| PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING | |
|---|---|
| **Course code : EEM 201** | **Course Title : ELECTRIC CIRCUITS** |
| **Semester : 3rd** | **Credits : 3** |
| **Hours per week : 3 (L: 3 T:0 P: 0 )** | |

Course Objectives: The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

• Maintain electrical systems applying AC and DC circuit fundamentals.

Course Contents:

1. Single Phase A.C Series Circuits
   - 1.1 Generation of alternating voltage, Phasor representation of sinusoidal quantities
   - 1.2 R, L, C circuit elements its voltage and current response, R-L, R-C, R-L-C combination of A.C series circuit, impedance, reactance, impedance triangle, Power factor, active power, reactive power, apparent power, power triangle and Vector diagram
   - 1.3 Resonance, Bandwidth, Quality factor and voltage magnification in series R-L, R-C, And R- L-C circuit
2. Single Phase A.C Parallel Circuits
   - 2.1 R-L, R-C and R-L-C parallel combination of A.C. circuits. Impedance, reactance, phasor diagram, impedance triangle ,
   - 2.2 R-L, R-C, R-L-C parallel A.C. circuits: power factor, active power, apparent power, reactive power, power triangle
   - 2.3 Resonance in parallel R-L, R-C, R-L-C circuit, Bandwidth, Quality factor and voltage magnification
3. Three Phase Circuits

3.1 Phasor and complex representation of three phase supply

3.2 Phase sequence and polarity

3.3 Types of three-phase connections, Phase and line quantities in three phase star and delta system Balanced and unbalanced load, neutral shift in unbalanced load

3.4 Three phase power, active, reactive and apparent power in star and delta system.

4. Network Reduction
   - 4.1 Source transformation
   - 4.2 Star/delta and delta/star transformation

5. Network Theorems
   - 5.1 Superposition theorem and Thevenin's theorem.
   - 5.2 Norton's theorem and Maximum power transfer theorem

Course Outcomes:

After the completion of the course the student will be able to :

1. Troubleshoot problems related to single phase A.C series circuits.
2. Troubleshoot problems related to single phase A.C parallel circuits.
3. Troubleshoot problems related to three phase circuits.
4. Use principles of circuit analysis to troubleshoot electric circuits.
5. Apply network theorems to troubleshoot electric circuits.

References:
1. Networks & Systems By Ashfaq Husain, , Khanna Book Publishing, New Delhi.
2. Fundamentals of Electrical Network By Gupta, B.R; Singhal, Vandana;, , S.Chand and Co.New Delhi, ISBN : 978-81-219-2318-7
3. Fundamentals of Electrical Engineering By Saxena, S.B Lal; Dasgupta, K;, Cambridge University Press Pvt. Ltd., New Delhi, ISBN : 978-11-0746-435-3
4. A Text Book of Electrical Technology Vol-I By Theraja, B. L. : Theraja, A. K;, , S. Chand & Co. Ramnagar, New Delhi, ISBN : 9788121924405
5. Circuit and network By Sudhakar, A. Shyammohan, S. Palli;, McGraw Hill Education, New Delhi, ISBN : 978-93-3921-960-4
6. Electric Circuits By Bell, David A., , Oxford University Press New Delhi, ISBN : 978-01-954-2524-6
7. Introductory circuit Analysis By Boylested, R.L., , Wheeler, New Delhi,ISBN: 978-00-231-3161-5
8. Basic Electrical Engineering By Mittle, V.N. ;Mittle, Arvind;, McGraw Hill Education, Noida, ISBN: 978-00-705-9357-2
9. Electric Circuit Analysis By Sivanandam, S.N, , Vikas Publishing House Pvt. Ltd, Noida, ISBN:978- 81259-1364-1
10. Circuit theory By Salivahanan, S.; Pravinkumar, S;, Vikas Publishing House Pvt. Ltd, Noida; ISBN:978-93259-7418-0

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

| Sr. No | Topic | Time Allotted (Hrs) | Marks Allocation (%) |
|---|---|---|---|
| 1 | Single Phase A.C Series Circuits | 12 | 25 |
| 2 | Single Phase A.C Parallel Circuits | 12 | 25 |
| 3 | Three Phase Circuits | 12 | 25 |
| 4 | Network Reduction | 6 | 10 |
| 5 | Network Theorems | 6 | 15 |
| | | 48 | 100 |

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 203** | **Course Title :** ELECTRIC CIRCUITS LAB |
| **Semester : 3rd** | **Credits : 1** |
| **Hours per week: 2** | **(L: 0 T:0 P: 2 )** |

**Course objectives**:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

Maintain electrical systems and applying AC and DC circuit fundamentals.

List of practicals:

1. Use dual trace oscilloscope to determine A.C voltage and current response in given

R, L, C circuit.

2. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L, R-C and R-L-C series circuits. Draw phasor diagrams. .
3. Use voltmeter, ammeter, wattmeter, p.f meter to determine current, p.f., active, reactive and apparent power for given R-C, R-L-C parallel circuits with series connection of resistor and inductor in parallel with capacitor.
4. Use variable frequency supply create resonance in given series & parallel R-L-C circuits or by using variable inductor or capacitor.
5. Use voltmeter, ammeter, wattmeter, p.f meter to determine line and phase quantities of voltage and current for balanced & unbalanced three phase star and delta connected loads and calculate active, reactive, and apparent power. Draw phasor diagrams
6. Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying superposition theorem.
7. Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Thevenin's theorem
8. Use voltmeter, ammeter to determine equivalent circuit parameter in a given circuit by applying Norton's theorem
9. Use voltmeter, ammeter to determine load resistance for maximum power transfer for a given circuit by applying maximum power transfer theorem.

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 205** | **Course Title : ELECTRICAL MACHINES - I** |
| **Semester : 3rd** | **Credits : 3** |
| **Hours per week : 3 (L: 3 T:0 P: 0 )** | |

**Course objectives**:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

• Maintain electric motors and transformers.

Course Contents:

1. **Transformers (single phase)**
   - 1.1 Introduction
   - 1.2 Constructional, working principle and EMF equation of a transformer
   - 1.3 Transformer Mutual and leakage fluxes, leakage reactance, on load and no-load phasor diagrams
   - 1.4 Transformer Equivalent circuit referred to primary , Relation between induced emf and terminal voltage, voltage regulation along with mathematical relation

1.5 Transformer Losses , efficiency ,condition for maximum efficiency , All day efficiency
1.6 Significance of transformer rating ,Open circuit and short circuit test.
1.7 Auto transformer construction, saving of copper, working and applications
1.8 constructional features and applications of Different types of transformers (Instrument Transformers, welding transformer, Isolation transformer )

2. **Transformers three phase** (10 hrs)
2.1 Construction : Bank of three single phase transformers, Single unit of three phase transformer , power and distribution transformer , Transformer Cooling
2.2 Accessories of transformers such as Conservator, breather, Buchholtz Relay, Tap Changer (off load and on load) (Brief idea)
2.3 Transformer connections i.e. delta-delta, delta-star, star-delta and star-star
2.4 Need of parallel operation of three phase transformer, Conditions for parallel operation (only conditions are to be studied)
2.5 Polarity tests on mutually inductive coils and single phase transformers;

3. DC Generator
3.1 Definition and comparison of motor and generator
3.2 construction, parts, materials and their functions
3.3 Principle of operation , Fleming's right hand rule, schematic diagrams
3.4 E M F Equation of a DC Generator and Factors determining induced emf
3.5 Armature reaction, commutation and Applications of DC generators
3.6 Types of dc Machines and their Equivalent Circuits , voltage built up in a dc shunt generator
3.7 Brief idea about of armature winding

**4. DC Motors**

4.1 Principle of operation , Fleming's left hand rule , Back emf and its Significance , the relation between back emf and Terminal voltage
4.2 Torque of a DC Motor and Factors determining the electromagnetic torque
4.3 Performance and characteristics of different types of DC motors
4.4 Speed control of dc shunt/series motors ( Flux and Armature control )
4.5 Need of starter, three point dc shunt motor starter and 2 point starter
4.6 Applications of DC motors
4.7 Losses in a DC machine
4.8 Determination of losses by Swinburne's test

Course outcomes:
After the completion of the course the student will be able to :
1. Maintain single phase transformer.
2. Maintain three phase transformers
3. Maintain different types of special purpose transformers used in different applications.
4. Maintain different types of DC generators.
5. Maintain different types of DC motors.

References:

1. Electrical Machines, Vol-I, II By G.C. Garg & P.S. Bimbhra , Khanna Book Publishing House (ISBN: 978-9386173-447, 978-93-86173-607), New Delhi
2. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi
3. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, Education Pvt Ltd. New Delhi
4. Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
5. Principles of Electrical Machines By Mehta, V. K. and Mehta, Rohit , S. Chand and Co. Ltd., New Delhi, ISBN: 9788121930888
6. Electrical Machines by JB Gupta, SK Kataria and Sons, New Delhi
7. Electrical Machines by Fitzgerald
8. Electrical Machines by Smarajit Ghosh-Pearson Publishers, Delhi.
9. Electrical Technology Vol-II (AC and DC machines ) By Theraja, B.L S. Chand and Co. Ltd., New Delhi, ISBN: 9788121924375,

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

| Sr. No | Topic | Time Allotted (Hrs) | Marks Allocation (%) |
|---|---|---|---|
| 1 | Transformers (single phase) | 16 | 30 |
| 2 | Transformers three phase | 8 | 20 |
| 3 | DC Machines | 12 | 25 |
| 4 | DC MOTORS | 12 | 25 |
| | **Total** | **48** | **100** |

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 207** | **Course Title : ELECTRICAL MACHINES – I Lab** |
| **Semester : 3rd** | **Credits : 1** |
| **Hours per week: 2 (L: 0 T:0 P: 2 )** | |

Course objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

• Use electric motors and transformers

**LIST OF PRACTICALS**

1. Determine regulation and efficiency of single phase transformer by direct loading.
2. Perform open circuit and short circuit test on single phase transformer to determine equivalent circuit constants, voltage regulation and efficiency
3. Perform polarity test on a three phase transformer whose polarity markings are masked
4. Finding the voltage and current relationships of primary and secondary of a three phase transformer under balanced load in various configurations such as

i. Star-star ii. Star delta iii. Delta star iv. Delta - Delta

5. Check the functioning of the CT, PT and isolation transformer.
6. Dismantle a DC machine
7. Reverse the direction of rotation of the DC shunt motor
8. Speed control of dc shunt and series motor by different methods
9. Study of dc series motor with starter (to operate the motor on no load for a moment)
10. Study of 3 point starter for starting D.C. shunt motor

.

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 209** | **Course Title : ELECTRICAL POWER – I ( Generation )** |
| **Semester : 3rd** | **Credits : 3** |
| **Hours per week : 3 (L: 3 T:0 P: 0 )** | |

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain the efficient operation of various electric power generating plants
- **To keep them abreast with modern techniques in Generation of Electrical Power**

Course Contents:

1. Sources of Energy
   - 1.1. Details of Various conventional sources of energy such as Fossil fuels, Hydropower , Nuclear fuels etc.
   - 1.2 Limitations and environmental Effects, current energy situation
   - 1.3 Details of Various Non conventional sources of energy such as Solar energy , wind energy , Bio Energy , Geothermal Energy , Ocean Energy etc
   - 1.4 Importance of non-conventional sources of energy in the present scenario.
2. Thermal Power Plants: Coal, and Nuclear-based
   - 2.1 Layout and working of a typical thermal power plant with steam turbines and electric generators.
   - 2.2 Properties of conventional fuels used in the energy conversion equipment used in thermal power plants: Coal, Nuclear fuels –fusion and fission action
   - 2.3 Safe Practices and working of various thermal power plants: coal-based, nuclear-based.
   - 2.4 Functions of the following types of thermal power plants and their major Auxiliaries : Coal fired boilers: fire tube and water tube.
     Types of nuclear reactors: Disposal of nuclear waste and nuclear shielding.

3. Hydro Power Plants

3.1 Energy conversion process of hydro power plant.
3.2 Layout and working of a typical Hydro power plant
3.3 Classification of hydro power plant: High, medium and low head.
3.4 working of hydro turbines used in different types of hydro power plant:
a. High head – Pelton turbine
b. Medium head – Francis turbine
c. Low head – Kaplan turbine.
3.5 Safe Practices for hydro power plants.

4. **Economics of Power Generation and Interconnected Power System**

4.1 Concept of the terms: connected load, firm power, cold reserve, hot reserve, spinning Reserve , Base load and peak load plants; Load curve, load duration curve, integrated duration curve
4.2 Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor.
4.3 Choice of size and number of generator units, combined operation of power station.
4.4 Causes, Impact and reasons of Grid system fault: State grid, national grid, brownout and black out; sample blackouts at national and international level
5. Power factor
5.1 Concept of power factor, Reasons and disadvantages of low power factor
5.2. Different methods of power factor improvement, simple problems

Course outcomes:

After the completion of the course the student will be able to:

1. Identify sources of energy
2. Maintain the optimised working of the thermal power plant.
3. Maintain the optimised working of hydro power plants.
4. Select the adequate mix of power generation based on economic operation.

References:

1. Power Plant Engineering by Nag. P. K., McGraw Hill, New Delhi, ISBN: 978-9339204044
2. Electrical Power Generation by Tanmoy Deb, Khanna Publishing House, Delhi (Ed. 2018)
3. Generation of Electrical Energy by Gupta, B.R.,S. Chand& Co. New Delhi,
4. Electrical Power System by VK Mehta, S Chand and Co., New Delhi
5. Power Plant Engineering by Manoj Kumar Gupta
6. A Course in Electrical Power by Gupta, J.B.– S. K Kataria and Sons, New Delhi. 2014,
7. A Course in Electrical Power by Soni, Gupta, Bhatnagar,. – Dhanpatrai and Sons
8. Wind Power Plants and Project Development Wizelius, Tore; Earnest, Joshua –, PHI

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

| Sr. No | Topic | Time Allotted (hrs) | Marks Allocation (%) |
|---|---|---|---|
| 1 | Sources of energy | | 10 |
| 2 | Thermal Power Plants | | 40 |
| 3 | Hydro Power Plants | | 20 |
| 4 | Economics of power generation | | 20 |
| 5 | Power factor | | 10 |
| 6 | | | |
| | **Total** | **48** | **100** |

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 211** | **Course Title : ELECTRICAL POWER – I ( Generation ) Lab** |
| **Semester : 3rd** | **Credits : 3** |
| **Hours per week : 3 (L: 3 T:0 P: 0 )** | |

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain the efficient operation of various electric power generating plants.

Practicals:

1. Identify the routine maintenance parts of the coal fired thermal power plant after watching a video programme.
2. Assemble and dismantle a small diesel generator power plant.
3. Identify the routine maintenance parts of the nuclear fired thermal power plant after watching a video programme
4. Identify the routine maintenance parts of the hydro power plant after watching a video programme
5. Assemble a micro hydro power plant and then dismantle it.

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of power generating stations including grid stations be arranged and various equipment, accessories and components explained to the students and make them familiar with the equipment and accessories installed over there. There should be at least 3 visits during the semester. The students may be asked to prepare notes while on visit and submit the report and give seminar. In addition, viva-voce be conducted to evaluate the knowledge gained during the field visit.

| PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING | |
|---|---|
| **Course code : EEM 213** | **Course Title : ELECTRICAL AND ELECTRONIC MEASUREMENTS** |
| **Semester : 3rd** | **Credits : 3** |
| **Hours per week : 3 (L: 3 T:0 P: 0 )** | |

Course objectives:
The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
• Use relevant measuring instrument in different electrical applications.

**COURSE CONTENTS**

1. **Fundamentals of Measurements :**
   - 1.1 Significance, units, fundamental quantities and standards
   - 1.2 Classification of Instrument Systems:
     Null and deflection type instruments , Absolute and secondary instruments
     Analog and digital instruments, Static and dynamic characteristics,
   - 1.3 Types of errors Calibration: need and procedure
   - 1.4. Classification of measuring instruments: indicating, recording and integrating instruments.
   - 1.5. Essential requirements of an indicating instruments

2. **Ammeters and Voltmeters (Moving coil and moving iron type):**
   - 2.1 Concept of ammeters and voltmeters and difference between them
   - 2.2 Extension of range of voltmeters and ammeter
   - 2.3 Construction and working principles of moving Iron and moving coil instruments
   - 2.4 Merits and demerits, sources of error and application of these instruments

3. **Wattmeters and Energy meters**

   - 3.1 Construction, working principle, merits and demerits of dynamometer type wattmeter, sources of error
   - 3.2 Construction, working principle, merits and demerits of single-phase and three-phase energy meters, Errors and their compensation, Simple numerical problems
   - 3.3 Construction and working principle of maximum demand indicators

**4 Miscellaneous Measuring Instruments**:
- 4.1 Construction, working principle and application of
  Meggar, Earth tester, Multimeter, Frequency meter (dynamometer type)
  single phase power factor meter (Electrodynamometer type).
- 4.2 Working principle of synchros cope, phase sequence indicator and tong tester (Clamp-on meter)

**5. Instrument Transformers**:
- **5.1** Construction, working and applications CT & PT and their ratio and phase angle error

**6. Power Measurements**

**6.1 In single phase circuits using wattmeter**

**6.2 In 3-phase circuits by**

i. 2 wattmeter method in balanced and unbalanced circuits and simple problems
ii. Three wattmeter method

7. **Electronic Instruments**:

6.1 Cathode Ray Oscilloscope: Block diagram, working principle of CRO and its various controls, applications of CRO.
6.2 Digital multi-meter (only block diagram) and Applications
6.3 LCR meters Study of LCR meters and their applications

8**. Measurement of Temperature**

8.1 construction, working principle and applications of different types of thermometers, thermocouple, resistance temperature detector

Course outcomes:

After the completion of the course the student will be able to:

1. Check the working of the electrical measuring instrument.
2. Use different types of measuring instruments for measuring voltage and current.
3. Use different types of measuring instruments for measuring electric power
4. Use different types of measuring instruments for measuring electric energy.
5. Use different types of electrical instruments for measuring various ranges of electrical parameters.

References:


1. Electrical Measurements and Measuring Instruments by Golding and Widdis; Wheeler Publishing House, New Delhi
2. Electrical Measurements and Measuring Instruments by SK Sahdev, Unique International Publications, Jalandhar
3. A Course in Electrical Measurement and Measuring Instruments by AK Sawhney and PL Bhatia; Dhanpat Rai and Sons, New Delhi
4. Electric Instruments by D. Cooper
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International (P) Ltd., Publishers, New Delhi
6. Electronics Instrumentation by Umesh Sinha, Satya Publication, New Delhi
7. Basic Electrical Measurements by Melville B. Staut.

8. Electrical Measurement and Measuring Instruments by JB Gupta, SK Kataria and Sons, New Delhi
9. Electrical Measurement and Measuring Instruments by ML Anand, SK Kataria and Sons, New Delhi
10. . Electrical and Electronic Measurement and Instrumentation by Rajput R.K., , S.Chand and Co. New Delhi, ISBN : 9789385676017
11. Electrical Measurements and Measuring Instruments by Suryanarayna N.V., , S.Chand and Co. New Delhi , ISBN :8121920116

**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

| Sr. No | Topic | Time Allotted (hrs) | Marks Allocation (%) |
|---|---|---|---|
| 1 | Fundamentals of Measurements | 5 | 10 |
| 2 | Ammeters and Voltmeters | 10 | 20 |
| 3 | Watt-meters and Energy meters | 5 | 10 |
| 4 | Miscellaneous Measuring Instruments: | 10 | 20 |
| 5 | Instrument Transformers: | 6 | 10 |
| 6 | Power Measurements | 3 | 10 |
| 7 | Electronic Instruments : | 6 | 10 |
| 8 | Measurement of Temperature | 3 | 10 |
| | **Total** | **48** | **100** |

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 215** | **Course Title : ELECTRICAL AND ELECTRONIC MEASUREMENTS lab** |
| **Semester : 3rd** | **Credits : 1** |
| **Hours per week : 2 (L: 0 T:0 P: 2)** | |

Course objectives:
The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:
• Use relevant measuring instrument in different electrical applications.

**LIST OF PRACTICALS**

1.
2. To measure the value of earth resistance using earth tester.
3. To measure power, power factor in a single-phase circuit, using wattmeter and power factor meter and to verify results with calculations.
4. Measurement of voltage and frequency of a sinusoidal signal using CRO and draw wave shape of signal.
5. Measurement of power in a 3 phase circuit using CT, PT and 3-phase wattmeter.
6. Use of LCR meter for measuring inductance, capacitance and resistance.
7. To record all electrical quantities from the meters installed in the institution premises.
8. To measure Energy at different Loads using Single phase Digital Energy meter.

Practicals:

1. Identify measuring instruments on the basis of symbols on dial, type, accuracy, class position and scale.
2. Measure AC and DC quantities in a working circuit
3. Extend range of ammeter and voltmeter by using (i) shunt and multiplier (ii) CT and PT.
4. Use Clamp-on meter and digital multi-meter for measurement of AC/DC current, AC/DC voltage.
5. Use electro-dynamic watt-meter for measurement of power in a single phase circuit
6. Troubleshoot electro-dynamic watt-meter for measurement of power in a single phase circuit
7. Use single wattmeter and two watt-meters for measurement of active and reactive power of three phase balanced load.
8. Calibrate single phase electronic energy meter by direct loading.
9. Use Megger for insulation resistance measurements.
10. Use earth tester for measurement of earth resistance.
11. Use CRO for the Measurement of supply frequency in single-phase circuit.
12. Use Tri-vector meter for measuring kW, kVAr and kVA of a power line

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 217** | **Course Title : Digital Electronics and Microprocessor** |

| Semester : 3rd | Credits : 3 |
|---|---|
| Hours per week : 3 (L: 3 T:0 P: 0 ) | |

Course Objective:
The objective of this subject is to enable the students to know basic concepts of digital electronics design and build digital hardware.

1. **Number Systems and logic gates**

1.1 Number System : Decimal, binary, octal, hexa-decimal BCD and ASCII code number systems and their inter-conversion ,Binary and Hexadecimal addition, subtraction and multiplication , 1's and 2's complement methods of addition/subtraction

1.2 Definition, symbol and truth tables for inverter, OR, AND, NAND, NOR and X-OR exclusive-AND gates

1.3 Boolean algebra and their applications , DeMorgan's Theorems , K-Map upto four variables

**2 Combinational and sequential ckts.**

2.1 Half adder, Full adder , Encoder, Decorder , Multiplexer/Demultiplexer , Display Devices (LED, LCD and 7-segment display) Brief Descriptions

2.5 **Flip-Flops:**
J-K , R-S ,D-Type and T-Type Flip-Flops and their applications

3 **Registers and counters**

3.1 Storage register and shift registers Introduction only

3.2 Asynchronous and synchronous Counters

4 **Converters**

4.1 A/D converter (successive approximation method of A/D Conversion)

4.2 D/A converters (Binary weighted Converter)

5 **Semi-conductor Memories**
Types, merits, demerits, and applications

6. **Microprocessor**

6.1 Introduction
6.2 Study of 8085 microprocessor architecture,
6.3 pin configuration
6.4 bus organization
6.5 registers
6.6 flags
6.7 interrupts

7 **Instruction set**

7.1 Instruction set of 8085 microprocessor

7.2 Addressing modes

7.3 8085 Programming, instruction format Writing some simple assembly language programmes

Course Outcome:

After completion of the course student will be able to:

1. Understand the fundamental concepts of digital electronics
2. Derive basic logic gates and universal gates
3. Understand, analyze and design various combinational and sequential circuits.
4. Analyze different types of registers and design counter circuits.
5. Analyze different logic families, their characteristics and performances
6. Understand basic functioning of Microprocessor and its applications

References:


1. Digital Electronics by Jamwal, Dhanpat Rai and Co. New Delhi
2. Microprocessors Architecture, Programming and Application with 8085/8080A, Ramesh S Gaonkar, Wiley Eastern Ltd. New Delhi
3. Introduction to Microporcessors by Aditya Mathur, TMH Publishing Co., New Delhi
4. Microprocessors and Microcontrollers by BP Singh, Galgotia Publications, New Delhi
5. Digital Systems by Sanjay K Bose, Wiley Eatern(P) Ltd. New Delhi
6. Digital Systems : principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi
7. Digital Integrated Circuits by AK Gautam, SK Kataria and Sons, New Delhi
8. Microprocessors(The 8086 and 8088) by AK Gautam and A Jaiswal; SK Kataria and Sons, New Delhi
9. Fundamental of Microprocessor—Dr. BN. Ram & Microcomputer
10. Microprocessor, Micro-controller—A.K. Mukhopadhyay & their Applications
11. Microprocessor, applications – Dr Ajit Pal


**SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER**

| **Sr. No** | **Topic** | **Time Allotted (hrs)** | **Marks Allocation (%)** |
|---|---|---|---|
| 1 | **Number Systems and logic gates** | 15 | 30 |
| 2 | **Combinational and sequential ckts.** | 15 | 30 |
| 3 | **Registers and counters** | 2 | 5 |
| 4 | **Converters** | 3 | 10 |
| 5 | **Semi-conductor Memories** | 2 | 5 |
| 6 | **Microprocessor** | 9 | 20 |

| | | | |
|---|---|---|---|
| 7 | **Instruction set** | 2 | 5 |
| | **Total** | **64** | **100** |

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** | |
|---|---|
| **Course code : EEM 219** | **Course Title : Digital Electronics and Mocroprocessor – Lab** |
| **Semester : 3rd** | **Credits : 1** |
| **Hours per week : 2 (L: 0 T:0 P: 2 )** | |

Course Objective:

The objective of this subject is to enable the students to know basic concepts of digital electronics design and build digital hardware

Practicals:

1. Writing assembly language programme using numemoanics and test them on μP Kit (any three)
   i. Addition of two 8-bit numbers
   ii. Subtraction of two 8-bit numbers
   iii. Multiplication of two 8-bit numbers
   iv. Division of two 8-bit numbers
   V. Finding average of N given integer
   vi. Finding maximum number out of three given numeric

**2.** Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, X-OR gates

3. Construction of Half Adder/Full Adder using gates
4 To verify the truth table for R-S and JK flipflop
5. Construction and testing of any counter
6 Verification of operation of a 8-bit D/A Converter
7 Assembly language programming for different applications on 8051 microcontroller

| **PROGRAM : THREE YEARS DIPLOMA PROGRAM IN ELECTRICAL ENGINEERING** |
|---|

| Course code : EEM 221 | Course Title : Electrical Workshop - II |
|---|---|
| Semester : 3rd | Credits : 2 |
| Hours per week : 4 (L: 0 T:0 P: 4 ) | |

Course Objective:

The objective of this subject is to enable the students to know basic concepts of digital electronics design and build digital hardware

## RATIONALE

An electrical diploma holder will be required to inspect, test and modify the work done by skilled workers or artisans working under him. In addition to these persons, many a times, it will become necessary for him to demonstrate the correct method and procedure of doing a job. In order to carry out this function effectively in addition to conceptual understanding of the method or procedure he must possess appropriate manual skills. The subject aims at developing special skills required for repairing, faultfinding, wiring in electrical appliances and installations.

## DETAILED CONTENTS

Course Objectives:

The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

• to become skilled in various electrical jobs

1.To carry out pipe/plate earthing for a small house and 3-phase induction motor.Testing the earthing using earth tester

2. Connections of single phase and 3-phase motors, through an appropriate starter and to change their direction of rotation

3. Wiring, testing and fault finding of the following contactor control circuits operating on 3-phase supply:
   a. Remote control circuits b. Time delay circuits
   c. Inter locking circuits d. Sequential operation control circuits

Note: Students may be asked to study control circuit of a passenger lift, automatic milling machine, etc. using relays

4. Winding/re-winding of a fan (ceiling and table) and choke
5. Power cable jointing using epoxy based jointing kits
6. Demonstration of laying of underground cables at worksite
7. Dismantling/assembly of star-delta and DOL starter
8. Dismantling and assembly of voltage stabilizers
9. Repair and maintenance of domestic electric appliances such as electric iron, geyser, fan, heat convector, desert cooler, room heater, electric kettle, electric oven, electric furnace etc.
10. Dismantling/assembly/maintenance of motor operated appliances such as mixer, blender, drill machine etc.
11. Estimating the material for

1. Domestic Installation 2. Industrial Installation 3. Service line

12. Wiring accessories
13. Wiring Protection devices