CURRICULUM

(Scheme of Studies and Examinations for 03rd-04th semesters,

w.e.f. academic year 2019-20)

for

UNDERGRADUATE DEGREE (B.Tech.) COURSE

IN

**ELECTRICAL ENGINEERING**

## [Scheme for 3rd& 4thsems.to be adopted in 2019-20]

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DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE AND TECHONOLOGY

(Established Under Haryana Legislature Act NO. 29 of 2006

And Approved by U.G.C. under Sections 2(f) and 12(B) of U.G.C. Act, 1956

NBA Accredited Department and NAAC ‘A’ grade University )

Murthal-131039, Sonipat (Haryana)

[www.dcrust.ac.in](http://www.dcrust.ac.in)

**DeenbandhuChhotu Ram University of Science & Technology, Murthal (Sonepat)**

**B.Tech. 2nd YEAR ELECTRICAL ENGINEERING (SEMESTER – III)**

**Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2019-20**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sl. No. | Course Code  | Course Title  | Teaching Schedule | Marks of Class work | Examination Marks | Total | Credits  | Duration of Exam. |
| Theory | Practical |
| L | T | P |
| 1 | EE201C | Electrical Circuit Analysis  | 3  | 1  | 0  | 25 | 75 | 0 | 100 | 4  | 3 |
| 2 | EE203C | Semiconductor Devices and Circuits | 3  | 1 | 0  | 25 | 75 | 0 | 100 | 4 | 3 |
| 3 | EE281C | Semiconductor Devices and Circuits Laboratory  | 0  | 0  | 2  | 25 | 0 | 75 | 100 | 1  | 3 |
| 4 | EE205C | Electrical Machines-I  | 3  | 1 | 0  | 25 | 75 | 0 | 100 | 4 | 3 |
| 5 | EE283C | Electrical Machine-I s Laboratory | 0  | 0  | 2 | 25 | 0 | 75 | 100 | 1  | 3 |
| 6 | EE207C | Measurements and Instrumentation | 3  | 1 | 0 | 25 | 75 |  | 100 | 4 | 3 |
| 7 | EE285C | Measurements and Instrumentation Laboratory  | 0  | 0  | 2  | 25 | 0 | 75 | 100 | 1  | 3 |
| 8 | ME201C | Engineering Mechanics (Common with ME and EEE) | 3  | 0 | 0  | 25 | 75 | 0 | 100 | 3 | 3 |
| 9 | MC203CMC201C | Constitution of India (Gr. A)Environment Studies (Gr. B) |  3 |  0 |  0 |  25 | 75 | 0 |  100 | 0 | 3 |
| **Total** | **18** | **04** | **06** | **225** | **450** | **225** | **900** | **22** | **27** |

**L= Lecture, T = Tutorial, P = Practical,&MC = Mandatory Course (Audit)**

1. All the branches are to be divided into groups ‘A’ and ‘B’ as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.
2. For DCRUST Murthal: GROUP A: BME, BT, CSE, ECE. GROUP B: CE, CHE, EE, ME.
3. The Environmental studies (GES201B) and Environmental Studies Field Work (GES203B) are compulsory

& qualifying courses.

1. The students will be allowed to use non-programmable scientific calculator in the examination. However,

Sharing/exchange of calculator is prohibited in the examination.

1. Electronics gadgets including Cellular phones are not allowed in the examination**.**
2. For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**DeenbandhuChhotu Ram University of Science & Technology, Murthal (Sonepat)**

**B.Tech. 2ndYEARELECTRICAL ENGINEERING(SEMESTER – IV)**

**Choice Based Credit System Scheme Of Studies & Examinations w.e.f. 2019-20**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sl. No.  | Course Code  | Course Title  | Teaching Schedule | Marks of Class work | Examination Marks | Total | Credits  | Duration of Exam |
| L | T | P |
| Theory | Practical |
| 1  | EE202C | Logic and Sequential Circuits | 3  | 1 | 0  | 25 | 75 |  | 100 | 4 | 3 |
| 2  | EE280C | Logic and Sequential Circuits Laboratory  | 0  | 0  | 2  | 25 | 0 | 75 | 100 | 1 | 3 |
| 3  | EE204C | Electrical Machines – II  | 3  | 1 | 0  | 25 | 75 | 0 | 100 | 4 | 3 |
| 4  | EE282C | Electrical Machines- II Laboratory  | 0  | 0  | 2 | 25 | 0 | 75 | 100 | 1 | 3 |
| 5  | EE206C | Power Systems – I  | 3  | 0 | 0 | 25 | 75 |  | 100 | 3 | 3 |
| 6  | EE284C | Power Systems Laboratory – I | 0  | 0  | 2  | 25 | 0 | 75 | 100 | 1 | 3 |
| 7  | EE208C | Signals and Systems  | 3 | 0 | 0  | 25 | 75 | 0 | 100 | 3  | 3 |
| 8  | MATH303C | Mathematics – III (Probability and Statistics) | 3  | 1  | 0  | 25 | 75 | 0 | 100 | 4  | 3 |
| 9 | BT221C | Biology for Engineers ( common with CHE and EEE) | 3 | 0 | 0  | 25 | 75 | 0 | 100 | 3  | 3 |
| 10  | MC201CMC203C | Environment Studies (Gr. A)Constitution of India ( Gr. B)  |  3 | 0 | 0 | 25 | 75 | 0 | 100 | 0 | 3 |
| **Total** | **21** | **03** | **06** | **250** | **525** | **225** | **1000** | **24** | **30** |

**L= Lecture, T = Tutorial, P = Practical,&MC = Mandatory Course (Audit)**

1. All the branches are to be divided into groups ‘A’ and ‘B’ as per the suitability of the institute/college, so that there is an equitable distribution of teaching load in odd and even semesters.
2. For DCRUST Murthal: GROUP A: BME, BT, CSE, ECE. GROUP B: CE, CHE, EE, ME.
3. The Environmental studies (GES201B) and Environmental Studies Field Work (GES203B) are compulsory & qualifying courses.
4. The students will be allowed to use non-programmable scientific calculator in the examination. However,sharing/exchange of calculator is prohibited in the examination.
5. Electronics gadgets including Cellular phones are not allowed in the examination**.**
6. At the end of 4th semester, each student has to undergo Professional Training (Level - 2) of at least 4 weeks from the industry / institute /research lab / training centre, etc. during summer vacation & its evaluation shall be carried out in 5th Semester.
7. For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**EE 201C ELECTRICAL CIRCUIT ANALYSIS**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits | Class-work Marks | : 25 |
| 3 | 1 | 0 | 4 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | :100 |
|  |  |  |  | Duration of Examination | :3 Hrs |

**Course Outcomes**:

At the end of this course, students will demonstrate the ability to

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyse circuits in the sinusoidal steady-state (single-phase and three-phase).
4. Analyse two port circuit behaviour.

**UNIT-I**

 **Network Theorems (10 Hours)**

Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources.Node and Mesh Analysis. Concepts of duality and dual networks.

**UNIT-II**

**Sinusoidal steady state analysis (11Hours)**

Phasor Analysis, Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response to dc and sinusoidal ac. Three-phase circuits. Mutually-coupled circuits, Dot Convention in coupled circuits & Ideal Transformer.

**UNIT-III**

**Electrical Circuit Analysis Using Laplace Transforms (8 Hours)**

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions.Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

**UNIT-IV**

**Two Port Network and Network Functions (6 Hours)**

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission & inverse transmission parameters and hybrid& inverse hybrid parameters, interconnections of two port networks.

**Text / References:**

1. M. E. Van Valkenburg, “Network Analysis”, Prentice Hall, 2006.

2. D. Roy Choudhury, “Networks and Systems”, New Age International Publications,

 1998.

3. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill

 Education,2013.

 4.C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education,

2004.

5. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

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**EE203C** **SEMICONDUCTOR DEVICES AND CIRCUITS**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 3 | 1 | 0 | 4 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | :100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

**Course Outcomes:**

At the end of this course, students will demonstrate the ability to

1. Understand the characteristics of transistors.
2. Design and analyse various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.

**UNIT-I**

**Diode circuits (4 Hours)**

P-N junction diode, I-V characteristics of a diode; Performance analysis of half-wave and full-wave rectifiers, Zenerdiodes, clamping, clipping and regulator circuits.

**BJT circuits (8 Hours)**

Structure and I-V characteristics of a BJT; Biasing circuits. BJT as a switch. BJT as an amplifier: small-signal model,common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.

**UNIT-II**

**JFET &MOSFET circuits (8 Hours)**

JFET &MOSFET structure and I-V characteristics, Biasing circuits. MOSFET as a switch. MOSFET as an amplifier: small-signal model and common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

**UNIT-III**

**Power and operational amplifiers (8 Hours)**

Power amplifier; ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, CMRR, gain bandwidth product), differential amplifier.

**UNIT-IV**

**Application of op-amp:**

**Linear applications of op-amp (8 Hours)**

Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, instrumentation amplifier, differentiator, integrator, active filter, oscillators, (Wein bridge and phase shift).

**Nonlinear applications of op-amp (6 Hours)**

Comparator, Zero Crossing Detector, Schmitt trigger ckt., Square-wave and triangular-wave generators, peak detector.

**Text/References:**

1. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University

Press, 1998.

1. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier

 theory and applications”, McGraw Hill U. S., 1992.

3. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.

4. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.

5. P.R. Gray, R.G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated

 Circuits”, John Wiley & Sons, 2001.

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

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**EE281C** **SEMICONDUCTOR DEVICES AND CIRCUITS LABORATORY**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 0 | 0 | 2 | 1 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | :100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

**COURSE OUTCOMES:**

Through this course, the students:

1. Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and operational amplifier.
2. Develop the ability to analyze and design analog electronic circuits using discrete components.
3. Observe the amplitude and frequency responses of common amplification circuits.
4. Design, construct, and take measurement of various analog circuits to compare experimental results in the laboratory with theoretical analysis.

**LIST OF EXPERIMENTS:**

1 To calculate efficiency of half wave and full wave rectifiers

2 Design power supply filter.

3 To drawn the characteristic of diode as a clipper and clamper.

4 To Realizezener diode as a voltage regulator.

5 To design CE amplifier for voltage, current and Power gains input, output

impedances.

6 To use CC amplifier as a buffer.

7 To plot frequency response of RC coupled amplifier.

8 To designconstant current source by using transister CE configuration .

9 To plot characteristics of FET.

10 To Design FET common source amplifier.

11 Design of FET common drain amplifier.

12 Graphical determination of small signal hybrid parameter of bipolar junction

transistor.

13 To Study and design of a DC voltage doubler.

14 To perform at least three out of above experiments on NI Elvis board.

**Note:-**

1 Total ten experiments are to be performed in the semester.

2 At least seven experiments should be performed from the above list. Remaining three experiments should be performed asdesigned and set by the concerned institution as per the scope of the syllabus.

**EE205C ELECTRICAL MACHINES-I**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 3 | 1 | 0 | 1 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | :100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

**Course Outcomes:**

At the end of this course, students will demonstrate the ability to

1. Understand the concepts of magnetic circuits.
2. Understand the operation of dc machines.
3. Analyse the differences in operation of different dc machine configurations.
4. Analyse single phase and three phase transformers circuits.

**Unit-I**

**Magnetic fields and magnetic circuits (5 Hours):**

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 gap and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.

**Electromagnetic force and torque (6 Hours):**

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. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency

**Unit-II**

**DC Machines (10 Hours):**

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, effect and mitigation.

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.

**Unit-III**

**DC machine (4 Hours):**

Starting, braking and speed control of DC motors. Losses, load testing and back-to-back testing of DC machines.

**Transformers (6 Hours):**

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing of single phase and three phase transformer - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses.

**Unit-IV**

**Transformers (10 Hours):**

Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers, Three-phase transformer- construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers,

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:**

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**EE283C**ELECTRICAL MACHINES-I LAB

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 0 | 0 | 2 | 1 |  Exam Marks | : 75 |
|  |  |  |  |  Total Marks | :100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the basic operation of Electrical machines
2. To Analyse various tests on Electrical machines
3. To Design some test circuits for Electrical Machines
4. To understand and analyse design parameters of transformers

LIST OF EXPERIMENT

1. To perform load test on DC shunt motor and determine performance characteristics

2. To perform load test on DC shunt generator.

3. To determine efficiency of DC shunt Machine by Hopkinson’s test.

4. To study speed control of DC shunt motor by field control and armature control method.

5. To study Ward Leonard method of speed control of D.C. motor.

6. To find turns ratio & polarity of a 1-phase transformer.

7. To perform open & short circuit tests on a 1-phase transformer, and determine transformer parameter and efficiency at different loads.

8. To separate the hysteresis and eddy current losses of a Transformer.

9. To perform Sumpner's back to back test on 1-phase transformers.

10. To perform Parallel operation of two 1-phase transformers.

11. To perform Parallel operation of two 3-phase transformers.

12.To convert three phase to two-phase By Scott-connection.

NOTE:

1. The students will be required to perform at least 8 experiments/exercises from the above list and any other experiments designed on the basis course.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing/ex-change of calculator are prohibited in the examinations.

3. Electronic gadgets including cellular phones are not allowed in the examination.

**EE207C** **MEASUREMENTS AND INSTRUMENTATION**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

 **SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 3 | 1 | 0 | 4 |  Exam Marks | : 75 |
|  |  |  |  |  Total Marks | :100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

**COURSE OUTCOMES:**

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

1. Learn about various measurement instruments for measurement of Voltage, Current, Power, Power Factor & Frequency, their construction, operating principle, limitations, etc.;
2. Understand statistical data analysis& errors in instruments;
3. Analyse the static characteristics of instruments
4. Understand the measurement of parameters & variables with the help of D.C. & A.C. bridges.

**UNIT- I**

**Fundamental Concepts Relating to Measurements:**True Value, Static Characteristics of Instruments (Accuracy, Precision, Resolution, Threshold, Sensitivity, Drift, Hysteresis & Dead-band, Dead Time); Classification of Instruments (Absolute & Secondary Instruments; Indicating, Recording & Integrating instruments); Generalized Instrument (Block diagram, description of blocks); Three forces in Electromechanical indicating instruments; Comparison of damping methods & their suitability; Scale information.

Errors in Measurements (Gross, Systematic, Random); Basic statistical analysis applied to measurements: Mean, standard deviation, Six-sigma estimation, Cp, Cpk, process capability indices.

**UNIT- II**

**MEASURING INSTRUMENTS FOR VOLTAGE & CURRENT:** Construction, Operating Principle, torque equation, Shape of scale, use as Ammeter or as Voltmeter (Extension of Range), Use on AC/DC or both, Advantages & disadvantages, Errors (Both on AC/DC) of PMMC types, Electrodynamic Type, Moving iron type (attraction, repulsion & combined types), & Induction type instruments, Instrument Transformers(C.T. & P.T.)

**UNIT- III**

**WATTMETERS & ENEGRY METERS:** Construction, operating principle, Torque equation, Shape of scale, Errors, Advantages & Disadvantages of Electrodynamic& Induction type Wattmeters; Single phase induction type Energy meter, Compensation & creep in energy meter.

**POWER FACTOR & FREQUENCY METERS:** Construction, operation, principle, Torque equation, Advantages & disadvantages of Single phase power factor meters (Electrodynamic& Moving Iron types) & Frequency meters (Electrical Resonance Type: Ferrodynamic&Electrodynamic types).

**UNIT- IV**

**MEASUREMENT OF RESISTANCES (MEDIUM, LOW & HIGH):** Voltmeter-ammeter method & Substitution Method for medium range resistance measurement; Limitations of Wheatstone bridge; Four-terminal resistance; Kelvin’s double bridge method for low resistance measurement, Difficulties in high resistance measurements; Measurement of high resistance by direct deflection & loss of charge methods, Meggar.

**MEASUREMENT OF INDUCTANCE (L) & CAPACITANCE (C) & FREQUENCY BY A.C. BRIDGES:** General balance equation, Circuit diagram, Phasor diagram, Advantages, disadvantages, applications of Maxwell’s inductance-capacitance,DeSauty Bridge, Hays Bridge, Owen’s Bridge, Schering Bridge, Wein’s bridge, Anderson Bridge.

**TEXT BOOK:**

A text Book of Measurements & Instrumentation (With Experiments) by J.S. Saini, Pub. New Age Publishers, N. Delhi.

**REFERENCE BOOKS:**

1. A Course in Elect. & Electronic Measurements & Instrumentation by A. K. Sawhney; Khanna Pub.
2. Electrical Measurements by E.W. Golding & F.C. Widdis; Pub.: Reem Publications
3. Electronic & Elect. Measurement & Instrumentation by J.B. Gupta; Pub.: Kataria& Sons.
4. Electronic Instrumentation & Measurement Technique, W.D. Cooper & A.D. Helfrick; Pub.: Prentice Hall
5. Measuring Systems by Ernest O. Doebelin&Dhanesh N. Manik; Pub.: McGraw Hill.

**Note:**

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2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

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**EE285C** **MEASUREMENTS AND INSTRUMENTATION LABORATORY**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 0 | 0 | 2 | 1 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

**COURSE OUTCOMES:**

 At the end of this Laboratory course, the students will be able to have hands on experience of:

1. Various measuring instruments;
2. Understanding statistical data analysis & errors in instruments;
3. Measurement of power and power factor using different techniques;
4. Measurement of parameters & variables with the help of D.C. & A.C. bridges;
5. Storage & retrieval of waveforms/ data to & from DSO and computations therefrom.

**LIST OF EXPERIMENTS**

1. To measure the resistances of a batch of resistors (same-value by specifications) and estimate their statistical parameters (mean & standard deviation).
2. To measure inductance (L) by Maxwell's bridge and by an LCR meter.
3. To measure capacitance (C) by De-Sauty's bridge and by an LCR meter.
4. To measure frequency (f) by Wien's bridge.
5. To measure resistance of a four-terminal Low Resistance using Kelvin's double bridge.
6. To measure High resistance and Insulation resistance using Megger.
7. To use DSO for storage and retrieval of steady state periodic waveforms produced by a function generator. Consider selection of trigger source and trigger level, selection of time scale and voltage scale. Also alter bandwidth of measurement and sampling rate & record observations.
8. To Store & Retrieve one cycle of data of a periodic waveform from a DSO and use the values of data to compute RMS values using C or MATLAB program.
9. To use DSO to capture transients like step response of R-L-C circuit.
10. To effect current measurement using Shunt, C.T., and Hall sensor.
11. To measure power with the help of Wattmeter, C.T. & P.T.
12. To measure, using 2-wattmeter method, the (a) power in a balanced & an unbalanced 3-phase load (b) p.f. in a balanced 3-phase load.
13. To measure power &p.f. by 3-ammeter method.
14. To measure power &p.f. by 3-voltmeter method.
15. To measure high resistance by loss of charge method.

**NOTE:**

The students are required to perform 10 experiments, with at least 8 experiments from the above list and further two experiments either from the above list or from any other experiments designed on the basis of the corresponding theory course.

**ME201C** **ENGINEERING MECHANICS**

**B.TECH. (Common with Mech. Engg. and Elecrical &Electronics Engg.)**

**SEMESTER-III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 3 | 0 | 1 | 4 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

 **UNIT-I**

**REVIEW OF BASIC FORCE SYSTEMS**: Dimensions and units of mechanics, idealization of mechanics, laws of mechanics, vector algebra review, moment of a force about a point and axis, the couple and couple moment, addition and subtraction of couples, moment of a couple about a line, translation of a force to a parallel position, resultant of a force system, equivalent force, Friction-static and dynamics, Problems.

**EQUILIBRIUM**: Introduction, free body diagram, control volumes, general equations of equilibrium,

two point equivalent loading, static in-determinacy, simple truss, method of joints, method of sections, Problems.

UNIT-II

**PROPERTIES OF SURFACES, MOMENTS AND PRODUCTS OF INERTIA** : First moment of an area and the centroid, principal axes, formal definition of inertia quantities, relation between mass-inertia terms and area-inertia terms, translation of coordinate axes, transportation properties of the inertia terms, a brief introduction to tensors, the inertia of ellipsoid and principal moments of inertia, Problems.

**UNIT-III**

**KINEMATICS OF PARTICLES AND RIGID BODIES**: Velocity and acceleration in path andcylindrical coordinates, motion of a particle relative to a pair of translating axes, inertial and non inertial frame of reference, centripetal and coriolis acceleration , definition and motion of a rigid body in the plane, translation and rotation in the plane, Chasles theorem, kinematics in a coordinate system rotating and translating in the plane, angular momentum about a point of a rigid body planar motion; Euler’s laws of motion , Problems.

**UNIT-IV**

**PARTICLE DYNAMICS, ENERGY & MOMENTUM METHODS**: Newton's law for rectangular

coordinates & cylindrical coordinates, Newton's law for path variables, work energy equations, work energy equations for a systems of particles, linear and angular momentum equations for a systems of particles. Conservation of angular momentum, Problems.

**TEXT BOOK:**

1. Engineering Mechanics - Statics & Dynamics by R.C. Hibler Pearson.
2. Engineering Mechanics - Statics & Dynamics by I.H. Shames, PHI, New Delhi
3. Engineering Mechanics – Timoschenko.

**REFERENCE BOOKS:**

1. Statics & Dynamics by J.L. Meriam, JohnWiley& Sons (P) Ltd. New York.

2. Statics & Dynamics by Beer & Johnson, MGH, New Delhi.

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

## B.Tech (Semester III/IV)

**MC203C Constitution of India**

**(Common for all branches of B. Tech.)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Class-work Marks | : 25 |
| 3 | 0 | 0 | 0 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

## **Course Objectives:**

## To make students conscious citizens of India and well equip them to explain and understand the importance of constitution of the country

## **Course Contents:**

## Unit I

**Philosophy of Indian Constitution**

## Ideological Basis and Salient Features of Indian Constitution

## Fundamental Rights & Duties of the Citizens

## Directive Principles of State Policy

## Unit II

**Nature and Dynamics of Indian Federalism**

 Federalism: Theory and Practice in India

 Federal Features of the Indian Constitution

 Legislative, Administrative and Financial Relations between the Union and the States

## Unit III

**Union and State Legislature**

## Parliament: Composition, Functions and Working of the Parliamentary system

## State Legislature: Composition and Functions of Vidhan Sabha/ Vidhan Parishad

## Unit IV

**Centre and State: Executive and Judiciary**

 President, Prime Minister and Council of Ministers

 Governor, Chief Minister and Council of Ministers

 Judiciary: Supreme Court; High Court

## Course Outcomes:

## At the end of the course students will be able to

## To understand basic features of the constitution and rights and duties of Indian citizens

## To understand the basic structure of Centre and State Government

## To get acquainted with the nature of parliamentary form of Government

## To have knowledge of the executive and judiciary powers in Indian democratic set-up

## Scheme of End Semester Examinations (Major Test):

1. The duration of examinations will be three hours.
2. Nine questions of 15 marks each will be set out of which the students will have to attempt five questions in all.
3. First question of 15 marks will be compulsory. It will cover all the four units of the syllabus. The nature of the questions in each unit will depend upon the nature of content therein. The questions may have sub-parts with marks assigned against each.
4. Question No 02 to 09 of 15 marks each will be set from the four units of the syllabus --- two from each unit.
5. In addition to first compulsory question the students will have to attempt four more questions, selecting one from each unit.

## Recommended Readings:

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## Austin G., *The Indian Constitution: Corner Stone of a Nation*, New Delhi: Oxford University Press, 1966

## Basu D.D., *An Introduction to the Constitution of India*, New Delhi: Prentice Hall, 1994

## Kothari R., *Politics in India*, New Delhi: Orient Language, 1970

## Siwach J.R., *Dynamics of Indian Government andPolitics*, New Delhi: Sterling Publishers, 1985

## Bhambhri C.P., *The Indian State--FiftyYears*, New Delhi: Shipra, 1997

## Ghai U.R.*, IndianPoliticalSystem*, Jalandhar: New Academic Publishing Company, 2010

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**MC201C (Environmental Studies)**

**(Common for all branches of B.Tech and B.Arch)**

**SEMESTER-III /IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 3 | 0 | 0 | 0 | Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

 **UNIT I 10 lectures**

Unit 1: The Multidisciplinary Nature of Environmental Studies, .Introduction to Environment: Definition, Scope, and importance of environmental studies; need for public awareness.

Environmental Pollution: Definition, Cause and effects of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Role of an individual in prevention of pollution, Pollution case studies

**UNIT- II**

 **10 lectures**

 Natural Resources: Water resources: over-utilization, floods, drought, dams-benefits and problems; Mineral resources: Use and exploitation, environmental effects; Food resources : changes caused by modern agriculture, fertilizer-pesticide problems, water logging, Energy resources : Growing energy needs, renewable and non renewable energy sources; Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

**UNIT –III**

 **10 lectures**

Ecosystems and Biodiversity: Concept of an ecosystem, Structure and function, Energy flow, Ecological succession, ecological pyramids. Concept of Biodiversity, definition and types, Hot-spots of biodiversity; Threats to biodiversity, Endangered and endemic species of India, Conservation of biodiversity.

**UNIT –IV**

 **8 lectures**

Social Issues and Environment: Water conservation, rain water harvesting, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, Public awareness. Population growth, variation among nations, Family Welfare Programme. Human Population and the Environment - Population growth, Population explosion, Women and Child Welfare.

Field Work - Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

 **Total : 43**

**COURSE OUTCOMES**:

On completion of the course, the students will be able to:

1. Develop concepts of basic environmental factors.
2. Introduce to the students the basic understanding of ecosystem and its structural and functional aspects and vast biodiversity
3. Outline aspects of environmental issues.
4. Understand the knowledge of energy resources and their environmental implications

REFERNCE BOOKS:

1. **A Textbook of Environmental Studies** by [Asthana D.K.](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Asthana+D.K.&search-alias=stripbooks) and [AsthanaMeera](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_2?ie=UTF8&field-author=Asthana+Meera&search-alias=stripbooks)
2. **Fundamental Concepts in Environmental Studies**by [Mishra D.D.](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Mishra+D.D.&search-alias=stripbooks)
3. **Environmental Studies** by [S.C Sharma M.P Poonia](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=S.C+Sharma+M.P+Poonia&search-alias=stripbooks)
4. **Textbook of Environmental Studies for Undergraduate** by [ErachBharucha](https://www.amazon.in/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&field-author=Erach+Bharucha&search-alias=stripbooks)
5. **Environmental Studies: Third Edition** by [R. Rajagopalan](https://www.amazon.in/R.-Rajagopalan/e/B006ILFF28/ref%3Ddp_byline_cont_book_1)

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**EE202 LOGIC AND SEQUENTIAL CIRCUITS**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 3 | 0 | 0 | 4 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

COURSE OBJECTIVES:

The main objective of this course is

1. To give the students basic knowledge of the logical operation and digital circuits.
2. Understanding the mathematical operations done in digital circuits.
3. To provide the understanding of data storage.
4. How decision making and other events take place in digital cicuits.

UNIT - I

**Fundamentals of Digital Systems and logic families**: Digital Signals, Digital Circuits, Logic Symbols and Truth Tables, AND, OR, NOT, NAND, NOR and Exclusive-OR Operations, Universal Gates, Boolean Algebra, Examples of IC Gates, Bases-2, 8, 10 and 16 Number Systems (Binary, Signed Binary, Octal Hexadecimal Number),Conversion from one Base to other Base,Binary Arithmetic, Addition, Subtraction, One’s and Two’s Complements Arithmetic, Other Binary Codes, Error Detecting and Correcting Codes, Digital Logic Families, TTL, Schottky TTL and CMOS Logic, Interfacing CMOS and TTL, Tri-State Logic.

(12Hours)

UNIT - II

**Combinational Digital Circuits**: Standard Representation for Logic Functions, Fundamental Sum of Products and Product of Sum Expressions, K-Map Representation, Simplification of Logic Functions Using K-Map, Minimization of Logical Functions. Don’t care Conditions, Common Combinational Logic Circuits, Multiplexer, De-Multiplexer /Decoders, Half Adders, Full Adders,Subtractors, Binary Coded DecimalArithmetic, Carry Look Ahead Adder, Serial Adder, Digital Comparator, Even and Odd Parity, Parity Checker/Generator, Code Converters, Priority Encoders, Decoders/Drivers for Display Devices, Q-M Method of Function Realization.

(12 Hours)

UNIT - III

**Sequential Circuits and Systems:**Binary Storage Element, A 1-bit Memory, Circuit Properties of Bi-Stable Latch, Basics of Flip-flop, Flip-Flop Operationand its types,SR and Clocked SR flip flop, J- K,T and D-types Flip-Flops, Applications of Flip-Flops, Introduction to Registers, Shift Registers, Applications of Shift Registers, Serial to Parallel Converter, Parallel to Serial Converter, General form of a Sequential Circuit, Asynchronous and synchronous Circuits, Sequence Generator, Ripple (Asynchronous) Counters, Synchronous Counters.

(12 Hours)

UNIT - IV

**A/D and D/A Converters**: Digital to Analog Converters: Weighted Resistor/Converter, R-2R Ladder, D/A Converter, Specifications for D/A Converters, Examples of D/A Converter lCs, Sample and Hold Circuit, Analog to Digital Converters: Quantization and Encoding, Parallel Comparator A/D Converter, Successive Approximation A/D Converter, Counting A/D Converter, Dual Slope A/D Converter, A/D Converter using Voltage to Frequency and Voltage to Time Conversion, Specifications of A/D Converters, Example of A/D Converter ICs. Memory Organization and Operation, Expanding Memory Size, Classification and Characteristics of Memories, Sequential Memory, Read Only Memory (ROM), Read and Write Memory(RAM), Commonly used Memory Chips.

(12 Hours)

TEXT/REFERENCES:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

COURSE OUTCOMES:

After going through this course, the students shall be able to:

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**EE280C LOGIC AND SEQUENTIAL CIRCUITS LAB**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 0 | 0 | 2 | 1 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

LIST OF EXPERIMENTS:

1. To realizeand verify truth tables of TTL gates –AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. To realize the universal property of NAND gate.
3. To realize the universal property of NOR gate.
4. Design & realize a given function using K-maps and verify its performance.
5. To verify the operation of Multiplexer & De-multiplexer.
6. To verify the operation of Comparators.
7. To perform Half adder and Full adder.
8. To perform Half Substractor and Full Substractor.
9. To verify the truth table of S-R, J-K, T & D Type flip flop.
10. To verify the operation of bi-directional shift register.
11. To verify the operations ofanalog to digital and digital to analog converter.
12. To design & verify the operation of 3 bits’ synchronous counter.
13. To design & verify the operation of synchronous UP/DOWN decade counter using JK flip flop & derive a seven segment display using the same.
14. To design & verify the operation of asynchronous UP/DOWN decade counter using JK flip flop & derive a seven segment display using the same.
15. Design a 4- bit shift register, verify its operation and verify the operation of a ring counter and a Johnson counter.
16. To implement the experiment 1 on NI ELVIS Board.
17. To implement Boolean expression on NI ELVIS Board.

NOTE:

1. The students will be required to perform the 8 experiments/exercises from the above list and any other experiment designed on the basis course.
2. The students will be allowed to use non-programmable scientific calculator. However, sharing/ex-change of calculator are prohibited in the examinations.
3. Electronic gadgets including cellular phones are not allowed in the examination.

**EE204C**

**ELECTRICAL MACHINES – II**

**B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 0 | 0 | 2 | 1 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

Course Outcomes:

At the end of this course, students will demonstrate the ability to

* 1. Understand the concepts of rotating magnetic fields.
	2. Understand the operation of ac machines.
	3. Analyse performance characteristics of ac machines.

**Unit-I**

**Fundamentals of AC machine windings (8 Hours)**:

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single-turn coil - active portion and overhang; full-pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding-concentrated and distributed, Sinusoidally distributed winding, winding distribution factor

**Pulsating and revolving magnetic fields (4 Hours):**

Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding - fixed current and alternating current Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

**Unit-II**

**Induction Machines (10 Hours):**

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. 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.

**Unit-III**

**Induction Generators (3 Hours):**

Generator operation. Types-Self-excitation, Doubly-Fed Induction Machines and their applications

**Single-phase induction motors (6 Hours):**

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

**Unit-IV**

**Synchronous machines(10 Hours):**

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation.

Characteristics of synchronous machines, V-curves. Salient pole machine - two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators - synchronization and load division.

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:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**EE282C**

**ELECTRICAL MACHINES – II LAB**

 **B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 0 | 0 | 2 | 1 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

LIST OF EXPERIMENTS:

1. To perform starting and reversing the direction of rotation of 1-Phase and 3-Phase induction motor.

2. To perform the open circuit test and block rotor test on 3 phase induction motor and determine equivalent circuit parameters.

3. To conduct the load test to determine the performance characteristics of the I.M.

4. To compute the torque v/s speed characteristics of 3-phase induction motor for various stator voltages .

5. To perform speed control of induction motor by using rotor resistance control.

6. To perform speed control of 3-Phase induction motor by using V/f control method.

7. To perform the open circuit test and block rotor test on single-phase induction motor and determine equivalent circuit parameters.

8. To draw Voltage Vs load Characteristics of 3 phase synchronous generator, and draw input vs. Output power.

9. To perform O.C. test on synchronous generator. And determine the full load regulation of a three phase synchronous generator by synchronous impedance method.

10. To plot V- Curve of synchronous motor.

11. To study the parallel operation of synchronous generators.

NOTE:

1. The students will be required to perform at least 8 experiments/ excersices from the above list and any other experiments designed on the basis course.

2. The students will be allowed to use non-programmable scientific calculator. However, sharing/ex-change of calculator are prohibited in the examinations.

3. Electronic gadgets including cellular phones are not allowed in the examination.

**EE206C POWER SYSTEM -I**

 **B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 0 | 0 | 2 | 1 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

**COURSE OBJECTIVES:** This course has been designed to understand the basics of power system problems and analysis and to analyze the system under normal and under fault condition. The students shall be able to represent the power system network for steady state or dynamic analysis.

**COURSE OUTCOMES:** At the end of this course, students will demonstrate the ability to understand the concepts of power systems, various power system components, evaluate fault currents for different types of faults, generation of over-voltages and insulation coordination, basic protection schemes, concepts of HVDC power transmission and renewable energy generation.

**UNIT-I**

**BASIC CONCEPTS**: Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Feeder, Servicemains Substations, Mechanical design of Transmission, Synchronous Grids and Asynchronous (DC) interconnections. Comparison of ac and dc transmission

**UNIT-II**

**POWER SYSTEM ANALYSIS**: Overhead Transmission Lines and Cables: Electrical and Magnetic Fields around conductors, Corona. Parameters of lines and cables. Capacitance and Inductance calculations for simple configurations. Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Generation of Over-voltages: Lightning and Switching Surges. Protection against Over voltages, Insulation Coordination. Propagation of Surges. Voltages produced by traveling surges. Bewley Diagrams

**UNIT-III**

**POWER SYSTEM COMPONENTS**: Insulators, Application of Phase-shifts. And Distribution transformers, Tap-Changing transformers. Synchronous Machines: Steady-state performance characteristics. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.

**UNIT-IV**

**FAULT ANALYSIS AND PROTECTION SYSTEMS**: Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformers in sequence networks. Computation of Fault Currents. Neutral Grounding. Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection), Power line carrier communication and their application.

**TEXT BOOKS**:

1. J. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
2. O. I. Elgerd, “Electric Energy Systems Theory”, McGraw Hill Education, 1995.
3. S K Gupta, “Power System Analysis”, Umesh Publication 2009
4. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, “Electric Power Systems”, Wiley, 2012.

**REFERENCE BOOKS**:

1. A.R. Bergen and V. Vittal, “Power System Analysis”, Pearson Education Inc., 1999.
2. Advanced Power System Analysis & Dynamics by L P Singh: Wiley Eastern LTD New Delhi
3. Elements of Power System Analysis by W D Stevenson: MGH Publication New Delhi
4. Power Generation, operation and control by Alen J. Wood by Wiley.

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

For student admitted in B. Tech. 1st Semester (C-Scheme) in 2019 and all trailing students, Examinations and evaluation of students shall be conducted as per guidelines AICTE Examinations Reforms covering the entire syllabus. The students shall be made aware about the reforms.

**EE284C**

**POAWE SYSTEM -I LAB**

 **B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 0 | 0 | 2 | 1 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

Experiment No. 1: (i) Study over current relay

 (ii) Draw the current-time characteristics of an over current relay

for TMS=1 & 0.5 and PSM=1.25 & 1.

Experiment No. 2: (i) Study percentage bias differential relay.

 (ii) Plot the characteristics of a percentage bias differential relay

for 20%, 30% and 40% biasing

Experiment No. 3: To draw the operating characteristics of IDMT over current relay.

Experiment No. 4: To draw the operating characteristics of IDMT under Voltage relay.

Experiment No. 5: To draw the operating characteristics of IDMT over Voltage relay.

Experiment No. 6: To draw the operating characteristics of Differential current relay.

Experiment No. 7: To draw the operating characteristics of negative sequence relay.

Experiment No. 8: To obtain A B C D parameter of a transmission line (model).

Experiment No. 9: To study Ferranti Effect on transmission line model.

Experiment No. 10: To visit study and draw the layout of 33KV substation.

Experiment No. 11: To visit study and draw the layout of 110/220 KV substation

Experiment No. 12: To study and designing of Earthing / Grounding.

Experiment No. 13: Study the burden effect on the performance of CT and measure ratio error.

Experiment No. 14: Study filtration and Treatment of transformer oil.

Experiment No. 15: Determine dielectric strength of transformer oil.

**Note: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set up by the department as per the scope of the syllabus.**

**EE208C SIGNAL AND SYSTEMS**

 **B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 3 | 1 | 0 | 4 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

COURSE OBJECTIVES:

The main goals of this course are:

1. To provide the basic understanding about the signals and their basic properties.
2. To give the ideas about different types of signals and systems.
3. Understanding of the signal analysis tools and conversion from one domain to the other.
4. To give the knowledge of the sampling and reconstruction of the sampled signal.

**UNIT - I**

**Introduction to Signals and Systems**:Introduction, 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, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

(12 hours)

**UNIT - II**

**Behavior of continuous and discrete-time LTI systems:**Impulse response and step response, convolution, input-output behavior 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 systems, State-Space Analysis, Multi-input, multi-output representation.State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

(12 hours)

**UNIT - III**

**Fourier, Laplace and z- Transforms:**Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

(12 hours)

**UNIT - IV**

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

(12 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.

5. A. V. Oppenheim and R. W. Schafer, “Discrete-Time Signal Processing”, Prentice Hall, 2009.

6. M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.

7. B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009.

**COURSE OUTCOMES:**

After going through this course, the students shall be able to:

1. Understand the concepts of continuous time and discrete time systems.
2. Analyse systems in complex frequency domain.
3. Understand sampling theorem and its implications.

**Note:**

1. In Semester Examinations, the examiner will set two questions from each unit (total 8 questions in all) covering the entire syllabus. The students will be required to attend only five questions selecting atleast one question from each unit.
2. The use of scientific calculator will be allowed in the examination. However, programmable calculator and cellular phone will not be allowed.

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**MATH303C MATHEMATICS-III**

**(Probability and Statistics)**

 **B.Tech. Electrical Engg. Semester-III**

L T P

3 10 (4 Credits) Marks for External Exam: 75

Marks for Internal Exam : 25

Total : 100 Duration of Exam : 3 Hours

**Note:**

The paper setter will set two questions (with/without parts) from each units, & a ninth compulsory question comprising of 6 to 10 sub-parts, covering the entire syllabus. The examinee will attempt 5 questions in all, along with the compulsory question (with all it sub-parts), selecting one question from each unit.

1. The use of programmable devices such as programmable calculators, etc. is not allowed during the exam.

**UNIT-I (12 Lectures)**

Measures of Central tendency: Moments, skewness and Kurtosis- Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameter for these three distributions, Correlation and regression — Rank correlation.

**UNIT-II (12 Lectures)**

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

**UNIT-III (12 Lectures)**

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

**UNIT-IV (12 Lectures)**

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

**Suggested Text/ReferenceBooks:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. S.S. Sastry, Engineering Mathematics, PHI, Vol. I & II.
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
5. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
6. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

 **Course outcomes:**

1. The students will be able to apply the concept of central tendencies, moment , skewness and kurtosis in designing the structure and nature of the curve.

2. The students will apply principle of least squares and chi-square test in defining the fitness of goods and shape of curves

3. The students can apply the probability spaces & conditional probability concept and properties in practical problems.

4. The students will be able to use the functioning of continuous random variable, distribution functions and densities in various field works.

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**EE221C BIOLOGY for Engineers**

 **B.TECH. (ELECTRICAL ENGINEERING, EEE, IC)**

**Choice Based Credit System (effective from Session 2019-20)**

**SEMESTER-IV**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| L | T | P | Credits |  Field work  | : 25 |
| 3 | 1 | 0 | 4 |  Exam Marks | : 75 |
|  |  |  |  | Total Marks | : 100 |
|  |  |  |  | Duration of Examination | 3 Hrs |

UNIT-I

**Introduction:** Significance of biology; why study biology ; Biological observation in history that led to the discovery of some major engineering basics( Brownian motion & origin of thermodynamics); Fundamental similarities and difference between science and engineering- human as the best machines, comparison between eye camera, flying of a bird and aircraft etc.

**Classification:** classification based on (a) cellularity- unicellular or a multicellular (b) Ultrastructure-prokaryotes or eukaryotes (c) Energy and carbon utilization- autotrophs and lithotrophs (d) Ammonia excretion –aminotelic, uricotelic (e) Habit- aquatic or terrestrial ; Molecular Taxonomy three major kingdoms of life.

Single-celled organism-Microorganism and Microbiology: concept of single called organism , species and strains; Identification and classification of microorganism ; Ecological aspects of single celled organism; Microscopy.

UNIT-II

**Biomolecules**: Molecules of the life –Monomeric unit and polymeric structure –sugar , starch and cellulose , Amino acid and proteins; Nucleotides and DNA/RNA;Two carbon unit and lipids.

**Proteins and Enzymes:** proteins structure and function ; Hierarchy in protein structure –primary , secondary , tertiary and quaternary structure; proteins as enzymes, transporters , receptors and structural elements; Enzymes classification and mechanism of action ; Enzymes catalysed reaction ; Enzyme kinetic and kinetic parameters;RNA catalysis

UNIT –III

**Genetics**: Genetics is to biology what Newtons law are to physics; model laws of genetics; concept of allele, recessiveness and dominance, segregation and independent assortment; Genetic material passes from parent to offspring ; Epistasis; Mapping of phenotype yto genes, gene/linkage mapping ; single gene disorder in human ; meiosis and mitosis.

**Genes, Chromosomes and information transfer**: DNA as genetic material ; Hierarchy of DNA structure single stranded to double stranded to nucleosomes to chromosomes; Moleculear basis of information transfer concept of genetic code ; Universality and degeneracy of genetic code.

UNIT-IV

**Metabolism:** Similarities between fundamental principles of energy transaction in physical and biological world; Thermodynamics as applied to biological system; Exothermic and endothermic versus endergonic and exergonic reaction; Concept of Keqand its relation to standard free energy ; Spontaneity; APT as an energy currency; Glycolysis and Krebs cycle (breakdown of glucose to CO2 to H2O); Photosynthesis (synthesis of glucose from CO2 toH2O); Energy Yielding and energy consuming reaction; Concept of energy change.

**TEXT BOOK:**

1. Biology : a Gopal approach Campbell , N.A Reece, J.B Urry ,Lisa; Cain M.L Wasserman , S.A Minorsky,P.VJackson, R.B Person Education ltd
2. Outline of Biochemistry , conn E.E Stumpf, P.K Burening ,G; Doi, R.H;John Wiley and sons

**REFERENCE BOOK:**

1. Principles of Biochemistry( V Edition ) by Nelson, D.L; and Cox, M.M.W.H Freeman and company.
2. Molecular Genetics (second Edition) stent G.S; Calender , R.W.H Freeman Company Distributed by satishkumarjain for CBS Publisher.
3. Microbiology , Prescott, L.M.J.P; Harley and CA Klein 1995, 2nd edition W.M.C Brown Publisher.

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**B. TECH. SEMESTER – IV**

**BT221C: BIOLOGY FOR ENGINEERS**

**(Common with 4th Semester Chemical Engg. And 3rd Semester BT, ME and CE)**

L T P Credits **Class Work Marks : 25 Marks**

3 - - 3 **Exam Marks : 75 Marks**

 **Total Marks : 100 Marks**

 **Duration of Exam : 3 Hrs.**

**Course Objectives:**

1. To learn about the significance of biology as an important scientific discipline for engineers.
2. To get a basic knowledge of classification and organization of living organisms.
3. To learn about the various biomolecules, and to understand their role in biological metabolism.
4. To understand the fundamentals of nature & structure of genetic material, and the flow of genetic information in biological systems.

**UNIT - I**

**Introduction:** Significance of biology; Why study biology;Biological observations in history that led to the discovery of some major engineering basics (brownian motion & origin of thermodynamics); **F**undamental similarities and differences between science and engineering- humans as the best machines, comparison between eye and camera, flying of a bird and aircraft etc.

**Classification:** Classification based on (a) Cellularity- unicellular or multicellular (b) Ultrastructure- prokaryotes or eukaryotes (c) Energy and carbon utilization- autotrophs, heterotrophs and lithotrophs (d) Ammonia excretion- aminotelic, uricotelic, or ureotelic (e) Habitat- aquatic or terrestrial; Molecular taxonomy- three major kingdoms of life.

**Single-celled organisms – Microorganisms and Microbiology:** Concept of- single-celled organisms**,** species & strains; Identification and classification of microorganisms; Ecological aspects of single-celled organisms; Microscopy.

**UNIT – II**

**Biomolecules:** Molecules of Life**-** Monomeric units and polymeric structures- sugars, starch and cellulose; Amino acids and proteins; Nucleotides and DNA/ RNA; Two carbon units and lipids.

**Proteins and Enzymes:** Proteins- structure and function; Hierarchy in protein structure- primary, secondary, tertiary and quarternary structure; Proteins as enzymes, transporters, receptors and structural elements; Enzymes: classification and mechanism of action; Enzyme catalyzed reactions; Enzyme kinetics and kinetic parameters; RNA catalysis.

**UNIT - III**

**Genetics:** Genetics is to biology what Newton’s laws are to physics; Mendel’s laws of genetics; Concept of- allele, recessiveness and dominance, segregation and independent assortment; Genetic material passes from parent to offspring; Epistasis; Mapping of phenotype to genes, gene/ linkage mapping; Single gene disorders in humans; Meiosis and mitosis.

**Genes, Chromosomes and Information transfer:** DNA as genetic material; Hierarchy of DNA structure- single stranded to double stranded to nucleosomes to chromosomes; Molecular basis of information transfer; Concept of genetic code; Universality and degeneracy of genetic code.

**UNIT - IV**

**Metabolism:** Similarities between fundamental principles of energy transactions in physical and biological world; Thermodynamics as applied to biological systems; Exothermic and endothermic versus endergonic and exergonic reactions; Concept of Keq and its relation to standard free energy; Spontaneity; ATP as an energy currency; Glycolysis and Krebs cycle (breakdown of glucose to CO2 to H2O); Photosynthesis (synthesis of glucose from CO2 and H2O); Energy yielding and energy consuming reactions; Concept of energy change

**Course Outcomes:**

1. Students will become familiar with the hierarchy of life forms at phenomenological level**.**
2. Students will understand the molecular basis of information transfer in the biological systems.
3. Students will learn about the significance of different building blocks of life forms, and the fundamental principles of energy transactions in the biological world.
4. The students will get an overview of the importance of studying biological systems for resolving the existing global issues with an engineering perspective.

**Text / Reference books:**

* Biology: A global approach: Campbell, N.A.; Reece, J.B.; Urry, Lisa; Cain. M.L.; Wasserman, S.A.; Minorsky, P.V.; Jackson, R.B. Pearson Education Ltd.
* Outlines of Biochemistry, Conn, E.E.; Stumpf, P.K.; Bruening, G.; Doi, R.H.; John Wiley and Sons.
* Principles of Biochemistry (V Edition), By Nelson, D.L.; and Cox, M.M.W.H. Freeman and Company.
* Molecular Genetics (Second edition), Stent, G.S.; and Calender, R.W.H. Freeman and Company. Distributed by Satish Kumar Jain for CBS Publisher.
* Microbiology, Prescott, L.M.J.P.; Harley and C.A. Klein. 1995. 2nd edition W.M.C. Brown Publishers.

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