calculator will be allowed in the examination hall
3rd Semester Examination to be held in the year Dec 2019, 2020, 2021, 2022

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

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.

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

BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-312
TITLE: ELECTRICAL CIRCUIT ANALYSIS LAB

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>2</td>
<td>50</td>
</tr>
</tbody>
</table>

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

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.
9. Determination of driving point and transfer function of a two port ladder network.

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

CLASS: B.E. 3rd SEMESTER
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-313
TITLE: ELECTRICAL WORKSHOP

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>

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.
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 ENGINEERING                                
COURSE NO: EEC-312                                            
COURSE TITLE: ELECTRONIC CIRCUITS I LAB                       

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

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.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Type</th>
<th>Course Title</th>
<th>Load Allocation</th>
<th>Marks Distribution</th>
<th>Total Marks</th>
<th>Credits</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEE-401</td>
<td>Professional Core Courses</td>
<td>Electric Machines II</td>
<td>3 1 0</td>
<td>50 100</td>
<td>150</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>PEE-402</td>
<td>Professional Core Courses</td>
<td>Control System</td>
<td>3 1 0</td>
<td>50 100</td>
<td>150</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>PEE-403</td>
<td>Professional Core Courses</td>
<td>Signal and Systems</td>
<td>3 1 0</td>
<td>50 100</td>
<td>150</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>EEC-402</td>
<td>Engineering Science Course</td>
<td>Digital Electronics</td>
<td>2 1 0</td>
<td>50 100</td>
<td>150</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>EEC-403</td>
<td>Engineering Science Course</td>
<td>Electromagnetic Waves</td>
<td>2 1 0</td>
<td>50 100</td>
<td>150</td>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>PEE-411</td>
<td>Professional Core Courses</td>
<td>Electric Machines Lab II</td>
<td>0 0 2</td>
<td>75 -</td>
<td>75</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>PEE-412</td>
<td>Professional Core Courses</td>
<td>Control System Lab</td>
<td>0 0 2</td>
<td>75 -</td>
<td>75</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>EEC-412</td>
<td>Engineering Science Course</td>
<td>Digital Electronics Lab</td>
<td>0 0 2</td>
<td>50 -</td>
<td>50</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>PEE-413/414</td>
<td>Professional Core Courses</td>
<td>Mini Project/ MOOCs</td>
<td>0 0 2</td>
<td>50 -</td>
<td>50</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>13 5 8</strong></td>
<td><strong>500 500</strong></td>
<td><strong>1000</strong></td>
<td><strong>22</strong></td>
<td></td>
</tr>
</tbody>
</table>
Annexure-II

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

CLASS: B.E. 4th SEMESTER
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: EE-401
TITLE: ELECTRICAL MACHINES-II
DURATION OF EXAM: 3 HOURS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

CREDIT-4

COURSE OUTCOMES:
At the end of the semester the Student will be able to

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Understand the concepts of rotating magnetic fields.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>Understand the operation of ac machines.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>Acquire knowledge of starting and braking of ac machines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>Analyse performance characteristics of ac machines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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:

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
BRANCH: ELECTRICAL ENGINEERING
COURSE CODE: PEE-402
TITLE: CONTROL SYSTEMS
DURATION OF EXAM: 3 HOURS

CREDIT- 4

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

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)

Module 2: 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. (7 hours)

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
BRANCH: ELECTRICAL ENGINEERING
COURSE TITLE: SIGNALS AND SYSTEMS
COURSE CODE: PEE-403
DURATION OF EXAM - 3 HOURS

COURSE OUTCOMES:-
At the end of the semester the Student will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>Understand the concepts of signal and systems.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>Understand the concepts of continuous time and discrete time systems.</td>
</tr>
<tr>
<td>CO3</td>
<td>Analyse systems in complex frequency domain.</td>
</tr>
<tr>
<td>CO4</td>
<td>Understand sampling theorem and its implications</td>
</tr>
</tbody>
</table>

MARKS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>External</th>
<th>Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>0</td>
<td>100</td>
<td>50</td>
</tr>
</tbody>
</table>

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

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:

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
BRANCH: ELECTRICAL ENGINEERING
COURSE NO: EEC-402
COURSE TITLE: DIGITAL ELECTRONICS
DURATION OF EXAM: 3 HOURS

CREDIT-3
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. Use of Calculator is allowed.
4th Semester Examination to be held in the Year May 2020, 2021, 2022, 2023

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

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50</td>
</tr>
</tbody>
</table>

COURSE OUTCOMES:
At the end of the semester the Student will be able to

<table>
<thead>
<tr>
<th>CO1</th>
<th>CO2</th>
<th>CO3</th>
<th>CO4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attain knowledge about the vector analysis, coordinate system, electric and magnetic fields and calculation of flux density, potential and energy densities.</td>
<td>Analyse the Maxwell’s equations and the wave propagation equation in free space and in different media</td>
<td>Able to compute dominant modes, degenerate modes for particular waveguide.</td>
<td>Understand the principle of pattern multiplication and apply this to find the radiation pattern of antenna array</td>
</tr>
</tbody>
</table>

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. Edminster
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 least two questions from each section. Use of Calculator is allowed.
LIST OF EXPERIMENTS:

1. To Study the cut-sectional model of AC Machines.
3. Determination of positive, negative and zero sequence Reactance of 3-phase synchronous machine.
5. Power Angle characteristics of a 3-phase synchronous machine.
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.

Note: Each student has to perform at least eight experiments out of which 40% shall be simulation based. Additional Practicals / Experiments will be performed based on the course content requirements.
**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
BRANCH: ELECTRICAL ENGINEERING
COURSE NO: EEC-413
COURSE TITLE: DIGITAL ELECTRONICS LAB
DURATION OF EXAM: 3 HOURS

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>2</td>
<td>50</td>
</tr>
</tbody>
</table>

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.
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                                                   

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:

- Attendance: 10 marks (20%)
- Report file: 15 marks (30%)
- Actual work done: 15 marks (30%)
- Viva-voce: 10 marks (20%)
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 4th 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.)