B.Tech Instrumentation Engineering

**SCHEME OF EXAMINATIONS**

**B.Tech. 2ND YEAR (SEMESTER–III) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-HSM-201 | Project Planning Estimation and Management | 2 | 2 | -- | -- | 2 | 40 | 60 |  | 100 | 3 Hrs |
| IN-ES-203 | Basic Instrumentation Engineering | 3 | 2 | 1 |  | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PC-205 | Network Analysis  | 3 | 2 | 1 |  | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PC-207 | Transducers and Applications | 3 | 2 | 1 |  | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PC-209 | Linear Integrated Circuits | 3 | 2 | 1 |  | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PRIE-09 | Instrumentation Lab | 1 | -- | -- | 2 | 2 | 20 |  | 30 | 50 | 3 Hrs |
| IN-PRNA-11 | Network Analysis Lab | 1 | -- | -- | 2 | 2 | 20 |  | 30 | 50 | 3 Hrs |
| IN-PRTR-13 | Transducer lab | 1.5 | -- | -- | 3 | 3 | 30 |  | 45 | 75 | 3 Hrs |
| IN-PRLIC-15 | Linear Integrated Circuits Lab | 1.5 | -- | -- | 3 | 3 | 30 |  | 45 | 75 | 3 Hrs |
|  | Total | 19 | 10 | 4 | 10 | 24 | 300 | 300 | 150 | 750 |  |

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
|  |  |  |  |  |  |  |  |  |  |  |  |
| IN-PC-202 | Power Electronics-I | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-BS-204 | Mathematics -III | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PE-206 | Control System Components | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PC-208 | Electrical Machines | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PC-210 | Digital Techniques | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PRPE-10 | Power Electronics Lab-I | 1.5 | -- |  | 3 | 3 | 30 | -- | 45 | 75 | 3 Hrs |
| IN-PRCS-12 | Control System Lab-1 | 1.5 | -- |  | 3 | 3 | 30 | -- | 45 | 75 | 3 Hrs |
| IN-PRDT-14 | Digital Lab | 1 | -- |  | 2 | 2 | 20 | -- | 30 | 50 | 3 Hrs |
| IN-PRSIM-16 | Simulation Lab | 1 | -- |  | 2 | 2 | 20 | -- | 30 | 50 | 3 Hrs |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  | Total | 20 | 10 | 5 | 10 | 25 | 300 | 300 | 150 | 750 |  |

B.Tech Instrumentation Engineering

**SCHEME OF EXAMINATIONS**

**B.Tech. 2ND YEAR (SEMESTER–III) (w.e.f.2019-20)**

IN-HSM-201 Project Planning Estimation and Management

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-HSM-201 | Project Planning Estimation and Management | 2 | 2 | -- | -- | 2 | 40 | 60 |  | 100 | 3 Hrs |

Course Outcomes

The objective of this course is to familiarize the prospective engineers with basics in economics and Management. It aims to equip the students to deal with advanced aspects of project appraisals and management aspects.

The students will learn:

* + The project proposal fundamentals
	+ The effective demand forecast analysis and tools for statistical analysis
	+ The basics of economics and management practices in project funding and control

**PROGRAM OUTCOMES**

1. Graduates will be able to apply fundamental knowledge in mathematics, science, electronics and instrumentation for solving engineering problems.
2. Graduates will be able to identify and analyze complex engineering problems in the areas of electronics, instrumentation and automation.
3. Graduates will be able to solve open-ended technical problems and be proficient in the design, test, and implementation of electronics, instrumentation and control systems.
4. Graduates will attain skills to conduct experiments/investigations and interpret data with reference to systems and standards related to electronics and instrumentation engineering.
5. Graduates will have proficiency in system design tools and software packages related to electronics and instrumentation.
6. Graduates will have knowledge in the area of instrumentation engineering to assess and address societal, health, safety, legal and cultural issues.
7. Graduates will have broad education necessary to understand the impact of engineering solutions and sustainable development in environmental and societal context in the field of Instrumentation.
8. Graduates will be able to understand and uphold professional, ethical, and social responsibilities in Instrumentation engineering.
9. Graduates will be able to function efficiently as an individual or in team in process and automation industries.
10. Graduates will have ability to communicate effectively in written, oral and instrumentation formats to put forth solutions and prepare detailed engineering report in the process and automation industries.
11. Graduates will be able to apply the knowledge, skill and attitude as a team player in initiating, executing and managing projects in the areas of design, manufacture, marketing and entrepreneurship in multi-disciplinary environments.
12. Graduates will be able to conduct information searching and processing and develop the ability for lifetime-learning in field of Instrumentation engineering.

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| --- |
| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** |  |  |  |  |  |  |  | **S** |  | **S** | **S** | **S** |
| **CO2** |  |  |  |  |  |  |  | **S** |  | **S** | **S** | **S** |
| **CO3** |  |  |  |  |  |  |  | **S** |  | **S** | **S** | **S** |
| **CO4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO5** |  |  |  |  |  |  |  |  |  |  |  |  |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

IN-HSM-201 Project Planning Estimation and Management

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions uniformly spread among the entire syllabus, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the entire syllabus, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt 4-questions out of 4-questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each.**

Module-1

Project Development Cycle: Pre-investment phase, implementation phase, operational phase. Aspects of Appraisal: Market Appraisal, Technical Appraisal, Financial Appraisal, Economic Appraisal. Objectives of investment decision making. Scouting for project ideas; Preliminary Screening, compatibility with the promoter, consistency with governmental prioritize, availability of inputs, Adequacy of the market, Reasonableness of cost, Acceptability of Risk Level.

Module--II

Market and Demand Analysis: Information required for Mauler and Demand Analysis, Secondary sources of information, Market Survey - Steps in sample survey, Demand Forecasting, Uncertainty in Demand forecasting, Method of Forecasting, Environmental Changes, coping with uncertainties.

Technical Analysis: Material and inputs; Product Technology; Choice of Technology, Acquiring Technology, Appropriateness, of Technology, Product Mix, Plant Capacity, Location of site.

Module--III

Financial Estimates: Cost of Project, Main Components, Means of financing, Planning the Capital structure of a new company, Norms of the Controller of Capital issue, Norms and requirements of All India Financial Institutions, Stock Exchange stipulation, Difficulty in raising External Finance, Designing the capital structure.

Module--IV

Project Planning & Control: Functions of Planning, Areas of planning, Project objectives and policies, life cycle of a project, Tools of Planning, Hierarchy of plans; Project Control- Reasons for ineffective control, variance Analysis Approach, Performance Analysis, Modern Approach to Control.

**Reference Books:**

1. Project Preparation, Appraisal, Budgeting Implementation by Parsanna Chandra, Tata Mc-Graw Hill.

**B.Tech. 2ND YEAR (SEMESTER–III) (w.e.f.2019-20)**

IN-PC-205 Network Analysis

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PC-205 | Network Analysis  | 3 | 2 | 1 |  | 3 | 40 | 60 |  | 100 | 3 Hrs |

Course Outcomes

* To model linear circuits and systems using differential equations and Transfer Functions..
* To expose to the concept of poles and zeros.
* To develop equations for large linear circuits by using network laws, and analyse their responses to different types of signals in time domain.
* To familiarise with two port network parameters.

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| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO5** |  |  |  |  |  |  |  |  |  |  |  |  |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions uniformly spread among the entire syllabus, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the entire syllabus, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt all questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each.**

IN-PC-205 Network Analysis

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Module-- I

Topology: Principles of Network Topology, graph matrices, network analysis using graph theory. Transient Response: Transient Response of RC, RLC, TL circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform.

Module-- II

Network Functions: Terminal pairs or ports, network functions for one-port and two-port networks, pole and zeros of network functions, restrictions on pole and zero locations for driving point functions and transfer functions, time domain behavior from pole-zero plots. Stability criteria of active networks

Module- - III

Characteristics and parameters of two port networks: Relationship of two port variables, short circuit admittance parameters, open circuit impedance, parameters, transmission parameters, hybrid parameters, relationship between parameter sets, interconnection of two port networks, T and π networks, lattice networks, terminated two port networks

Module-- IV

Fundamental of filters, filter networks, equation of filter network, classification and characteristic impedance of band low-pass, high-pass, band-pass & band-reject, constant K pass filters, m – derived. Network synthesis: Herwitz Polynomial, positive real functions, synthesis of one port and two port networks, elementary idea of active networks and frequency response.

**Text Books:**

1. Network Analysis A.Sudhakar & S.P.Shyammohan TMH
2. Introduction to Modern Network Synthesis Van Valkenburg, PHI
3. Network Analysis By Van Valkenburg, PHI
4. Network Analysis By G.K.Mithal, Khanna Publication
5. Networks and Systems by D.Roy Choudhury; New Age International

**Reference Books:**

1. Reza F. M. and Seely S., “Modern Network Analysis”, Mc.Graw Hill Book Company

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

3. Kuo F. F., “Network Analysis & Synthesis”, John Wiley & Sons.

IN-PRNA-11 Network Analysis Lab

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IN-PRNA-11 | Network Analysis Lab | 1 | -- | -- | 2 | 2 | 20 |  | 30 | 50 | 3 Hrs |

NETWORKS LAB

**List of Experiments**

**2rd Year / 4th Semester**

**Subject: Network Analysis Lab (PR-2307)**

|  |  |
| --- | --- |
| **S.No** | **Experiments** |
| **1.** | To find out the cut-off frequency of RC Low pass filter.  |
| **2.** | To find out the cut-off frequency of RC High pass filter.  |
| **3.** | To find out the Impedance or z-parameters for two port network.  |
| **4.** | To find out the Admittance or y-Parameters of two port network.  |
| **5.** | To find out the hybrid or h-Parameters for two port network.  |
| **6.** | To find out the transmission or ABCD- Parameters for two port network.  |
| **7.** | To find out the impedance or Z-parameters for series connected two -two port network. |
| **8.** | To find out the admittance of Y –parameters for parallel connected two –two port network.  |
| **9.** | To find out the transient response of series connected RC Network.  |
| **10.** | To find out the transient response of parallel connected RC Network.  |

**IN-PC-209 LINEAR INTEGRATED CIRCUITS**

**Course Outcomes:**

**After successful completion of this course, the students should be able to**CO1: Acquire knowledge in identifying implementation areas of op-amps for specific purpose.
CO2: Design and construct circuit’s depending upon applications.
CO3: Analyze the circuits using modern simulation software
CO4: Design electrical circuits, devices, and systems to meet application requirements.
CO5: Design a project as a team

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| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | **S** | **S** | **S** |  |  |  |  |  |  |  |  |  |
| **CO2** | **S** | **S** | **S** |  |  |  |  |  |  |  |  |  |
| **CO3** |  |  |  | **S** | **S** |  |  |  |  |  |  |  |
| **CO4** |  | **S** | **S** |  |  |  |  |  |  |  |  |  |
| **CO5** |  |  |  |  |  |  |  | **S** | **S** | **S** | **S** | **S** |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

**B.Tech. 2ND YEAR (SEMESTER–III) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PCC-209 | Linear Integrated Circuits | 3 | 2 | 1 |  | 3 | 40 | 60 |  | 100 | 3 Hrs |
| IN-PRLIC-15 | Linear Integrated Circuits Lab | 1.5 | -- | -- | 3 | 3 | 30 |  | 45 | 75 | 3 Hrs |

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions among the 4-modules, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the 4-modules, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt 4-questions out of 4-questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each.**

IN-PCC-209 Linear Integrated Circuits Details of the Course Contents

**Module-1**

The basic operational amplifier, the differential amplifier, the emitter coupled differential amplifier, transfer characteristics of differential amplifier, offset error voltages and currents, input bias current, input offset current, input offset current drift, input offset voltage, input offset voltage drift, output offset voltage, PSRR, slew rate and universal balancing techniques, measurement of Op-Amp parameters

**Module -II**

Op-Amp Circuit Stability, Frequency and Phase Response, Freq. compensating methods, Op-Amp Circuit Bandwidth. Op-Amp applications: Inverter, scale changer, adder, analog integration and differentiation( brief explanation with circuit diagram), wave form generator (square wave, pulse and triangle wave generator),

**Module -III**

Op-Amp Applications II: Instrumentation Amplifier, Precision Half Wave Rectifier, Precision Full Wave Rectifier, limiting Circuits, Clamping Circuits, Peak Detectors, Sample & Hold Circuits, logarithmic Amplifier, inverting Schmitt Trigger Circuit, Phase Shift Oscillator, Oscillator Amplitude Stabilization, Wien-Bridge Oscillator.

**Module -V**

Regulated Power Supplies: Regulator Action, Regulator Performance, Voltage follower Regulator (Design & performance), Adjustable Voltage Regulator (Design & performance),Stabilization, Output Current limiting (Short circuit Protection) (Fold-back Current limiting), I.C. Regulators (Basic Idea). The 555 I.C. Timer, and its applications, Voltage Time Base Generators, Step (Stair Case) Generators.

References:

1. Microelectronics by Millman Grabel, TMH
2. Electronic Principles by Malvino, TMH
3. Integrated Electronics by Millman Halkias, McGraw Hill
4. Op-Amps & Linear Integrated Circuits by R.A.Gayakwad, PHI

IN-PRLIC-15 Linear Integrated Circuits Lab

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| INE-PRLIC-15 | Linear Integrated Circuits Lab | 1.5 | -- | -- | 3 | 3 | 30 |  | 45 | 75 | 3 Hrs |

**Course Outcomes:**

After successful completion of this course, the students should be able toCO1: Design basic application circuits using op-amp.
CO2: Understand and implement the working of basic digital circuits
CO3: Design multivibrators and voltage regulators
CO4: Design Counters and Timers
CO5: Design and Fabricate small projects using simulation tools and hardware

LIST OF EXPERIMENTS : Experiments beyond the syllabus should be conducted

1. Op-Amp parameters.
2. Op-Amp Application 1: Inverting, non-inverting.
3. Op-Amp Application 2: square wave generator, differentiator, integrator, log amplifier .
4. Design of astable, monostable multivibrators
5. Application of IC voltage regulator.
6. Op-amplifier as Rectifiers.

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PC-202 | Power Electronics-I | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |

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**Course Outcomes**

**After successful completion of this course, the students should be able to**

1. Identify, formulate & solve engineering problems with simulation.
2. Simulate characteristics of SCR, MOSFET, IGBT, gate firing circuits.
3. Formulate Thyristor Analogy and Thyristor Protection.
4. Simulate Rectifiers and on hardware kits.
5. Simulate Cyclo-converter circuit.

**PROGRAM OUTCOMES**

1. Graduates will be able to apply fundamental knowledge in mathematics, science, electronics and instrumentation for solving engineering problems.
2. Graduates will be able to identify and analyze complex engineering problems in the areas of electronics, instrumentation and automation.
3. Graduates will be able to solve open-ended technical problems and be proficient in the design, test, and implementation of electronics, instrumentation and control systems.
4. Graduates will attain skills to conduct experiments/investigations and interpret data with reference to systems and standards related to electronics and instrumentation engineering.
5. Graduates will have proficiency in system design tools and software packages related to electronics and instrumentation.
6. Graduates will have knowledge in the area of instrumentation engineering to assess and address societal, health, safety, legal and cultural issues.
7. Graduates will have broad education necessary to understand the impact of engineering solutions and sustainable development in environmental and societal context in the field of Instrumentation.
8. Graduates will be able to understand and uphold professional, ethical, and social responsibilities in Instrumentation engineering.
9. Graduates will be able to function efficiently as an individual or in team in process and automation industries.
10. Graduates will have ability to communicate effectively in written, oral and instrumentation formats to put forth solutions and prepare detailed engineering report in the process and automation industries.
11. Graduates will be able to apply the knowledge, skill and attitude as a team player in initiating, executing and managing projects in the areas of design, manufacture, marketing and entrepreneurship in multi-disciplinary environments.
12. Graduates will be able to conduct information searching and processing and develop the ability for lifetime-learning in field of Instrumentation engineering.

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| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** |  | **S** |  | **M** |  |  |  |  |  |  |  |  |
| **CO2** |  |  |  |  |  |  |  |  |  |  | **M** |  |
| **CO3** |  |  |  |  |  |  |  |  | **M** |  |  |  |
| **CO4** |  |  | **M** | **S** |  |  |  |  |  |  | **S** |  |
| **CO5** |  | **M** | **S** |  |  | **S** |  |  | **S** |  | **S** |  |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

**POWER ELECTRONICS-I**

Module-I

Introduction to power devices: Constructional features & characteristics of thyristors, MOSFET, IGBT, MCT. Triggering & switching: Various triggering devices used for thyristor.

Module -II

Thyristor Analogy: Two transistor analogy, series and parallel operation of thyristors.

Protection: Protection of SCR against over current, over voltage, high dv/dt, and high di/dt.

Module -III

Classification of Rectifiers, Phase Controlled Rectifiers: Single phase half wave controlled, Fully wave and half controlled rectifiers with Resistive, Inductive and e.m.f. loading and their performance parameters. Three phase half wave, full wave and half controlled rectifiers with resistive and inductive and emf loading and their performance.

Module -IV

Cycloconverter: Introduction & principle of working cycloconverter; types of cycloconverter; enveloped type & phase controlled type , features of cycloconverter; voltage wave form, circulating mode of operation, circulating current free modes, cycloconverter under discontinuous conduction, effect of source inductance on the performance of cycloconverter, network reaction, Advantages and disadvantages of cycloconverter .

References:

1. Modern Power Devices by B.Jayant Balica, New Age Inter.
2. Power Electronics by P.C. Sen (TMH)
3. An Introduction to Thyristors and Their Applications by M. Ramamurthy (EWP)
4. Power electronics by Ned Mohan and Robins, John Wiley and Sons
5. Power Electronics by M. Rashid (PHI)
6. Thyristor Phase Controlled converters and Cyclo-converters by B.R.Pelly
7. Power Electronics by Vendem Subrahmanyam, New Age International

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PRPE-10 | Power Electronics Lab-I | 1.5 | -- |  | 3 | 3 | 30 | -- | 45 | 75 | 3 Hrs |

LIST OF EXPERIMENTS STUDY EXPERIMENTS :

1.Study of characteristics of SCR,MOSFET,IGBT

2.Study of Gate firing circuits

3.Pulse Width Modulation techniques

SIMULATION EXPERIMENTS :

1. Single Phase Half wave controlled converter with R,RL&RLE Load (for firing angles 30,60,90)with/without FD

2. Single Phase Half controlled converter with R,RL&RLE Load (for firing angles 30,60,90)with/without FD

3. Single Phase Full controlled converter with R,RL&RLE Load (for firing angles 30,60,90)with/without FD

4. Three Phase semi controlled converter with R,RL&RLE Load

5. Three Phase full controlled converter with R,RL&RLE Load

6. Single phase AC Voltage Controller with R&RL Loads

7. Boost converter and buck converter with open loop and closed loop operations

8. Single Phase inverter

9. Single Phase cyclo converter

**HARDWARE EXPERIMENTS :**

1.Thyristorised drive for PMDC motor with speed measurement and Single Phase Half controlled rectifier and full controlled rectifier

2. Closed loop control of DC Motor using three face fed four quadrant chopper drive.

3.IGBT based 4 quadrant drive for PMDC Motor with speed measurement and closed loop control

4.Three Phase input Thyristorised drive for Dc Motor with closed loop control

5.Speed control of three Phase 3-Phase wound Induction Motor

6.DC Jones chopper

7.Single Phase Series Inverter

8.Single Phase Parallel Inverter

1.Characteristics of

a) SCR,

b) MOSFET,

c) IGBT

2. Gate firing circuits of SCR,

3. Single phase AC Voltage controller with R & RL loads

4. Single phase fully controlled bridge converter with R&RL loads

5. Forced competition circuit trainer (Class A,B,C,D & E)

6. DC jones chopper with R&RL loads

7. Single phase parallel inverter with R & RL loads

***PROGRAM OBJECTIVES & OUTCOMES***

**PROGRAM OBJECTIVES**:

1. To simulate and design various gate firing circuits.

2. To familiarize the students by introducing softwares like P- sim, Multisim, and help them to simulate and analyze different converters.

3. To enable the students to study & simulate circuits using Matlab software and on hardware kits.

**PROGRAM OUTCOMES:**

1. Ability to design and conduct simulation and experiments.

2. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

3. Ability to identify, formulate & solve engineering problems with simulation.

4. Ability to simulate characteristics of SCR, MOSFET, IGBT.

5. Ability to simulate gate firing circuits

6. Ability to simulate Rectifiers, AC voltage controller on hardware kits.

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

**IN-BS-204 Mathematics -III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-BS-204 | Mathematics -III | 4 | 3 | 1 | -- | 4 | 40 | 60 |  | 100 | 3 Hrs |

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions uniformly spread among the entire syllabus, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the entire syllabus, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt 4-questions out of 4-questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each**

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

**IN-BS-204 Mathematics -III**

Course Outcomes

The objective of this course is to familiarize the prospective engineers with techniques in complex variables, Fourier series, statistics and probaility . It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

The students will learn:

* + The mathematical tools needed in evaluating contour integration.
	+ The effective mathematical tools for statistical analysis
	+ The tools of Bessel and series solution, Fourier series to analyze harmonics used in various techniques dealing engineering problems.

|  |
| --- |
| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | **S** |  | **S** |  |  |  |  |  |  |  |  |  |
| **CO2** | **S** |  | **S** | **S** |  |  |  |  |  |  |  |  |
| **CO3** | **S** |  | **S** |  |  |  |  |  |  |  |  |  |
| **CO4** |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO5** |  |  |  |  |  |  |  |  |  |  |  |  |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-BS-204 | Mathematics -III | 4 | 3 | 1 | -- | 4 | 40 | 60 |  | 100 | 3 Hrs |

**IN-BS-204 Mathematics –III** Detailed contents:

**Module**-I

Bessel functions: series solution of Bessel differential equation, Bessel function of first kind Jn(x), generating function for Jn(x), recurrence relations.

Legendre Polynomials: Legendre differential equation, Legedre polynomials Pn(x) as solution of legedre differential equation for (n>0), generating function for Pn(x), recurrence relations, Orthoganality of Pn(x).

**Module** -II

Fourier Series: Euler’s formulae, conditions for Fourier expansions, Fourier expansion of functions having points of discontinuity, change of interval, odd & even functions, half range series. Fourier Transforms: Fourier Integrals, Fourier transforms, Fourier cosine and sine transforms, Properties of Fourier Transforms, convolution theorem, Parseval’s identity, relation between Fourier and Laplace transforms

**Module** -III

Function of a complex variables: Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, harmonic functions, Taylor and Laurent series, singular points, residues, evaluation of residues at poles, and poles of mth order, Cauchy’s residue theorem, the Cauchy’s principle value, evaluation of definite integrals.

**Module** -IV

Probability Distributions: Probability, Baye theorem, Discrete & Continuous probability distributions, discrete random variable, probability function, distribution function, Mathematical expectation, expectation of a sum of random variables, expectation of product of independent variables.

Binomial distribution, the Poisson distribution, the normal distribution, relation between a normal and a binomial distribution, the mean deviation of a normal distribution, area under normal error curve, fitting of normal curve, the normal and Gaussian law of error, applicability of the normal law of error, normal error distributions, chi square test-definition, conditions, test of independence, goodness of fit, test of homogeneity, limitations.

Text / References:

1. E. Kreyszig, “ Advanced Engineering Mathematics”, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, “Introduction to Probability Theory” , Universal Book Stall, 2003.
3. S. Ross, “ A First Course in Probability”, Pearson Education India, 2002.
4. W. Feller, “ An Introduction to Probability Theory and its Applications” , Vol. 1, Wiley, 1968.
5. N.P. Bali and M. Goyal, “ A text book of Engineering Mathematics” , Laxmi Publications, 2010.
6. B.S. Grewal, “ Higher Engineering Mathematics” , Khanna Publishers, 2000.
7. T. Veerarajan, “Engineering Mathematics” , Tata McGraw-Hill, New Delhi, 2010.
8. Theory of Errors By J.Topping
9. Probability and Statistics, Speigel, Schaum Series, 2016

References:

1. Complex variables and Applications by R.V.Churchil; McGraw Hill
2. Engineering Mathematics Vol-II by S.S.Sastry; PHI
3. Operation Research by H.A.Taha;
4. Probability and Statistics for Engineers by Johnson ; PHI
5. Higher Engineering Mathematics by B.S.Grewal
6. Advance Engineering Mathematics by E. Kreyzig

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PE-206 | Control System Components | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions among the 4-modules, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the 4-modules, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt 4-questions out of 4-questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each.**

IN-PE-206 Control System Components

**Course Outcomes**

**After successful completion of this course, the students should be able to**

CO1: Design and conduct performance experiments, as well as to identify, formulate and solve machine related problems.

CO2: Analyze and describe aspects of the construction, principle of operation, applications and methods of speed control

CO3: Describe the construction, application and operation of single phase and three phase transformers

CO4: Understand the basic concepts and working of switches and relays.

CO5: Identify suitable motors for industrial applications

**PROGRAM OUTCOMES**

1. Graduates will be able to apply fundamental knowledge in mathematics, science, electronics and instrumentation for solving engineering problems.
2. Graduates will be able to identify and analyze complex engineering problems in the areas of electronics, instrumentation and automation.
3. Graduates will be able to solve open-ended technical problems and be proficient in the design, test, and implementation of electronics, instrumentation and control systems.
4. Graduates will attain skills to conduct experiments/investigations and interpret data with reference to systems and standards related to electronics and instrumentation engineering.
5. Graduates will have proficiency in system design tools and software packages related to electronics and instrumentation.
6. Graduates will have knowledge in the area of instrumentation engineering to assess and address societal, health, safety, legal and cultural issues.
7. Graduates will have broad education necessary to understand the impact of engineering solutions and sustainable development in environmental and societal context in the field of Instrumentation.
8. Graduates will be able to understand and uphold professional, ethical, and social responsibilities in Instrumentation engineering.
9. Graduates will be able to function efficiently as an individual or in team in process and automation industries.
10. Graduates will have ability to communicate effectively in written, oral and instrumentation formats to put forth solutions and prepare detailed engineering report in the process and automation industries.
11. Graduates will be able to apply the knowledge, skill and attitude as a team player in initiating, executing and managing projects in the areas of design, manufacture, marketing and entrepreneurship in multi-disciplinary environments.
12. Graduates will be able to conduct information searching and processing and develop the ability for lifetime-learning in field of Instrumentation engineering.

Module-1

Control System: Open loop & closed loop operation, Introduction to control system components, Representation of control components: Mechanical, Electrical, hydraulic and pneumatic. Transfer function of control system, Mathematical Modeling of Dynamic system: Mechanical, Electrical, Analogous system, Electromechanical system, hydraulic and pneumatic transfer function by block diagram, reduction technique, signal flow graphs techniques, Meson's gain formula for signal flow graph.

Module-2

Basic control action & Industrial automatic controller: On/Off or two position, proportional, integral, proportional-Integral, proportional-derivative and proportional-integral-derivative control action. Pneumatic controller, comparison between pneumatic and hydraulic systems, Pneumatic amplifiers, pneumatic proportional controller, pneumatic derivative and integral control action, PID controller, PI controller action. Hydraulic controller: Advantage and disadvantage of Hydraulic controllers, Hydraulic integral controller, proportional controller, Hydraulic PI controller, hydraulic PD controller.

Module-3

Electronic controller: On/Off or two position, proportional, integral, proportional-integral, proportional-derivative and proportional-integral-derivative, design and consideration. Programmable controller, characteristic function of PLC, block diagram of PLC, ladder diagram, ladder diagram elements, development of simple ladder diagram & applications.

Module-4

Control valve: Type and characteristics, control valve sizing, selection criteria concept. Calculation of control valve size, positioner, necessity type & effects on performance of control valve. Pneumatic control valve characteristics, Actuators: electrical actuators, pneumatic actuators, Hydraulic, Electro-hydraulic, Electro-pneumatic.

Auxiliary process components: Hydraulic pumps & power supply, Hydraulic servomotor, Hydraulic integrator, Amplidyne, Magnetic Amplifier.

**Reference Books :**

1. Process Control and Instrument Technology by C.D.Jhonson.

2. Instrumentation for Process Measurement and Control By N.A.Anderson

3. Automatic Control Engineering by Raven

4. Automatic Control System by C.Kuo

5. Modern Control Engineering by Katsuhiko & Ogata

6 Control System by Nagrath & Gopal

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PRCS-12 | Control System Lab-1 | 1.5 | -- |  | 3 | 3 | 30 | -- | 45 | 75 | 3 Hrs |

*Program Educational Objectives*

Graduates of the program will,

|  |  |
| --- | --- |
| PEO1  | Have successful professional careers in Electrical Sciences, and IT enabled areas and be able to pursue higher education.  |
| PEO2  | Demonstrate ability to work in multidisciplinary teams and engage in lifelong learning.  |
| PEO3  | Exhibit concern for environment and sustainable development.  |

***COURSE OUTCOMES:***

After the successful completion of the course, the student will be able to

1. Execute time response analysis of a second order control system using MATLAB/ simulation software

2. Analyze and interpret stability of the system through Root Locus, Bode plot and Nyquist plot.

3. Design Lag, Lead, Lead-Lag compensators and verify experimental results using MATLAB.

4. Analyze toque- speed characteristics of DC and AC servomotors.

5. Analyze the effect of P, PI, PD and PID controllers on a control system.

List of Experiments **2nd Year / 4th Semester**

**Subject: Control System Lab**

|  |  |
| --- | --- |
| **S.No** | **Experiments** |
| **1.** | Simulation Software for pneumatic components : An Introduction  |
| **2.** | Simulation Software for hydraulic components : An Introduction |
| **3.** | Design a hydraulic circuit using a double acting cylinder and 4/2 hand operated valve to raise or lower the pressure.  |
| **4.** | Design a hydraulic circuit by using a single acting cylinder to open or close the door. The operator can open or close the door at the time of loading or unloading the component.  |
| **5.** | Design a hydraulic circuit to lift a movable object by using telescopic cylinder and 4/3 hand lever valve.  |
| **6.** | Design a pneumatic circuit to open and close the door. By operating a push button valve, door should be open or close.  |
| **7.** | Design a pneumatic circuit using a double acting cylinder and 5/2 air spring valve to open the door which can be controlled from other place.  |
| **8.** | Design a pneumatic circuit for a piston of double acting cylinder is to extend when one or both of the two 3/2 push button valve is activated, if both the push button are released the cylinder has to retract.  |

**IN-PC-208 ELECTRICAL MACHINES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PC-208 | Electrical Machines | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |

**IN-PC-208 ELECTRICAL MACHINES**

**Course Outcomes**

**After successful completion of this course, the students should be able to**

CO1: Design and conduct performance experiments, as well as to identify, formulate and solve machine related problems.

CO2: Analyze and describe aspects of the construction, principle of operation, applications of various electrical machines.

CO3: Describe the construction, application and operation of single phase and three phase transformers

CO4: Understand the basic concepts and working of switches and relays.

CO5: Identify suitable motors for industrial applications

**PROGRAM OUTCOMES**

1. Graduates will be able to apply fundamental knowledge in mathematics, science, electronics and instrumentation for solving engineering problems.
2. Graduates will be able to identify and analyze complex engineering problems in the areas of Electrical, Instrumentation and Automation.
3. Graduates will be able to solve open-ended technical problems and be proficient in the design, test, and implementation of Electrical, Instrumentation and control systems.
4. Graduates will attain skills to conduct experiments/investigations and interpret data with reference to systems and standards related to electronics and instrumentation engineering.
5. Graduates will have proficiency in system design tools and software packages related to electronics and instrumentation.
6. Graduates will have knowledge in the area of instrumentation engineering to assess and address societal, health, safety, legal and cultural issues.
7. Graduates will have broad education necessary to understand the impact of engineering solutions and sustainable development in environmental and societal context in the field of Instrumentation.
8. Graduates will be able to understand and uphold professional, ethical, and social responsibilities in Instrumentation engineering.
9. Graduates will be able to function efficiently as an individual or in team in process and automation industries.
10. Graduates will have ability to communicate effectively in written, oral and instrumentation formats to put forth solutions and prepare detailed engineering report in the process and automation industries.
11. Graduates will be able to apply the knowledge, skill and attitude as a team player in initiating, executing and managing projects in the areas of design, manufacture, marketing and entrepreneurship in multi-disciplinary environments.
12. Graduates will be able to conduct information searching and processing and develop the ability for lifetime-learning in field of Instrumentation engineering.

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| --- |
| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** |  |  |  | **S** |  |  |  | **S** | **S** | **S** | **S** | **S** |
| **CO2** | **S** |  |  | **S** |  |  |  | **S** | **S** | **S** | **S** | **S** |
| **CO3** | **S** |  |  | **S** |  |  |  |  | **S** | **S** | **S** | **S** |
| **CO4** |  |  |  | **S** |  |  |  |  | **S** | **S** | **S** | **S** |
| **CO5** |  |  |  | **S** |  |  |  |  | **S** | **S** | **S** | **S** |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

Module-1

MAGNETIC CIRCUITS AND INDUCTION: Magnetic Circuits, Magnetic Materials and their properties, static and dynamic e.m.f.s and force on current carrying conductor, AC operation of Magnetic Circuits, Hysteresis and Eddy current losses, frictional & copper losses. TRANSFORMERS: Basic theory, construction, operation at no-load, equivalent circuit, phasor diagram, O.C. and S.C. tests for parameters determination, efficiency and regulation, auto-transformer, introduction to three phase transformer; Scott connection, parallel operation of transformer.

Module-2

PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSIONS: Force and torque in magnetic field system, energy balance, energy and force in singly excited magnetic field system, concept of co-energy, forces and torques is system with permanent magnets, dynamic equation. DC MACHINES: Basic theory of DC generator, brief idea of construction, emf equation, load characteristics, basic theory of DC motor, concept of back emf, torque and power equations, load characteristics, starting and speed control of DC motors, Types of DC generator & motors, Armature reaction, commutation characteristics of DC machines.

Module-3

Induction Motors: Three phase motors, principle of operation, slip-torque equation, torque-slip characteristic, relation between slip and rotor copper loss, equivalent circuit, different types of starters applications. Single phase induction motors, principle of working, types, applications, Special Purpose Machines: Principle, working, applications of stepper motor, servo motors and universal motors.

Module-4

Alternators: Constructional features, synchronous speed, e.m.f. equation, winding factor, regulation by synchronous impedance method. Motors - concept of rotating magnetic field, principle of working, effect of variation of load, Vee curves.

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions among the 4-modules, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the 4-modules, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt 4-questions out of 4-questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each.**

Reference Books :

1. Electrical Machines by Magrath and Kothari, TMH
2. Electrical Machines by Mukharjee and Chakravarty; Dhanpat Rai & Sons
3. Electrical Machines, Vol I & II by B.L.Thareja; Dhanpat Rai & Sons
4. Electrical Motor & Power Electronics by P.C.Sen; J.Wiley.

**B.Tech. 2ND YEAR (SEMESTER–IV) (w.e.f.2019-20)**

**IN-PC-210 DIGITAL TECHNIQUES**

**Course Outcomes
After successful completion of this course, the students should be able to**CO1: Understand, demonstrate and troubleshoot the different types of logic gate
CO2: Demonstrate an understanding of minimizing logic circuits using Boolean operations
CO3: Understand principles and operations, demonstrate and troubleshoot combinational logic circuits.
CO4: Understand principles and operations, demonstrate and troubleshoot sequential logic
circuits.
CO5: Understand principles and operations, demonstrate and troubleshoot registers and
counters.

|  |
| --- |
| CO/PO Mapping(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak |
| **COs** | **Programme Outcomes (POs)** |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | **S** | **S** | **S** | **S** | **S** |  |  |  |  |  |  |  |
| **CO2** | **S** | **S** | **S** | **S** | **S** |  |  |  |  |  |  |  |
| **CO3** | **S** | **S** | **S** | **S** | **S** |  |  |  |  |  |  |  |
| **CO4** | **S** | **S** | **S** | **S** | **S** |  |  |  |  |  |  |  |
| **CO5** | **S** | **S** | **S** | **S** | **S** |  |  |  |  |  |  |  |

**Course Assessment methods:**

|  |  |
| --- | --- |
| **Direct**  | **Indirect** Course end survey |
| Internal test I  |  |
| Internal test II |  |
| Internal test III |  |
| Assignment |  |
| Tutorial |  |
| Seminar |  |
| End Semester Exam |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| INE-PCC-210 | Digital Techniques | 3 | 2 | 1 | -- | 3 | 40 | 60 |  | 100 | 3 Hrs |

**Note:** The Examiner(s) will set the question paper in three sections, Section-A, Section-B, and Section-C. Section-A is compulsory. Section-A comprises 4-short answer type questions uniformly spread among the entire syllabus. Section-B comprises 4-questions among the 4-modules, asking for conceptual questions, definitions, derivations, principles, construction and working etc. Section-C comprises 4-questions uniformly spread among the 4-modules, asking for the derivations, numericals and applications of the various topics covered therein. The student has to **answer/ attempt 4-questions out of 4-questions in Section-A, 2-questions out of 4-questions in Section-B and** **2-questions out of 4-questions in Section-C. Section-A carry12 marks. Section-B and Section-C carry 24 marks each.**

INE-PCC-210 DIGITAL TECHNIQUES Details of the Course Contents

Module -I

Number system and codes, signed binary numbers, Boolean relations, sum of products method, algebraic simplification, k-Maps, Karnaugh simplifications, binary addition, binary subtraction, digital operation of a digital system, OR, AND gates, inverter circuit, the inhibit (enable) operation, XOR circuits, DeMorgan's Laws, NAND & NOR gates. Logic Hardware: DTL, TTL, RTL, ECL, DCTL, Integrated injection logic, PMOS, NMOS, CMOS Logic and their characteristics, Dynamic MOS circuits,

Module -II

Binary Adders (Half Adder, Parallel Operation, Full adder, MSI Adders, Serial Operation). Arithmetic functions (True/Complement, Zero/One Element, Binary Subtraction, Digital Comparator), Decoder, Encoders, Multiplexers, Demultiplexures, Flip flops: RS Latches, Level clocking (Clocked SR flip flop), D latch, Edge triggered JK Flip Flop, JK Master Slave flip flop, T type Flip Flop.

Module -III

Shift Registers, Static and dynamic MOS Shift registers, Tristate logic and its uses in computers, synchronous & Asynchronous counters, Binary module counters, Programmable and presettable up/down counters, Applications of Counters.

Module -IV

A/D & D/A converters and their design. Digital storage devices: ROM, RAM, EPROM, EEPROM, PAL & PLA, ULA, MOS ROM, ROM Applications

**Reference Books :**

1. Digital Electronics by Gothman, Prentice-Hall

2. Digital Principals & Applications by Malvino & Leach, TMH

3. System Design by Sonde, TMH

4. Digital Computer Electronics by A.P.Malvino, TMH

5. Analog and Digital Electronics by Peter.H.Beards.

6. Integrated Electronics by Millman & Halkias, McGraw Hill

IN-PRDT-14 Digital Lab

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Course No.** | **Course title** | **Credits** | **Teaching Schedule** | **Allotment of marks** | **Duration of Exams** |
| **L** | **T** | **P** | **Total** | **Minor test + Curricular activities** | **Major test** | **Practical** | **Total** |
| IN-PRDT-14 | Digital Lab | 1.5 | -- |  | 3 | 3 | 30 | -- | 45 | 75 | 3 Hrs |

**Course Outcomes:**

After successful completion of this course, the students should be able toCO1: Design basic application circuits using op-amp.
CO2: Understand and implement the working of basic digital circuits
CO3: Design multivibrators and voltage regulators
CO4: Design Counters and Timers
CO5: Design and Fabricate small projects using simulation tools and hardware

LIST OF EXPERIMENTS : Experiments beyond the syllabus should be conducted.

1. Study of flip flop. ( JK, RS, D)
2. Implementation of combinational circuit
3. Design and Implementation of counters.
4. Design and Implementation of parallel and shift registers.
5. Binary adder/ subtractor
6. Digital comparator
7. Multiplexers and Demultiplexer
8. Realization of logic gates using diodes and transistors, DTL &TTL.
Characteristics of TTL Gates
9. Half and full adders and subtractors using basic gates

**Expected Outcome**After the completion of the course, students should be able to
•Design and implement combinational circuits
•Design and implement sequential circuits
•Get familiarized with the TTL logic family.

**Text Books:**1. Charles H. Roth, Jr. Fundamentals of Logic Design, 5th edition, Thomson Books/Col
2. A. Anand Kumar, Fundamentals of Digital Circuits, PHI learning, 2/e, 2010, ISBN:
81-203-3679-7.