APPLIED MATHEMATICS

L	T	P	Curri. Ref. No.:G105
3	1	0	

Total Contact Hrs.: **Total Marks: 100** **Theory:**
Theory: 45 End Exam.: 70
Tutorial: 15 P.A. : 30
Credit : 4

RATIONALE :-
Mathematics is an important tool to solve wide variety of engineering problems. Most of the technological processes in industry are described effectively by using mathematical framework. Mathematics has played an important role in the development of mechanical, civil, aeronautical and chemical engineering through its contribution to mechanics of rigid bodies, hydrodynamics, aero-dynamics and heat transfer etc. It has become of great interest to electrical engineers through its application to information theory, and design of digital computer etc.

AIM :
Through this syllabus we aim to give students a strong foundation in Matrix and Vector with their applications. We also aim to give detail idea of Numerical Solution of Algebraic Equation, Partial Differentiation, Ordinary Differential Equations, Laplace Transform and Fourier Series.

Course Objective:-
After completion of the course, students will be able to –

1. Solve algebraic basic equations using Numerical Methods
2. Differentiate multi-variable functions using partial differentiation principle.
3. Find Complementary Function and Particular Integral of second order differential equation.
4. Solve differential equation using Laplace and Inverse Laplace Transformation.
5. Analyze non sinusoidal signals using Fourier's Series.

DETAIL COURSE CONTENT:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
1. Numerical Solution of Algebraic Equations.	**6**
1.1 Bisection method.	
1.2 *Regula-falsi* method /method of false position.	
1.3 Newton-raphson method.	
1.4 Problems on the above methods.	
2. Partial Differentiation.	**8**
2.1 Introduction to functions of two or more variables.	
2.2 Geometrical Interpretation of a function of two variables.	
2.3 Partial derivatives.	
2.4 Second order partial derivative.	
2.5 Homogeneous function.	
2.6 Euler's theorem.	
2.7 Problems	
3. Differential Equations (ordinary):	**10**
3.1 Linear differential equations of second order with constant coefficients.	
3.2 Complete solution = Complementary function + Particular integral.	
3.3 Method of finding particular integral.	
3.4 Applications of differential equations to electrical circuit problems.	
3.5 Problems related to other physical systems.	
4. Laplace Transform (LT):	**10**
4.1 Piece-wise or sectional continuity.	
4.2 Functions of exponential order.	
4.3 Definition of function and the transform concept.	
4.4 Definition and notation of Laplace Transform.	
4.5 Linearity property.	
4.6 First shifting theorem (first translation).	
4.7 Second shifting theorem (second translation).	
4.8 Change of scale property.	
4.9 Laplace transform of derivatives.	
4.10 Laplace transform of integral	
4.11 Solution of problems using LT	
4.12 Solution of ordinary differential equation up to second order using LT.	

5. Concept of Inverse Laplace Transform & its properties **5**

5.1 Definition of inverse Laplace Transform and null function.
5.2 Linearity property.
5.3 First shifting property.
5.4 Second shifting property.
5.5 Change of scale property.
5.6 Inverse Laplace Transform of derivatives.
5.7 Convolution theorem.
5.8 Problems.
5.9 Solution of differential equations using Laplace Transform.

6. Fourier Series. **8**

6.1 Periodic function.
6.2 Trigonometric series.
6.3 Fourier series and Fourier coefficients theorem.
6.4 Finite discontinuity, Even functions and Odd functions.
6.5 Change of interval and Change of period.
6.6 Complex form of Fourier series, half range series
6.7 Parseval's identity for Fourier series.
6.8 Problems using Fourier series.

SUGGESTED LEARNING RESOURCE:

Reference Books:

1. Integral Calculus, B.C. Das
2. Diploma Engineering Mathematics (Vol. II), B.K. Pal
3. Applied Mathematics , Dr. J.S. Bindra & K.S. Gill
4. Applied Mathematics - I, Dr. J.S. Bindra & K.S. Gill
5. Applied Mathematics -III, Dr. J.S. Bindra.
6. Engineering Mathematics Vol. I, II, and III, S.Arumugam, A.Thangapandi ISSAC, and Somsundaram.

***Any Suggested Assignment/Micro Project*:**

ENGINEERING ECONOMICS & ACCOUNTANCY

L	T	P		
3	0	0		Curri. Ref. No.: G303
Total Contact Hrs.:		**Total Marks: 100**		**Theory:**
Theory: 45				End Exam : 70
Theory Class Duration				P.A.: 30
45 classes of 1hr. or				**Practical:**
60 classes of 45 mins.				End Exam.: 0
Prerequisite: G103, G104				P.A. : 0
Credit: 3				

RATIONALE/AIM:

The knowledge of Economics and Accountancy is needed by personal dealing with the cost of products of any kind related to quality and standards of production including its financial control. Engineers in general need to know the cost of the final products for marketing purposes. The knowledge of Economics as well as Accountancy is required by all people dealing in any business or enterprises.

This particular subject deals with the Basic Concepts of Economics, Factors of Production, Types of Industries, Market forms, Need of Economics Planning for overall development, Concept of Money, Unemployment causes and measures, Industrial Policy, Public Finance, Business Transactions and Accountancy, Maintenance of Cash and balances, Receipts and Expenditures Accounts, Final Accounts and Cost Concepts.

COURSE OUTCOME:

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

1. Define basic terminologies of economics.
2. Identify factors of production.
3. Define different scales of industries.
4. Distinguish different Market Forms.
5. Distribute Expenditure (Capital & Revenue)
6. Do the cost analysis with appropriate classifications of cost accounts.
7. Apply the concept of Trial balance & final accounts.
8. Define basic features of economy of money.
9. Understand industrial policy with appropriate acts.
10. Apply different concept of business transactions and accountancy.

DETAIL COURSE CONTENTS:
THEORY:

UNIT	TOPIC/SUB-TOPIC	Total hrs.
1	**INTRODUCTION:** Introduction to Economics and its Utility of Study Importance of the study of economics.	1
2	**BASIC CONCEPTS OF ECONOMICS:** Definition of Goods, Utility, Value, Price, Income, Capital Classification of Goods, Human Wants-Classification and Types-Relation between Wealth and Capital. Consumer Behaviour: Basic Law of Demands and Supply Concepts and measurement of elasticity of demand	3
3	**PRODUCTION:** Meaning and Factors of Production Land, Labour, Capital and Organisation – meaning and Characteristics Formation of Capital, Break Even Analysis, Break Even Chart its uses.	3
4	**SCALE OF INDUSTRIES:** Meaning of Small, Medium and Large Scale production Advantages and Disadvantages of Small Scale and Large Scale Production	2
5	**MARKET FORMS:** Meaning of Market-Forms of Market Features of Perfect, Imperfect and Monopoly Price Determination under Perfect Competition and Monopoly	3
6	**ECONOMIC PLANNING:** Basic features of underdeveloped Economy – Basic features of Indian Economy. Meaning, Objectives and Needs of Planning Current Five Year Plan	2
7	**MONEY:** Meaning and Function of Money Introduction to the concepts of the value of Money	2
8	**UNEMPLOYMENT:** Meaning, types and causes of Unemployment in India. Unemployment problems in India-Measures taken by the Government of India.	2
9	**INDUSTRIAL POLICY:** Current Industrial Policy. Monopoly Restricted Trade Practices Act (MRTP), Foreign Exchange Management Act (FEMA), Competitions Act	3
10	**PUBLIC FINANCE:** Meaning of Public Finance-Distinction Between Public and Private Finance. Sources of Public Revenue.	2
11	**BUSINESS TRANSCTIONS AND ACCOUNTANCY:** Transactions and classifications, need and objectives of proper records including double entry system. Classification of accounts and its description (in respect of real accounts, personal accounts and nominal accounts) Debit and credit concepts: Golden rules of Debit and Credit. Objectives and Principals of Double Entry System of Book Keeping.	5
12	**BOOKS OF ACCOUNTS:** Journal and Ledger, their subdivisions; posting from journals to ledger. Balancing of Accounts	2
13	**CASH BOOK:** Objectives of Cash Book (in respect of all kinds of Cash Transactions). Single Column, Double Column and Triple Column Impress System of Petty Cash Book.	2
14	**TRIAL BALANCE:** Objectives, Preparation – Errors and Rectification (In respect of Balance of Accounts for the Total period)	2
15	**FINAL ACCOUNTS:** Steps of preparing accounts: Trading Accounts, Profit and Loss Accounts. Revenue and Depreciation Adjustment. Introduction to Balance Sheet	5
16	**CAPITAL AND REVENUE EXPENDITURE DISTRIBUTION:** Receipt and Payments Income and Expenditure differences	3
17	**MEANIING AND PURPOSE OF COSTING:** Element of Cost Analysis and Classification of expenditure for Cost Accounts. Cost Control: Prime Cost, Overhead Cost and Indirect Material and Tools.	3
	TOTAL HRS:	**45**

TEXT / REFERENCE BOOKS:

1. Elements of Economics – K.K. Dewett & J.D. Verma
2. An Introduction to Economics Theory – H.L.Ahuja
3. Double Entry Book Keeping – Mohan, Juneja, Chawla & Saxena
4. Double Entry System of Book Keeping – J.R. Batliboy

ELECTRICAL ENGINEERING CIRCUITS & MATERIALS

L	**T**	**P**		Curri. Ref. No.: EE401
3	1	2		
Total Contact Hrs.:			**Total Marks: 100**	**Theory:**
Theory: 45				End Exam : 70
Practical: 0				P.A.: 30
***Theory Class duration*:**				**Practical:**
45 classes of 1 Hr. or				End Term Exam:0
60 classes of 45 minutes				P.A. : 0
Pre-requisite: Nil				
Credit : 5				

RATIONALE:

The concept of electrical circuit is very essential for the study of the other subjects in Electrical Engineering. This subject covers the basic electrical principles both on d.c. and a.c. circuits. The fundamental principles of magnetic circuits have also been covered. The concept of transients in ac & dc circuits have been included here. The knowledge of electrical engineering material in Electrical Engineering plays an important role. The technicians who will be completing the course under diploma engineering scheme will be entrusted to select the proper materials for the use as conductor, semiconductor and insulator. Resistance materials are used for different purposes as potential divider, heating and controlling element. This subject provides the necessary information regarding all above materials so that the student can select the suitable materials for the definite purposes.

AIM:

a) To develop the concept on basic electrical circuit principles.
b) To develop problem solving ability on electrical circuit principles.
c) To describe the properties of different electrical engineering materials.
d) To develop the skill for selection of right material for right job.
e) To develop the skill for suggesting the substitute of the replacement material when it is not available in ready stock.

Course Objectives:

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

1. Explain the properties of different electrical engineering materials.
2. Select right material for specific electrical and electronics job.
3. Explain the basic concept of magnetic circuit in electrical engineering.
4. Apply the concept of fundamental magnetic circuit in electrical engineering.
5. Apply the concept of fundamental theorems for solving ac circuit problems.
6. Explain the basic transient behaviour in ac and dc circuit.

DETAIL COURSE CONTENT

THEORY: 45 Hours

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.

1.0 Materials for Conductors, Resistors and Insulator **5**

- 1.1 Classify electrical material based on
  - 1.1.1 Their properties and applications
  - 1.1.2 Their atomic structure
- 1.2 To describe the properties of
  - 1.2.1 Conductors, semiconductors
  - 1.2.2 Superconductors
  - 1.2.3 Insulators
- 1.3 To state the important electrical and mechanical characteristics of
  - 1.3.1 Good conducting materials
- 1.4 Describe the application and properties of important resistance materials like tungsten, carbon, nichrome, manganin, eureka, platinum
- 1.5 To classify the insulating materials in terms of temperature ranges (e.g. class O, class Y)

2.0 Dielectric Material **4**

- 2.1 To define dielectric strength, dielectric loss, dissipation factor, the factors affecting dielectric loss
- 2.2 To state the relation between relative permittivity and dielectric strength.
- 2.3 To describe conduction through
  - 2.3.1 Gaseous dielectric
  - 2.3.2 Liquid dielectric
  - 2.3.3 Solid dielectric
- 2.4 To state the application of dielectrics

3.0 Magnetic Material **8**

- 3.1 To define
  - 3.1.1 Ferromagnetic material
  - 3.1.2 Paramagnetic material
  - 3.1.3 Diamagnetic material
  - 3.1.4 Curie point
- 3.2 To draw and explain the hysteresis loop for different materials like hard sheet, wrought iron and alloy steel
- 3.3 To state the effect of adding impurities in Ferromagnetic materials
- 3.4 State the properties of
  - 3.4.1 Electromagnetic steel and alloys
  - 3.4.2 CRGO
  - 3.4.3 Dynamo grade steel
  - 3.4.4 Ferrites
  - 3.4.5 ALNICO
  - 3.4.6 Hard ferrites

4.0 Magnetic Circuits **5**

- 4.1 To understand the relation between magnetic flux and magnetic intensity.
- 4.2 To define permeability, reluctance, permeance.
- 4.3 Describe magnetic circuit and comparison with electrical circuit.
- 4.4 To define series, parallel and composite magnetic circuit.
- 4.5 To enumerate the energy stored in magnetic field.
- 4.6 To determine the pulling force by an electromagnets.

5.0 AC Circuits **10**

- 5.1 To state
  - 5.1.1 Kirchhofff's current law
  - 5.1.2 Kirchhofff's voltage law
  - 5.1.3 Superposition theorem
  - 5.1.4 Norton's theorem and Thevenin's theorem
  - 5.1.5 Maximum power transfer theorem
  - 5.1.6 To solve the *ac* network problems using above theorems and laws

6.0 Series and Parallel Resonance **6**

6.1 To state the condition for series resonance
6.2 To determine the expression of frequency at resonance condition
6.3 To define quality factor and band width
6.4 To state the condition for parallel resonance
6.5 To determine the resonance frequency for parallel L-C circuit
6.6 To solve problems on series and parallel resonance

7.0 Transient in DC and AC circuits **7**

7.1 To study of *dc* transients and steady state response of a series R-L circuit.
7.2 Fall and rise of current in R-L circuit
7.3 Define time constant in R-L circuit.
7.4 To study of *dc* transients and steady state response of a series R-C circuit.
7.5 Charging and discharging of a capacitor in R-C circuit
7.6 Define time constant in R-C circuit.
7.7 To study of *ac* transients and steady state response of a series R-L circuit.
7.8 To study of *ac* transients and steady state response of a series R-C circuit.

Total Hours 45

PRACTICAL:

Sl No. SKILLS TO BE DEVELOPED

1. **Intellectual skills -**
   Basic concept about electrical and electronics materials, reduction of electrical circuits using network analysis, resonance in ac circuits, determination of Q-factor in L-C circuits, transient in R-C circuit.
2. **Motor skills-**
   Verify KCL, KVL, Thevenin's, Norton, Maximum Power, Superposition, Charging and discharging of Capacitor, Resonance in R-L-C circuit, Transient in R-C circuit.
3. **Social skills-**
   Learn to work with peers as a group
   Communicate with peers and teachers to clarify the doubts
   Arrange the workplace
   Troubleshooting simple electrical circuits and repairing

Suggested List of Laboratory Experiments :-

S.No	Laboratory Experiments
1	Identification and testing of passive components
2	To verify Kirchhoff's current law and voltage law
3	To verify Superposition theorem
4	To verify Thevenin's theorem
5	To verify Maximum power transfer theorem
6	To develop the charging and discharging curve of voltage across the capacitor connected in series with a resister
7	To measure the voltages across R, L, C in a series RLC circuit. To develop phasor diagram.
8	To determine the resonance frequency and Q-factor in a series LC circuit
9	To determine the resonance frequency and Q-factor in a parallel LC circuit

REFERENCE BOOKS:

Title	Author	Publisher
Fundamentals of Electrical Engineering	Rajendra Prasad	Prentice-Hall of India Pvt. Ltd.
Electronics and Electrical Engineering	Lionel Warnes	Macmillan
Electrical Engineering Material	N. Alagappan and N.T Kumar	Tata McGraw Hill Publishing Company Limited
A course in Electrical Engineering Materials	S.P. Seth, P.V. Gupta	Dhanpat Rai & Sons
Electrical Engineering Materials	A.J. Dekker	PHI
Materials Science for Electrical & Electronics Engineers	Ian P. Jones	Oxford
Electrical Properties of Materials	L. Solymar & D. Walsh	Oxford
A textbook of electrical technology	B L Theraja	S Chand
Introduction to material science for engineers	J.K. Shackelford & M.K. Muralidhara	Pearson Education
Electrical, Electronics and Computer Engineering	K.A. Krishnamurthy and M.R Raghuveer	T.M.H.

ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENT

L	T	P		
3	0	2		Curri. Ref. No.: EE402
Total Contact Hrs.:			**Total Marks: 150**	**Theory:**
Theory: 45				End Term Exam: 70
Practical: 30				P.A.: 30
Pre-requisite:Nil				**Practical:**
Credit: 4				End Term exam:25
				P.A.: 25

RATIONALE

The subject Electrical Measurement and Measuring Instrument is an important subject in the field of Electrical Engineering. This subject deals with the technique of measuring voltage, current and wattage by the indicating type of instruments. The technique of measurement of electrical power in single phase and three phase circuits will be studied here. Measurement of energy and testing of energy meters will be studied under this subject. Prior to above the working principle, construction of all type of measuring instruments like indicating, integrating and recording type will also be studied here. Uses of ac bridges and other resistance measuring instruments are included under this subject. It is noteworthy to mention that the modern industries are implementing digital instruments for measuring electrical quantities but till date the conventional instruments are being used for this reason the importance of studying the subject "Electrical Measurement and Measuring Instruments" still exists.

AIM:

1. To acquire the skill for selecting similar instruments for the measurement of voltage, current and wattage.
2. To learn the technique connecting different type of electrical measuring instruments.
3. To learn the technique of calibrations and adjustment of different type of electrical measuring instruments.
4. To explain the working principle and construction of different type of electrical measuring instruments.

Course Objective:-

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

1. Explain the construction and working principle of different types of electrical measuring instruments.
2. Connect different types of electrical measuring instruments to measure various electrical parameters.
3. Select the right instruments for the measurement of voltage, current, power and energy.
4. Apply the appropriate technique to measure resistance, inductance and capacitance.

D E T A I L C O U R S E C O N T E N T

THEORY:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.

1. Types of Measuring Instruments: 7

1.1 To classify different type of instruments.
e.g. indicating integrating, and recording.

1.2 To describe type of - (a) deflection system (b) controlling System and (c) damping systems.

1.3 To describe the advantage and disadvantages of above mentioned systems.

1.4 To describe the constructional detail of pointer, control spring and Instrument bearings.

2. Construction & Working principles of Measuring Instruments: 7

To describe the constructions, working principles for following instruments:

2.1 Moving coil instruments

2.2 Moving iron instruments

2.3 Electro-dynamic instruments

2.4 Induction instruments

2.5 Electrostatic Instruments

3. Extension of Range of Measuring instruments: 6

3.1 To describe the method of extensions of range of ammeters and voltmeters (d.c meters)

3.2 To describe the concept of swamping resistor

3.3 3.2To describe the method of extension of range of ammeter and voltmeter (a.c meters). Uses of C.T and P.T and their working principles

3.4 3.3To describe the working principles of rectifier type instruments

3.5 3.4To solve of problems on above concepts

4. Measurement of Resistance 7

4.1 To classify the resistance according to the range values

4.2 To define the accuracy of measurements

4.3 To describe method of measurement of resistances

4.3.1 To state ammeter voltmeter method of measurement.

4.3.2 To state method of substitution for the measurement of resistance. Discuss the sources of error

4.3.3 To state Wheatstone bridge principle of measurement of resistances with precautionary measures

4.3.4 To describe the Kelvin-Double bridge principle. Deduce the expression for calculation for the value of unknown resistance. Discuss the methods for eliminating the errors for measurements.

4.3.5 To describe the basic principles of series and shunt ohmmeter.

4.3.6 To describe the constructions working principles of Megger.

4.3.7 State the type of Megger tester and their field of application.

4.3.8 To state the method of measuring the insulation resistance while the power is on.

4.3.9 To solve problems on above topic

5. Measurement of Power 7

5.1 To describe the method of connecting a wattmeter for measurement of single-phase power

5.2 To describe the method of measuring single phase power by (a) three ammeter and (b) three voltmeter method.

5.2.1 To describe the method of measurement of *p.f* by using wattmeter, voltmeter and ammeter in single-phase circuit.

5.3 To describe the method of three phase power by two wattmeter method. Deduce the expression for measurement of total power and the p.f of the circuit for the balanced load conditions.

5.4 To solve problems on power measurement

6. Measurement of Energy **5**

6.1 To describe the construction and working principle of d.c energy meters

6.2 To describe the construction and working principles of induction type energy meter.

6.2.1 To describe the method of testing of Energy meter

6.2.2 To describe the method of construction of three phase energy meters

6.3 Solve problems on energy meter testing

7. AC Bridges **6**

To describe the principles of a.c bridges on the following:

7.1 Capacitance comparison bridge

7.2 Inductance comparison bridge

7.3 Describe the precautionary measure to be taken for high frequency measurement

7.4 Description of the method of Wagner's earth connection

7.5 Solution of problems on above concepts

TOTAL: 45

Practical :-

S.No Skills to be developed

1. **Intellectual skills-**

Basic concept about moving coil, moving iron, Electro-dynamic, Induction and Electrostatic Instruments, extension of range of measuring Instruments, measurement of low, medium and high value resistance, inductance and capacitance, Measurement of Power, Measurement of Energy.

2. **Motor skills-**

Assembly of moving coil, moving iron, Electro-dynamic, Induction and Electrostatic Instruments, measurement of voltage, current, power, energy, resistance, inductance and capacitance, connection of different measuring instruments, calibration of energy meter, extension of range of instruments.

3. **Social skills -**

Learn to work with peers as a group
Communicate with peers and teachers to clarify the doubts
Arrange the workplace
Troubleshooting simple measuring instruments and repairing

SUGGESTED LIST OF LABORATORY EXPERIMENTS :-

Sl.No Laboratory Experiments

1. Dismantling and assembly of indicating type PMMC instrument, identification and drawing the following:
   (a) Deflecting syste (b) Controlling System (c) Damping System
2. Dismantling and assembly of indicating type electro-dynamic wattmeter, identification and drawing of (a) deflecting System (b) controlling system (c) damping system (d) current coil (e) potential coil (f) voltage multiplier
3. Dismantling and assembly of indicating type instrument e.g. moving iron voltmeter and ammeter, identification and drawing of (a) deflecting system (b) controlling system and damping system.
4. Dismantling and assembly of rectifier type voltmeter
5. 5.1 Dismantling and assembly of Single phase energy meter, identification and drawing of:
   (a)deflecting system (b) braking system
   (c) current coil (d) potential coil
   (e) creep adjustment (f) pf adjustment
   (g) speed adjustment
   5.2 Calibration of single phase energy meter
6. Measurement of power by three voltmeter methods
7. Measurement of power and power factor by three-ammeter method

8. Measurement of three phase power & power factor by 2 wattmeter method
9. Extension of range of a PMMC voltmeter
10. Connection of CT and PT for measurement of high current and high voltage and determination of transformation ratio of current and potential transformer
11. Measurement of resistance by Wheatstone bridge and Kelvin's double bridge
12. Measurement of medium value resistance by ammeter voltmeter method
13. Measurement of inductance using suitable bridge
14. Measurement of capacitance using suitable bridge

Any Suggested Assignment / Micro project:

REFERENCE BOOKS:

Authors	**Book Title**	**Publisher**
H.S. Kalsi, A K Sawhney	Electronics Instrumentation Electrical and Electronics Measurements and Instrumentation	T.M.H Dhanpatrai
Cooper D. and A.D. Heifrick	Modern Electronic Instrumentation and Measuring Techniques	P.H.I
E. Handscombe	Electrical Measurements and Measuring Instruments	The Wykeham Technologies Service
S. R. Paul	Electrical Measurement and Measuring Instruments	Rukamari Book House Calcutta
S. R. Paul	Electrical Measuring Instruments	Concept Publications

ELECTRONIC DEVICES & CIRCUITS - I

L T P Curri. Ref. No.: EE409
3 0 2

Total Contact Hrs.: **Total Marks: 150**
Theory: 45
Practical: 0
Theory Class Duration
45 Classes for 1hr.
60 Classes for 45 mins.
Pre-requisite: Nil
Credit : 4

Theory:
End Exam : 70
P.A.: 30
Practical:
End Exam.: 25
P.A. : 25

RATIONALE

Electrical Engineering cannot stand alone without the study of analog electronics which consists of different electronic devices and circuits. The modern electrical equipments are mostly controlled by electronic circuits where both the circuits are mostly designed on the basis of linear and binary operation of the solid state devices. This subject provides the facility for the study of basic knowledge of the solid state devices and their application. Care has been taken so that the study of the practical circuits is included in this subject rather than theoretical approach. Some problems on designing of simple electronic circuits have also been included here.

AIM:

1. To develop knowledge on the characteristics of
   a) Different type of diodes
   b) Transistors
2. To describe the working principles of transistor amplifiers
3. To describe the effect of feedback on amplifier
4. To develop different application circuits on diode and transistors

DETAILED COURSE CONTENTS

THEORY:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.

1.0 SEMICONDUCTOR DIODES **12**

1.1 Semiconductor physics

To Describe

1.1.1 The properties of semiconductor

1.1.2 The principle of conduction in crystal

1.1.3 Doping

1.1.4 Unbiased diode

1.1.5 Forward and reverse biased diode

1.2 Characteristics and application of diodes

1.2.1 To describe the volt amps, characteristics of diode

1.2.2 To explain the property of ideal diode

1.2.3 To define the resistance of diode and describe the method of measurements

1.2.4 To describe practical diode

1.2.5 To state the important specifications of semiconductor diode

1.2.6 To describe the half wave and full wave rectifier circuits

1.2.7 To calculate the efficiency of rectifier circuit

1.2.8 To write the formulae of calculating the parameters of filter circuit

1.3 Special purpose diodes

1.3.1 To describe the characteristics and field of application of:
(a) zener diode (b) capacitive diode
(c) light emitting diode (d) photo diode
(e) schottky diode (f) tunnel diode (g) PIN diode

2.0 BIPOLAR JUNCTION TRANSISTOR **12**

2.1 To describe the construction of transistor

2.2 To describe the working principle of transistor

2.3 To state the types of transistor

2.4 To describe the characteristics of transistor and method of drawing characteristics curves

2.5 To describe the amplifying characteristics in
(a) common base (b) common emitter
(c) common collector configuration

2.7 To define:
(a) current amplification factor (b) collector current
(c) emitter current (d) leakage current (e) input resistance
(f) output resistance (g) base current amplification factor

2.8 To establish the relation between $\dot{\alpha}$ and β

2.9 To describe the method of drawing the:
(a) input characteristics curve (b) output characteristics curve

2.10 To compare the characteristics of three different configurations e.g. CB, CE, CC

2.11 To analyze the load line of a transistor (both for dc and ac)

2.12 To describe the function of the heat sink of transistor.

2.13 To write the specification of a transistor.

2.14 To state the conditions for faithful amplification.

3.0 Biasing of BJT **81**

3.1 To define transistor biasing and essential requirement of a transistor Biasing circuit.

3.2 To define the function of a small single stage amplifier, and calculate its voltage and power gain.

3.3 Classification of Amplifiers.

3.4 To define the multistage amplifiers and different type of coupling.

3.5 To describe the different types of power amplifiers

3.6 To describe and draw the different stages of an amplifier used in PA system.

3.7 To study the feedback amplifier (concept of feedback, gain in feedback, advantage & disadvantage in feedback amplifiers).

4.0 Sinusoidal Oscillators **8**

4.1 To state the type of electronic oscillators

4.2 To describe damped and un-damped oscillations

4.3 To state the conditions of oscillation

4.4 To study different types of oscillators like Hartley, Colpitt, Phase-shift, Wein Bridge & Crystal oscillators and their application.

5.0 WAVE SHAPING CIRCUITS **5**

5.1 To study the working of diode clipping and diode clamping circuits.

TOTAL: 45

PRACTICAL :-

SL.No. *SKILLS TO BE DEVELOPED*

1. **Intellectual skills-**
   Basic concept about diode, Zener diode, BJT, Oscillators and wave shaping circuits. Biasing of BJT, cascade connection of amplifiers, resonance frequency of Hartley and Colpitt oscillator
2. **Motor skills-**
   Verify characteristics of Diode, Zener diode and BJT. Application of BJT in CB, CE and CC amplifiers. Construct multi-stage amplifier, Hartley oscillator, Colpitt oscillator, Phase shift oscillator, Clipping and Clamping with biasing
3. **Social skills-**
   Learn to work with peers as a group
   Communicate with peers and teachers to clarify the doubts
   Arrange the workplace
   Troubleshooting simple analog circuits and repairing
   Design Power Amplifier (PA) system

SUGGESTED LIST OF LABORATORY EXPERIMENTS :-

Sl.No LABORATORY EXPERIMENTS

1. To determine the forward and reverse characteristics of PN junction diode
2. To determine the input and output characteristics of transistor
3. To determine the forward and reverse characteristics of a zener diode
4. To connect the transistor in (a) common base (b) common emitter (c) common collector amplifiers and to compare their gain
5. To assemble (a) two stage R.C. coupled (b) transformer coupled (c) direct coupled amplifier and check the amplification of the input signal
6. To connect a single stage amplifier and check the cut off, saturation and normal biasing conditions on input signal by varying the biasing.
7. To determine the frequency response curve of a two stage R.C. coupled amplifier
8. To determine the –
   (a) current amplification factor in common base configuration
   (b) base current amplification factor in common emitter configuration
9. To determine the input and output characteristics of transistor –
   (a) draw the d.c. load line (b) draw the collector dissipation curve
10. To construct a multistage amplifier with –
    (a) power amplifier and check the amplification of input signal with and without negative feedback
11. (1) Construct Hartley oscillator and adjust:
    (a) gain to obtain sinusoidal wave output, and
    (b) L-C to vary the frequency
    (2) Determine the resonance frequency and amplitude of oscillation
12. (1) Construct Colpitt oscillator and adjust –
    (a) gain to obtain sinusoidal wave output and
    (b) L-C to vary the frequency
    (2) Determine the resonance frequency and amplitude of oscillation
13. Construct a phase shift oscillator and adjust its gain to obtain sinusoidal output. Determine (a) gain and (b) frequency of oscillation during oscillation
14. Construct the diode clipping and clamping circuit and observe the clipping level with change in biasing voltage

TEXT / TEXTBOOK REFERENCES:

Authors	Book Title	Publisher
S. K. Mandal	Basic Electronics	Mc Graw Hill Education
Robert Boyelsad	Electronic Devices & Circuit Theory	PHI
Sahdev	Electronic Principles	Dhanpat Rai & Sons
Mothershead	Electronic Devices & circuits	TMH
Floyd	Electronic Devices	Prentice Hall
Malvino	Electronic Principles	TMH

ELECTRICAL ENGINEERING DRAWING

L	T	P	Curri. Ref. No.: EE407
0	0	6	

Total Contact Hrs.: **Total Marks: 100** **Theory:**
Theory: 45 End Exam: 0
Practical: 0 P.A.: 0
Practical:
Pre-requisite:G206A End Exam: 0
Credit : 2 P.A.: 100

RATIONALE:

Drawing is the language of Engineers. Any job which is to be communicated for implementation is required to be done within an optimum time span and with efficacy. Since last century lot of change has taken place in Drawing for representing job specification. Standardized symbols as prescribed by Bureau of Indian specification are to be introduced while practicing the jobs on Drawing. The preparation of list of material along with the specification writing is also an important factor which is to be dealt in this subject

AIM:

- To acquire the skill in presenting the job specification using standardized symbols used in Electro technological field (as per the stipulation by Bureau of Indian Standard).
- To acquire skill in using the norms and standards prescribed in Indian Electricity Rules and Bureau of Indian Standard regarding selection of components and circuit accessories and equipments.
- To acquire skill in preparing the list of components with full specifications.
- To acquire the skill in using handbooks and standards for developing the drawing
- To acquire the skill in presenting an object (Electrical or mechanical) through the third angle projection system.
- To acquire the skill in presenting an object (Electrical or mechanical) by free hand sketch.
- To acquire the skill in using Computer Aided Drafting for the presentation of Electrical Drawing.

DETAILED COURSE CONTENTS:

PRACTICAL:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	**CONSTRUCTION OF ASSEMBLY DRAWING OF THE ELECTRICAL AND MECHANICAL** **Item:** 1.1 Preparing the list of Electrical Symbols as per IS 2032 (Part I to Part XI) 1.2 Preparation of Drawing Sheet and selection of name plate using IS696-1972. 1.3 Preparation of Isometric free hand sketch of Mechanical or electrical objects and their dimensioning as per Bureau of Indian Specification 1.4 Preparation of orthographic projection Drawing from the free hand sketch	**10**
2.0	**DRAWINGS OF JOINTS AND ELECTRICAL ACCESSORIES** **Preparation of Drawing on –** 2.1 Different type of Cable Joint 2.2 Kit Kat fuse with its holder 2.3 SPST knife switch 2.4 Carbon brush holder 2.5 Cable lugs or Thimble	**6**
3.0	**DRAWING OF ELECTRICAL INSTRUMENTS** **Preparation of Drawing on –** 3.1 Dial of (a) Moving Iron (b) Moving Coil (c) Dynamometer and (d) Induction Type Instruments 3.2 Diagrams of deflecting systems of (a) Moving Coil (b) Moving Iron (c) Dynamometer and (d) Induction Type Instruments 3.3 Diagrams on (a) Controlling system (b) Damping System 3.4 Diagrams on (a) reed type frequency meter (b) Weston Frequency Meter 3.5 Diagram on polyphase Energy Meter	**10**

4.0 DRAWING ON ELECTRICAL MACHINE **10**

4.1 Sectional Drawing of D.C. Shunt Motor
4.2 Assembly Drawing of three phase wound Rotor induction Motor
4.3 Assembly Drawing of three phase transformer with tank and bushing

5.0 DRAWING ON PANELS **6**

5.1 Schematic Diagram on Automatic Star Delta starter
5.2 Control panel of a sub-station

6.0 WINDING DIAGRAM **6**

6.1 Developed lap winding diagram of a 4 pole D.C. Machine
6.2 Schematic diagram of a 4 pole D.C. Machine
6.3 Developed winding diagram of double layer, short chorded lap winding of a 3 phase 400V, 4 Pole Induction Motor

7.0 TRANSMISSION AND DISTRIBUTION LINE DIAGRAM **6**

7.1 Drawing of the diagram of a 3 phase 4 wire Power Distribution system showing the arrangements for service connection and safety device over road crossing safety guard
7.2 Diagram for HT and LT insulation with detail of fittings
7.3 Detail diagram of distribution pole with stay wire
7.4 Detail diagram of Transmission Pole with arrangement of conductors and safety devices

8.0 PLANT AND SUBSTATION LAYOUT DIAGRAM **10**

8.1 Preparation of diagram of Pole Mounted Sub-station
8.2 Preparation of the diagram of Foundation mounted outdoor substation
8.3 Preparation of the layout of 11KV substation

9.0 AUTO CAD VERSION 2000 SOFTWARE **20**

(a) Selecting size of paper
(b) Drawing border line and name plate
(c) Drawing Electronic schematic Diagram
(d) Drawing printed circuit Board
(e) Preparing printed circuit assembly drawing
(f) Mechanical Assembly drawing (usage of ELECTEMP.DRG. ELECOMP.DRG and other relevant files and commands)

N.B.: The job must include Activity
Study of (a) graphic Area (b) Command Line/Prompt Area (c) Screen
Menu Area (d) status line (e) pull down Menu and Menu Bar (f) Pull down Window and Dialogue Boxes (g) keyboard and function of each keys (h) Function keys (i) Hot Keys (j) usage of commands (A, C, CP, DV, E, L, LA, LT, M, MS, P, PL, PS, R, T, V, Z) (k) Input and plotting devices (l) command terminators and choice selection

Class Test **6**

Total Hrs. 45

REFERENCE BOOKS:

1. Electrical Engineering Drawing by Dr. S. K. Bhattacharya, New Age International Publishers
2. IS 2032 (Part I to Part XI)
3. IS 696-1972

C PROGRAMMING WITH LINUX

L	T	P		
1	0	4		Curri. Ref. No.: EE507
Total Contact Hrs.:		**Total Marks: 100**	**Theory:**	
Theory: 0			End Exam : 0	
Practical: 45			P.A.: 0	
Prerequisite: Nil			**Practical:**	
			End Exam.: 50	
Credit: 3			P.A. : 50	

RATIONALE:
This course is an introduction to the C programming language. The student will learn to write programs containing the following C language features: simple data types, one-dimensional arrays, conditional and control statements, and functions. The student will also develop programs to handle sequential files. The programs will be run on a LINUX machine, and the student will learn the necessary LINUX commands to create, edit, save, compile, link, debug and run these programs in a LINUX environment. The use of structured programming techniques, program readability, program documentation and testing will be emphasized.

AIM:
Upon completion of" this course, the successful student will be able to :

- State the basic operations of a modern digital computer and its peripherals.
- Use LINUX operating system commands to handle files, and perform programming tasks as a user.
- Use integer and real number arithmetic operations in a C program.
- Apply the concepts of variables, constants, and built-in functions in a program.
- Concept of data structure — string, array (linear, nonlinear), graph, queue, stack, tree etc.
- Write user-defined functions.
- Develop pseudo-code solutions for a stated problem. Implement the solution program using the C language.
- Utilize branching and looping techniques in a program.
- Implement simple applications using the array data type in a program.
- Pass parameters to a function
- Differentiate local variables from global variables, and state the scope of a variable.
- Write programs with clear documentation.
- Test programs for proper operation.

Course Objective:-
After completion of the course, students will be able to:

1. Describe LINUX commands.
2. Explain basic structure of C program.
3. Write programs in C language using concept of functions, variables, arrays and loops.

DETAILED COURSE CONTENT:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	**Digital Computer Operations**	**3**
1.1	Sketch a block diagram of a computer and describe the functions of each of the blocks.	
1.2	Use the following terms to describe the operation of a computer - main memory, bit, byte, word, machine code, high-level, operating system.	
2.0	**Introduction to the LINUX Operating System**	**5**
2.1	Describe the functions of an operating system.	
2.2	Use the following LINUX commands (plus any additional commands specified by your instructor) - passwd, vi, chmod, cat, more, Ipr, rm, tnv, cp, Is, cd, pwd, mkdir, and mail.	
2.3	Use the vi/other editor to create a C source program.	
2.4	Use the C compiler and the linker to compile and link the source program to produce an executable code.	
2.5	Describe what is meant by the following terms: file, file-name, file extension (or file type), directory, text file, machine language file.	
2.6	Describe the differences between a file produced by the editor, the compiler, and the linker.	

3.0 Basic Components of a C Program **4**

3.1 Understand the basic structure of a C program and identify its 3 basic components - the program heading, the declaration section, and the executable section.

3.2 Define and give examples of the following terms: reserved words, standard identifiers, identifiers, statements, and syntax diagrams.

3.3 Write simple programs using the predefined functions scanf() and printf().

3.4 Use the following arithmetic operations: +, -, *, %, / on integer variables.

3.5 Use the following arithmetic operations: +, -, *, %, / on real variables.

3.6 Use mixed-mode arithmetic expressions containing both real and integer operations.

4.0 Variables, Constants, and Standard Functions

4.1 Understand the difference between the allocation of memory locations (in the declaration section) and the assignment of values to variables and constants. **4**

4.1.1 Use the following data types: int, float, and char in simple programs.

4.1.2 Use constants in simple programs.

4.1.3 Use the scanf() and getchar() functions to enter data values interactively for a program.

4.1.4 Use standard functions in simple programs.

4.2 Functions without Parameters **3**

4.2.1 Understand the concept of a user defined function.

4.2.2 Write simple programs using functions that do not use parameters.

4.3 Programming Techniques **8**

4.3.1 Define & give examples of pseudo-code & algorithms.

4.3.2 List the steps in the program development process.

4.3.3 Write programs that have adequate documentation.

4.3.4 Differentiate between compile-time errors, run-time errors and design errors.

4.3.5 Given a program containing compile-time errors, (syntax errors), identify and correct the errors.

4.3.6 Given a program printout containing a run-time error message, correct the error.

4.3.7 Given a printout containing a design error, correct the error.

4.3.8 Use the echo-checking technique to debug a program.

4.4 Decisions **4**

4.4.1 Understand and use "boolean1 data types (Macro and non-zero) as implemented m .

4.4.2 Construct Boolean expressions using the six relational operators and the three logical operators

4.4.3 Understand operators and use the IF statement.

4.4.4 Understand and use the IF ... ELSE statement.

4.5 Repetitions (Iteration) **2**

4.5.1 Understand and correctly use the FOR.... statement in programs requiring single fixed repetition loops.

4.5.2 Use nested FOR.... statements in programs requiring multiple repetitions of single repetition loops.

4.6 Testing Loops **3**

4.6.1 Understand and correctly use the WHILE.... pre-test loop.

4.6.2 Understand and correctly use the DO...WHILE post test loop.

4.6.3 Understand and correctly use die 'coin' built-in function and correctly use it in both die WHILE and DO ... WHILE loops.

4.7 One dimensional Arrays **3**

4.7.1 Understand the concept one and two dimensional arrays.

4.7.2 Correctly declare an array with a variable definition.

4.7.3 Write simple input/output routine using arrays.

4.8 Functions (with parameters) **4**

4.8.1 Understand how parameters arc passed between functions.

4.8.2 Describe graphically the difference between passing parameters by value and by reference.

4.8.3 Describe die difference between formal and actual parameters.

4.8.4 Use functions requiring value parameters.

4.9 Scope of Variables **4**

4.9.1 Describe the difference between a local and a global variable.

4.9.2 Indicate the scope of each identifier for a given program.

LIST OF EXPERIMENTS:

1. Write a program to output the following multiplication table:

   7 x 1 = 7
   7 x 2 = 14
   7 x 3 = 21
   …
   …
   7 x 25 = 175

2. Write a program to calculate the average of a set of N numbers.

3. Write a program to determine and print the sum of the following harmonic series for a given value of n:

   $$1 + \frac{1}{2} + \frac{1}{3} + \ldots\ \ldots\ \ldots + \frac{1}{n}$$

   The value of n should be given interactively through the terminal.

4. The total distance traveled by a vehicle in t seconds is given by
   distance = ut + (at2)/2
   Where u is the initial velocity, (meters per second), a is the acceleration (meters per second2). Write a program to evaluate the distance traveled at regular intervals of time, given the values of u and a. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of u and a.

5. Write a program to read the following numbers, round them off to the nearest integers and print out the results in integer form:

   29.72 301.21 -76.73 -46.46

6. Admission to a professional course is subject to the following conditions:

   a. Marks in Mathematics >=60
   b. Marks in Physics >=50
   c. Marks in Chemistry >=40
   d. Total in all three subjects >>200
   Total in mathematics and physics >=150

   Given the marks in the three subjects, write a program to process the applications to list the eligible candidates.

7. Floyd's triangle is given as follows:

   1
   2 3
   4 5 6
   7 8 9 10
   11 12 13 14 15
   …
   …
   …
   79 91

   Write a program to print the triangle and modify it to produce the following triangle

   1
   0 1
   1 0 1
   0 1 0 1
   1 0 1 0 1

8. Write a program that will read a positive integer and determine and print its binary, octal, hexadecimal equivalents. The program should obtain the option from the user interactively.
9. Write a program to calculate the standard deviation of a number of data stored in an array.
10. Consider two arrays A and B containing a sorted list of data items in ascending order. Write a program to merge them into a single sorted array C that contains every item from arrays A and B, in ascending order.
11. Write a program which will read a string and rewrite it in the alphabetical order. For example, the word "INDIA" should be written as "ADIIN".
12 Write a program, using recursive functions, to evaluate

$$f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots$$

PROFFESIONAL PRACTICE - II

L	T	P	Curri. Ref. No.: EE510
0	0	2	

Total Contact Hrs.: 30 **Total Marks: 50** **Practical:**
Pre-requisite: Nil P.A. : 50
Credit : 1

RATIONALE:
Interact with Industry is essential for proper understanding about implementation procedure of the theoretic gained during course of study. The course contents of professional practice – II is designed to develop interpersonal skill and adoptability to the industry so that the student will be benefited in their professional carrier.

Course Objective:
After completion of the course, students will be able to:
1. Prepare details Industrial Process Report
2. Explain recent trends through Guest Lecture
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Update oneself regularly with latest technological developments in this field as the knowledge in this field is expanding in leaps and bounds

DETAIL COURSE CONTENT:
THEORY:

Contents **Activities** **Hrs.**

1: INDUSTRIAL VISITS
Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the team work. Visit to any ONE from the list below:
a. Nearby petrol pump (fuel, oil, product specifications)
b. Automobile service station (observation of components / aggregates)
c. Telephone exchange
d. Food processing industry (lay out and machine)
e. Tea processing industry (lay out and machine)
f. Dairy plant/Water treatment plant (lay out and machine)
g. Community health centre (organization, modus-operandi, various activities)
h. Panchayt/ BDO office to understand swarojkar yojona / gram sarak yojona scheme / Rural electrification and Report on a particular/specific case.

2: LECTURES BY PROFESSIONAL / INDUSTRIAL EXPERT
Lectures by professional / industrial expert to be organized from any TWO of the following areas:
a. Free and open source software
b. Software for drafting
c. Non destructive testing
d. Acoustics
e. Illumination/Lighting system.
f. Common electricity rules and norms (do's and don'ts) for all
g. Automobile pollution, norms of pollution control
h. Fire Fighting/Safety Precautions and First aids.
i. Public health & Hygiene awareness
j. Working around trucks-loading and unloading of engineering machineries.
k. Industrial hygiene.
l. Special purpose wiring in chemical / hazardous industries.
m. Safe application of electrical energy in daily life.
n. Energy and environment
o. Carbon Trading

3: GROUP DISCUSSIONS:
The students should discuss in a group of six to eight students, each group to perform any TWO group discussions. Topics and time duration of the group discussion to be decided by concerned teacher.
Concerned teacher may modulate the discussion so as to make the discussion a fruitful one. At the end of each discussion each group will write a brief report on the topic as discussed in the group discussion.
Some of the suggested areas are –
a. Sports
b. Social networking - effects & utilities
c. Current news item
d. Discipline and house keeping
e. Use of plastic carry bag (social & domestic Hazard)
f. Any other common topic related to electrical field as directed by concerned teacher.

4. STUDENTS' ACTIVITIES: 6

The students in a group of 3 to 4 will perform ANY ONE of the following activities:

a. Collect and study IS code for engineering drawing.
b. Specifications of lubricants.
c. Draw orthographic projections of a given simple machine element using CAD software

EXAMINATION SCHEME (SESSIONAL):

Continuous internal assessment of 50 marks is to be carried out by the teachers throughout the third semester.

Distribution of marks:

Activities	= 20 Marks.
Group Discussion	= 10 Marks.
Field visit	= 10 Marks.
Guest lecture attendance and report	= 10 Marks.

Sample path for Term III in Mechanical Engineering.

Sl. No	Code	Course	Study Scheme				Evaluation Scheme							Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory				Practical				
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
								Class Test	Assignment	Attendance		Sessional	Viva voce		
1	ME401	Thermal Engineering	NIL	3	0	0	70	15	10	5	0	0	0	100	3
2	ME403	Fluid Mechanics	G201 G201	3	0	2	70	15	10	5	25	25	0	150	4
3	ME404	Manufacturing Process-I	NIL	3	0	0	70	15	10	5	0	0	0	100	3
4	ME406	Theory of Machines	NIL	3	0	0	70	15	10	5	0	0	0	100	3
5	G105	Applied Mathematics	G103 G104	3	1	0	70	15	10	5	0	0	0	100	4
6	G303	Engineering Economics & Accountancy	NIL	3	0	0	70	15	10	5	0	0	0	100	3
7	ME407	Mechanical Drawing	NIL	0	0	4	0	0	0	0	25	25	0	50	2
8	G302	Development of Life Skill-Ii	NIL	1	0	2	0	0	0	0	0	25	25	50	2
9	CE513	Professional Practices – II		0	0	2	0	0	0	0	0	50	0	50	1
TOTAL				**19**	**1**	**14**	**420**	**90**	**60**	**30**	**50**	**150**	**50**	**850**	**27**