

**M.D UNIVERSITY**  
**SCHEME OF STUDIES AND EXAMINATION**  
**BE. II YEAR ELECTRICAL ENGINEERING**  
**SEMESTER – III**  
**Modified 'E' Scheme Effective from 2006 –2007**

Course No.	Course Title	Teaching Schedule				Marks of Class Work	Examination		Total Marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
HUM-201-E	ECONOMICS (Common for all branches)	3	1	-	4	50	100	-	150	3
MATH-201-E	MATHEMATICS - III (Common for all branches)	3	2	-	5	50	100	-	150	3
EE-201-E	ELECTRICAL ENGINEERING MATERIALS & SEMICONDUCTOR DEVICES (EL,EI,IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-203-E	NETWORK THEORY (EL,EI, IC,EE, EEE, AEI)	3	1	-	4	50	100	-	150	3
EE-207-E	ELECTRICAL MACHINES-I (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-209-E	ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS (EE, EEE)	3	1	-	4	50	100	-	150	3
EE-223-E	NETWORK THEORY LAB. (EL,EI, IC,EE, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-211-E	ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS LAB. (EE, EEE)	-	-	2	2	25	-	25	50	3
EE-231-E	ELECTRICAL WORKSHOP (EL,EI, IC,EE, CHE, EEE, AEI)	-	-	2	2	25	-	25	50	3
EE-215-E	ELECTRIC MACHINES-I LAB. (EE, EEE)	-	-	3	3	50	-	50	100	3
	<b>TOTAL</b>	<b>18</b>	<b>7</b>	<b>9</b>	<b>34</b>	<b>425</b>	<b>600</b>	<b>125</b>	<b>1150</b>	

NOTE:

1. Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

**HUM-201-E**

**ECONOMICS  
(COMMON FOR ALL BRANCHES)**

L T P  
3 1 -

Class Work : 50 Marks  
Theory : 100 Marks  
Total : 150 Marks  
Duration of Exam. : 3 Hrs.

COURSE OBJECTIVE : The purpose of this course is to :

1. Acquaint the student in the basic economic concepts and their operational significance and
2. Stimulate him to think systematically and objectively about contemporary economic problems.

## UNIT-I

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics.

## UNIT-II

Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

## UNIT-III

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.

## UNIT-IV

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

## UNIT-V

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices.

## UNIT-VI

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

### **Books Recommended :**

TEXT BOOKS :

1. Principles of Economics : P.N. Chopra (Kalyani Publishers).
2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS :

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)
2. Micro Economic Theory – M.L. Jhingan (S.Chand)
3. Micro Economic Theory - H.L. Ahuja (S.Chand)
4. Modern Micro Economics : S.K. Mishra (Pragati Publications)
5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)
6. Indian Economy : Rudar Dutt & K.P.M. Sundhram

NOTE: Eight questions are to be set atleast one question from each unit and the students will have to attempt five questions in

all.

-----  
 (COMMON FOR ALL BRANCHES)

L	T	P	Class Work	:	50 Marks
3	2	-	Exam.	:	100 Marks
			Total	:	150 Marks
			Duration of exam.	:	3 Hours

### Part-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

### Part-B

Functions of Complex Variable : Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeros and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

### Part-C

Probability Distributions and Hypothesis Testing : Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.

Linear Programming : Linear programming problems formulation, Solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS :

1. Advanced Engg. Mathematics : F Kreyszig.
2. Higher Engg. Mathematics : B.S. Grewal.

REFERENCE BOOKS :

1. Advance Engg. Mathematics : R.K. Jain, S.R.K.Iyenger.
2. Advanced Engg. Mathematics : Michael D. Greenberg.
3. Operation Research : H.A. Taha.
4. Probability and statistics for Engineers : Johnson. PHI.

Note: Examiner will set eight questions, taking two from Part-A, three from Part-B and three from Part-C. Students will be required to attempt five question taking atleast one from each part.

L T P	CLASS WORK	:	50
3 1 0	EXAM	:	100
	TOTAL	:	150
	DURATION OF EXAM	:	3 HRS

**UNIT 1 CONDUCTING MATERIALS:**

Review of energy bands, description of materials, drift velocity, collision time, Mean free path, mobility, conductivity, relaxation time, factors affecting conductivity of materials, types of thermal conductivity, Wiedmann-Franz law, super conductivity, effect of magnetic field, conducting materials, applications.

**UNIT 2 DIELECTRIC MATERIALS:**

Behaviour of dielectric materials in static electric field, Dipole moments, Polarization, Dielectric constant, Polarizability, Susceptibility, mechanisms of polarization, behaviour in alternating field, dielectric loss, loss tangent, types of dielectric & insulating materials, electrostriction, Piezo-electricity, Applications.

**UNIT 3 MAGNETIC MATERIALS:**

Permeability, Magnetic susceptibility, magnetic moment, Magnetization, Dipole moment, types of magnetic materials, Magnetostriction, eddy current & hysteresis losses, applications.

**UNIT 4 SEMICONDUCTORS:**

Review of Si and Ge as semiconducting materials, Continuity Equation, P-N junction, Drift & Diffusion, Diffusion & Transition capacitances of P-N junction.

**UNIT 5 CONSTRUCTION AND CHARACTERISTICS OF DEVICES:**

Brief introduction to Planar Technology for device fabrication., metal -semiconductor junctions (ohmic and non-ohmic), breakdown mechanisms in p-n junction, zener diode, electrical and optical excitation in diodes, LED, solar cells and photo-detectors.

**UNIT 6 BIPOLAR AND MOS DEVICES :**

BJT, UJT, JFET, MOSFETS

**UNIT 7 POWER DEVICES :**

Thyristor, Diac, Triac, GTO, IGBT, VMOS

**TEXT BOOKS:**

1. Electrical Engineering Materials: A.J. Dekker; PHI.
2. Solid State Electronic Devices : StreetMan & Banerjee; Pearson.
3. Electronic Devices & Circuits: Millman & Halkias; MGH.

**REFERENCE BOOKS:**

1. Electrical Engineering Materials: S.P Seth & P.V Gupta; Dhanpat Rai.
2. Text Book of Power Electronics : H.C.Rai; Galgoitia Publications.
3. Electronic Devices & Circuit Theory : Boylestad & Nashelsky; Pearson.
4. Semiconductor devices : Jaspreet Singh; John Wiley.

**NOTE :** Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.

L T P  
3 1 0

CLASS WORK	:	50
EXAM	:	100
TOTAL	:	150
DURATION OF EXAM	:	3 HRS

#### UNIT 1 TRANSIENT RESPONSE :

Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using laplace transform.

#### UNIT 2 NETWORK FUNCTIONS :

Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions, Time domain behavior from the pole-zero plot.

#### UNIT 3 CHARACTERISTICS AND PARAMETERS OF TWO PORT NETWORKS :

Relationship of two-port variables, short-circuit Admittance parameters, open circuit impedance, parameters, Transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

#### UNIT 4 TOPOLOGY :

Principles of network topology , graph matrices, network analysis using graph theory.

#### UNIT 5 TYPES OF FILTERS AND THEIR CHARACTERISTICS :

Filter fundamentals, high-pass, low-pass, band-pass, and band-reject Filters.

#### UNIT 6 NETWORK SYNTHESIS :

Positive real functions, synthesis of one port and two port networks, elementary ideas of Active networks.

#### TEXT BOOKS:

1. Network Analysis & Synthesis : Umesh Sinha; Satya Prakash Pub.
2. Network Analysis & Synthesis : F.F.Kuo; John Wiley & Sons Inc.

#### REFERENCE BOOKS:

1. Introduction to modern Network Synthesis : Van Valkenburg; John Wiley
2. Network Analysis: Van Valkenburg; PHI
3. Basic circuit theory:Dasoer Kuh; McGraw Hill.
4. A Course in Electrical Circuit Analysis by Soni & Gupta; Dhanpat Rai Publication.
5. Circuit Analysis : G.K. Mithal; Khanna Publication.
6. Networks and Systems : D.Roy Choudhury; New Age International.

NOTE: Eight questions are to be set in all by the examiner taking at least one question from each unit. Students will be required to attempt five questions in all.

L T P  
3 1 -

Theory :100 Marks  
Class work : 50 Marks  
Total :150 Marks  
Duration of Exam :3 Hrs.

TRANSFORMERS: Principle, construction of core, winding & tank, operation, testing of single phase transformer, equivalent circuit, phasor diagram, parameters determination, P.U. representation of parameters, regulation, losses & efficiency, separation of iron losses.

Various types of connection of three phase transformer, their comparative features, Zig-Zag connection.

Parallel operation of single phase & three phase transformers.

Auto-transformer: Principle, construction, comparison with two winding transformers, application.

Nature of magnetizing current, plotting of magnetising current from B-H curve, Inrush current, harmonics, effect of construction on input current, connection of three phase transformer.

Phase-Conversion: Three to two phase, three to six phase and three to twelve phase conversions.

Introduction to three winding, tap-changing & phase-shifting transformers.

D.C. MACHINES: Elementary DC machine, principle & construction of D.C. generator, simplex lap and wave windings, E.M.F. equation, armature reaction, compensating winding, commutation, methods of excitation, load characteristics, parallel operation. Principle of DC Motors, torque and output power equations, load characteristics, starting, speed control, braking, testing, efficiency & applications.

#### TEXT BOOKS:

1. Electric Machines: I.J.Nagrath and D.P.Kothari, TMH, New Delhi.
2. Performance & Design of D.C. Machines: A.E. Clayton & N.N. Hancock; ELBS)

#### REF. BOOKS:

1. Electric Machinery, Fitzgerald & Kingsley, MGH.
2. Theory of alternating current machinery, A.S. Langsdorf, TMH.
3. Electrical Machines, P.S.Bhimbra, Khanna Publishers Delhi

NOTE: 4 questions are to be set from part A & 4 questions from part B. Students have to attempt five questions with at-least two from each part.

EE-209-E ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

L T P  
3 1 0

Class Work :50  
Exam :100  
Total :150  
Duration of Exam :3hrs

UNIT-I: UNITS STANDARDS & ERRORS: S.I. units, Absolute standards (International, Primary, Secondary & Working Standards), True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold).

UNIT-II: MEASURING SYSTEM FUNDAMENTALS: Classification of Instruments (Absolute & Secondary Instruments; Indicating, Recording & Integrating instruments; Based upon Principle of operation), Generalized Instrument (Block diagram, description of blocks), three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces), Comparison between gravity & spring controls; Comparison of damping methods & their suitability, bearing supports, pivot-less supports (Simple & taut-band), Scale information, Instrument cases (Covers).

UNIT-III: MEASURING INSTRUMENTS: Construction, operating principle, Torque equation, Shape of scale, use as Ammeter or as Voltmeter (Extension of Range), Use on AC/DC or both, Advantages & disadvantages, Errors (Both on AC/DC) of PMMC types, Electrodynamic Type, Moving iron type (attraction, repulsion & combined types), Hot wire type & Induction type, Electrostatic type Instruments.

UNIT-IV: WATTMETERS & ENERGY METERS: Construction, operating principle, Torque equation, Shape of scale, Errors, Advantages & Disadvantages of Electrodynamic & Induction type Wattmeters; & single phase induction type Energy meter, Compensation & creep in energy meter.

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

UNIT-VI: LOW & HIGH RESISTANCE MEASUREMENTS: Limitations of Wheatstone bridge; Kelvin's double bridge method, Difficulties in high resistance measurements, Measurement of high resistance by direct deflection, loss of charge method, Megohm bridge & Meggar.

UNIT-VII: A.C. BRIDGES: General balance =n, Ckt. diagram, Phasor diagram, Advantages, disadvantages, applications of Maxwell's inductance, inductance-capacitance, Hays, Anderson, Owens, De-Sauty's, Schering & Weins bridges, Shielding & earthing.

TEXT BOOK: 1. A Course in Elect. & Electronic Measurement & Instrumentation by A. K. Sawhney; Khanna Pub.

- REFERENCE BOOKS: 1. Electrical Measurements by E.W. Golding  
2. Electronic & Elect. Measurement & Instrumentation by J.B.Gupta; Kataria & Sons.  
3. Electronic Instrumentation & Measurement Technique, W.D.Cooper & A.D. Helfrick.  
4. Measuring Systems by E.O. Doebelin; TMH.

NOTE: 5 out of 8 questions be attempted; at least 1 question be set from each unit.

L T P  
0 0 2

CLASS WORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS :

1. Transient response of RC circuit.
2. Transient response of RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To calculate and verify "Z" parameters of a two port network.
5. To calculate and verify "Y" parameters of a two port network.
6. To determine equivalent parameter of parallel connections of two port network.
7. To plot the frequency response of low pass filter and determine half-power frequency.
8. To plot the frequency response of high pass filter and determine the half-power frequency.
9. To plot the frequency response of band-pass filter and determine the band-width.
10. To calculate and verify "ABCD" parameters of a two port network.
11. To synthesize a network of a given network function and verify its response.
12. Introduction of P-Spice

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

EE-211-E            ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS LAB

L    T    P  
0    0    2

Class Work        : 25  
Exam                : 25  
Total                : 50  
Duration of Exam : 3hrs

LIST OF EXPERIMENTS :

1. To identify the meters from the given lot.
2. To convert & calibrate a D'Arsonnal type galvanometer into a voltmeter & an ammeter.
3. To calibrate an energy meter with the help of a standard wattmeter & a stop watch.
4. To measure power & p.f. by 3-ammeter method.
5. To measure power & p.f by 3-voltmeter method.
6. To measure power & p.f in 3-phase circuit by 2-wattmeter method.
7. To measure capacitance by De Sauty's bridge.
8. To measure inductance by maxwell's bridge.
9. To measure frequency by Wien's bridge.
10. To measure the power with the help of C.T & P.T.
11. To measure magnitude & phase angle of a voltage by rectangular type potentiometer.
12. To measure magnitude & phase angle of a voltage by polar type potentiometer.
13. To measure low resistance by Kelvin's double bridge.
14. To measure high resistance by loss of charge method.

Note: At least 7 experiments should be performed from above list. Remaining 3 experiments may either be performed from above list or designed & set by concerned institution as per scope of syllabus.

L T P  
0 0 2

CLASS WORK	:	25
EXAM	:	25
TOTAL	:	50
DURATION OF EXAM	:	3 HRS

LIST OF EXPERIMENTS:

1. Introduction of tools, electrical materials, symbols and abbreviations.
2. To study stair case wiring.
3. To study house wiring i.e., batten, cleat, casing-caping and conduit wirings.
4. To study fluorescent tube light.
5. To study high pressure mercury vapour lamp (H.P.M.V).
6. To study Sodium lamp.
7. To study repairing of home appliances such as heater, electric iron, fans etc.
8. To study construction of moving iron, moving coil, electrodynamic & induction type meters.
9. To design & fabricate single phase transformer.
10. To study fuses, relays, contactors, MCBs and circuit breakers.
11. Insulation testing of electrical equipments.
12. To design, fabricate a PCB for a circuit, wire-up and test.

NOTE: Ten experiments are to be performed, out of which at least seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution.

EE-215-E

Electrical Machine Lab-I

L T P  
- - 3

Practical	:50 Marks
Class work	:50 Marks
Total	:100 Marks
Duration of Exam	:3 Hrs.

#### LIST OF EXPERIMENTS

1. To find turns ratio & polarity of a 1-phase transformer.
2. To perform open & short circuit tests on a 1-phase transformer.
3. To perform Sumpner's Back to back test on 1-phase transformers.
4. Parallel operation of two 1-phase transformers.
5. To convert three phase to 2-phase By Scott-connection.
6. To perform load test on DC shunt generator.
7. Speed control of DC shunt motor.
8. Swinburne's test of DC shunt motor.
9. Hopkinson's test of DC shunt M/Cs.
10. Ward Leonard method of speed control.

NOTE: At least 10 experiments be performed in the semester. At least seven experiments should be performed from above list. Remaining 3 experiments may either be performed from the above list or designed & set by concerned institution as per scope of syllabus.