

B.TECH SEMESTER-VII ELECTRICAL ENGINEERING

THEORY COURSES:

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total Hrs.
1.	EE-401T	Protection & Switchgear	4	310	4
2.	EE-403T	High Voltage Engineering	4	310	4
3.	EE-405T	Industrial Training	3	010	1
4.	HU-402T	Engineering Economics	3	310	4
5.	EE-407T	Seminar	2	020	2
6.		Pool Elective	4	310	4
7.		Open Elective	4	310	4
Total			24		23

LABORATORY COURSES:

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total Hrs.
1.	EE-401P	Protection & Switchgear	2	003	3
2.	EE-403P	Project-I	2	003	3
Total			4		6
TOTAL (THEORY + LABORATORY)			28		29

Pool Elective

1. Non Conventional Energy Sources (EE-411T)
2. Neural Networks & Fuzzy Logic (EE-413T)
3. Utilization of Electrical Power & Traction (EE-415T)

Open Elective

1. HU-449T Principal of Management
2. MA-491T Operations Research
3. CY-491T Charge Transfer in Plasma
4. HU-493T Introduction to Psychology
5. CY-401T Polymeric Materials and their Applications
6. PH-419T Futuristic Materials

B.TECH SEMESTER-VIII ELECTRICAL ENGINEERING

THEORY COURSES:

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total Hrs.
1.	EE-402T	Electric Drives & Control	4	310	4
2.	EE-404T	Electrical Machine Design	4	310	4
3.	Open Elective	4	310	4
4.	Pool Elective	4	310	4
Total			16		16

LABORATORY COURSES:

SI. No.	Course No.	Subject	Credits	Teaching Schedule Hrs. LTP	Total Hrs.
1.	EE-404P	Power System	2	003	3
2.	EE-406P	Project-II	10	009	9
Total			12		12
TOTAL (THEORY + LABORATORY)			28		28

POOL ELECTIVE

1. EE-406T E.H.V AC & DC Transmission
2. EE-408T Power Quality.
3. EE-410T Power System Operation & Control

OPEN ELECTIVES:

1. HU-402T Engineering Economics
2. PH- 429T Material Imperfection and Applications
3. HU-409T Quantitative Methods in Economics
4. HU-407T Foreign Trade

B-TECH. SEMESTER-VII
PROTECTION AND SWITCHGEAR
EE-401T

L	T	P	TOTAL
3	1	0	4

Unit I:

Introduction to Protection System: Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays: Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

Unit-II:

Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III:

Protection of Transmission Line: Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

Unit-IV:

Circuit Breaking: Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker: Classification, testing station and equipments, testing procedure, direct and indirect testing

Unit-V:

Apparatus Protection: Protection of Transformer, generator and motor.

Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF₆, Vacuum and d. c. circuit breakers.

Text Books:

1. S. S. Rao, "Switchgear and Protection", Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear, Wiley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, "Fundamentals of Power System Protection", Prentice Hall of India.
5. T.S.M Rao, "Power System Protection: Static Relays with Microprocessor Applications" Tata Macgraw Hill".
6. A.R. Van C. Warrington , " Protective Relays- Their Theory and Practice, Vol. I & II" Jhon Willey & Sons.

B-TECH. SEMESTER-VII
HIGH VOLTAGE ENGINEERING
EE-403T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

Break Down In Gases:

Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, break down in non-uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics:

Classification of liquid dielectric, characteristic of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectrics:

Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT-II:

Generation of High Voltages and Currents:

Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III:

Measurement of High Voltages and Currents:

Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

UNIT-IV:

Non-Destructive Testing:

Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:

Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, Tata Mc-Graw Hill.

Reference Books:

2. E. Kuffel and W. S. Zaengal, "High Voltage Engineering", Pergamon Press.

3. M. P. Chaurasia, "High Voltage Engineering", Khanna Publishers

4. R. S. Jha, "High Voltage Engineering", Dhanpat Rai & sons

5. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.

6. M. Khalifa, 'High Voltage Engineering Theory and Practice,' Marcel Dekker.

7. Subir Ray, 'An Introduction to High Voltage Engineering' Prentice Hall of India

B-TECH. SEMESTER-VII
NON CONVENTIONAL ENERGY SOURCES
EE-411T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

INTRODUCTION:

Power Crisis, future energy demand, role of Private sectors in energy management,

UNIT-II:

MHD generation:

Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output.

UNIT-III

Solar power plant:

Conversion of solar heat to electricity, Solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use.

UNIT-IV:

Wind Energy:

Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices & economic size.

UNIT-V:

Geothermal Energy:

Earth energy, heat extraction, vapor turbine cycle, difficulties & disadvantages

UNIT-VI:

Tidal energy:

Tidal phenomenon, tidal barrage, tidal power Schemes.

UNIT-VII:

Ocean Thermal Energy:

Introduction, energy conversion, problems.

UNIT-VIII:

Chemical Energy Sources:

Fuel cells, classifications, hydrogen production, hydrogen energy, utilization of hydrogen gas.

UNIT-IX:

Thermoionic generator:

Basic principle Thermoionic generator.

Text Books:

1. Non-conventional energy sources by G.D. Rai, Khanna Publisher.

B-TECH. SEMESTER-VII
NEURAL NETWORKS & FUZZY LOGIC
EE-413T

L	T	P	TOTAL
3	1	0	4

Unit-I:

Neural Networks-1(Introduction & Architecture):

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory

Unit-II:

Neural Networks-II (Back propagation networks):

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III:

Fuzzy Logic-I (Introduction):

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV:

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V:

Fuzzy Neural Networks:

L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation(BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:

1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.

Reference Books:

3. Siman Haykin, ”Neural Netowrks”Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

B-TECH. SEMESTER-VII
UTILIZATION OF ELECTRICAL ENERGY & TRACTION
EE-415T

L	T	P	TOTAL
3	1	0	4

Unit-I:

Electric Heating:

Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating

Unit-II:

Electric Welding:

Electric Arc Welding, Electric Resistance welding, Electronic welding control

Electrolyte Process:

Principles of electro deposition, Laws of electrolysis, applications of electrolysis

Unit-III:

Illumination:

Various definitions, Laws of illumination, requirements of good lighting Design of in door lighting and outdoor lighting systems

Refrigeration and Air Conditioning:

Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV:

Electric Traction - I

Types of electric traction, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V:

Electric Traction – II

Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:

1. H.Partab,“Art and Science of Electrical Energy” Dhanpat Rai & Sons.
2. G.K.Dubey,“Fundamentals of Electric Drives” Narosa Publishing House

Reference Books:

3. H. Partab, “ Modern Electric Traction” Dhanpat Rai & Sons.
4. C.L. Wadhwa, “ Generation, Distribution and Utilization of Electrical Energy” New Age International Publications.

B-TECH. SEMESTER-VIII
ELECTRIC DRIVES & CONTROL
EE-402T

L	T	P	TOTAL
3	1	0	4

Unit-I:

Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives
Classification of electric drives Speed-torque conventions and multi-quadrant operations
Constant torque and constant power operation Types of load, Load torque: components, nature and classification.

Unit-II:

Dynamics of Electric Drive: Dynamics of motor-load combination; Steady state stability of Electric Drive; Transient stability of electric Drive.

Selection of Motor Power rating:

Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

Unit-III:

Electric Braking:

Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors

Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

Unit-IV:

Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.

Unit-V:

Power Electronic Control of AC Drives: Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor:

Self controlled scheme

Special Drives:

Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa publishing House.
2. S.K.Pillai, "A First Course on Electric Drives", New Age International.

Reference Books: 3. M.Chilkin, "Electric Drives", Mir Publishers, Moscow.

4. Mohammed A. El-Sharkawi, "Fundamentals of Electric Drives", Thomson Asia, Pvt. Ltd. Singapore.

5. N.K. De and Prashant K.Sen, "Electric Drives", Prentice Hall of India Ltd.

6. V.Subrahmanyam, "Electric Drives: Concepts and Applications", Tata McGraw Hill.

B-TECH. SEMESTER-VIII
ELECTRICAL MACHINE DESIGN
EE-404T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

Basic Considerations:

Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials. Calculation of total mmf and magnetizing current. Transformer Design: Output equation design of core, yoke and windings, overall dimensions, Computation of no load current to voltage regulation, efficiency and cooling system designs

UNIT-II:

Design of rotating machines – I:

Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size. Core and armature design of dc and 3-phase ac machines

UNIT-III:

Design of rotating machines – II:

Rotor design of three phase induction motors. Design of field system of DC machine and synchronous machines. Estimation of performance from design data.

UNIT-IV:

Computer Aided Design

Philosophy of computer aided design, advantages and limitations.

Computer aided design approaches analysis, synthesis and hybrid methods.

Concept of optimization and its general procedure.

Flow charts and 'c' based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines.

Text Books:

1. K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay, "Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.

Reference Books:

- 3.M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
- 4.A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C.Machines" Pitman & Sons.
- 5.S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.

B-TECH. SEMESTER-VIII
EHVAC & DC TRANSMISSION
EE-406T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

Introduction : Need of EHV transmission, standard transmission voltage, comparison of EHV ac & dc transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission

UNIT-II:

EHV AC Transmission : Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:

Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high Ac and Dc voltages, measurement of high voltage by spheregaps and potential dividers.

Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:

EHV DC Transmission – I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters. Principle of dc link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of dc link.

UNIT-V:

EHV DC Transmission – II: Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, ac and dc filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books :

- 1.R. D. Begamudre, “Extra High Voltage AC Transmission Engineering” Wiley Eastern.
- 2.K. R. Padiyar, “HVDC Power Transmission Systems: Technology and System Reactions” New Age International.
- 3.J. Arrillaga, “High Voltage Direct current Transmission” IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
- 4.M. S. Naidu & V. Kamaraju, “High Voltage Engineering” Tata Mc Graw Hill.

Reference Books:

- 5.M. H. Rashid , “ Power Electronics : Circuits, Devices and Applications” Prentice Hall of India.
- 6.S. Rao, “EHV AC and HVDC Transmission Engineering and Practice” Khanna Publisher.
- 7.“EPRI, Transmission Line Reference Book, 345 KV and above” Electric Power Research Institute. Palo Alto, California, 1982.

B-TECH. SEMESTER-VIII
POWER QUALITY
EE-408T

L	T	P	TOTAL
3	1	0	4

Unit-I:

Introduction to Power Quality:

Terms and definitions of transients,

Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions;

Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations.

Unit-II:

Voltage Sag:

Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III:

Electrical Transients:

Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV:

Harmonics:

Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V:

Measurement and Solving of Power Quality Problems: Power quality measurement devices- Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices:

Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, “Electrical Power System Quality” McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “ Power Quality” CRC Press.

B-TECH. SEMESTER-VIII
POWER SYSTEM OPERATION & CONTROL
EE-410T

L	T	P	TOTAL
3	1	0	4

UNIT-I:

Introduction :

Structure of power systems, Power system control center and real time computer control, SCADA system. Level decomposition in power system. Power system security. Various operational stages of power system. Power system voltage stability

UNIT-II:

Economic Operation :

Concept and problems of unit commitment. Input-output characteristics of thermal and hydro-plants. System constraints. Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental. transmission loss, transmission loss formula (without derivation). Hydrothermal scheduling long and short terms. Concept of optimal power flow

UNIT-III:

Load Frequency Control :

Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV:

Automatic Voltage Control :

Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.

Voltage and Reactive Power control :

Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V:

State Estimation:

Detection and identification, Linear and non-linear models.

Flexible AC Transmission Systems:

Concept and objectives

FACTS controllers: Structures & Characteristics of following FACTs Controllers.

TCR, FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC Transmission Systems"
4. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.

Open-Elective, (Final Year)

Code: HU-449 T

Subject : Principle of Management

Credits 4(3-1-0)

UNIT 1: Management as a discipline: Definition, nature, scope, functions, managerial Skills, Management. Thought-Historical Prospective, Social Responsibility, of Business.

UNIT2: Planning: Concept and purpose, planning process, Management, By Objectives (MBO), Decision making.

UNIT3: Organization: Concept and purpose of organisation, types of organisation, bases of Departmentation, concept of Authority and Responsibility, Span of Management, Line and Staff Authority, Functional Authority, Delegation of Authority, Centralization and Decentralization of Authority, Coordination Staffing.

UNIT4: Directing: Leadership Concept, Ingredients, Traits, Styles, Roles Communication Concept. Types, Process Barriers, Making Communication effective, Importance.

UNIT5: Controlling: Concept, Provides, Requirements, for adequate control, controlling and earning, Budgeting control Importance, Management Audit, Management in future.

Subject: Operation Research
Branches: EI

Code: MA-491T
Semester :VII

Credits: 4
LPT:310

UNIT 1: Introduction: Definition of O.R. and its scope, modeling in O.R. General methods for solving O.R. models. The Monte-carlo technique, main characteristic of O.R. main phases of O.R. Linear programming problems. Graphical method for solve L.P.P., Two phase Method, Big-M Method, problems of tie.

UNIT 2: Assignment Model : Mathematical formulation of assignment model, Reduction theorem, problems of maximization & minimization. Hungarian process, travelling salesman problems.

UNIT 3: Transportation Model : Mathematical formulation of transportation problem. Definition of BFS, IBFS, Optimum solution. Algorithms of N-W rule, Least-cost & VAM and their problem

UNIT 4: Sequencing : Introduction, principle assumptions processing of jobs through two, three & m machine's.

UNIT 5: Game Theory : Characteristic of Games. Basic definitions, minimax criterion and optimal strategy. Equivalence of rectangular Games, Dominance process, Arithmetic method for solving zero-sum-two person Games. Graphical and simplex methods for solving the games.

UNIT 6: Replacement: Replacement of item that fail completely.

UNIT 7: Inventory : Elementry Inventory Models, Inventory models with price breaks.

List of Pool Elective:

1. EI-402 PCB Design & Technology
2. EI-456 Aircraft Instrumentation
3. EC-458 Digital Image Processing
4. EC-460 Microwave Integrated circuit

Semiconductors :

Introduction of semiconductors. intrinsic and extrinsic, II-VI and III-V semiconductors and its alloys, Advantages and necessity of the tailoring of semiconductor, Semiconductors and its alloys used of LED and other devices, Utility of semiconducting alloys like GaAs, GaN, GaP etc.

Superconductors:

Fundamental Phenomena associated with superconductors. Type I & II superconductors, Meissner Ochenfeld effects, Josephson effects, fundamental of BCS theory. Novel High Temperature Superconductors. High temperature superconductors, TlBa CaCuO single and bilayer. Electron superconductors NdCuO etc. Doping effects in superconductors, Organic superconductors, fullerenes. Application of the superconductors in science, medical and commercial sectors.

Material for Magnetic media:

Material useful for magnetic recording head, magnetic disk, magnetic tape media, Magneto optic recording materials. Holography, data storage materials.

Holography:

Fundamentals of holography, Difference between conventional photography and holography. Techniques to make a hologram. Advantages of holography over other techniques.

Introduction of following with applications :

Fibre optics, Lasers, Ceramics, Dielectric Characterization of Materials

Books:

- 1) Superconductivity Today: T.V. Ramakrishnan & C.N.R. Rao Wiley Eastern Pvt. Ltd, New Delhi, 1992
- 2) Solid State Physics: Ashcroft/Mermin

Quantitative Methods in Economics (HU-409T)
L P T (3 1 0) CREDIT-4

- UNIT:1** **Statistics:** Definition, Importance, Scope and Limitations of statistics, primary and secondary data. Classification of Meaning objectives and types of classification. Frequency Distribution-Discrete, Grouped and continuous frequency distributions. Fundamentals of frequency distribution.
- UNIT:2** **Measures of Central Tendencies:** arithmetic mean, Median, Mode, Geometric Mean and Harmonic Mean, Demerits and Uses of all methods.
- UNIT:3** **Measures of Dispersion:** Mean deviation Method about Mean, Median and Mode, Merits and Demerits of Mean Deviation. Coefficient of M.D. Standard Deviation (S.D.) Method with simple short-cut and step deviation methods. Merits and Demerits of S.D. Coefficient of S.D.
- UNIT:4** **Correlation:** Introduction, Types of Correlation, Karl Pearson's Coefficient of Correlation. Interpretation of 'r'. Probable Error, Uses of Probable Error.
- UNIT:5** **Linear Regression Analysis:** Introduction, Two method of Linear Regression Analysis:- (1) Line of Regression of Y on X and (2) Line of Regression and X on Y. Why two lines of regression Coefficient of Regression. Relation between the coefficient of correlation and Regression.
- UNIT:6** **Index Number:** Definition, Uses and Types of Index Numbers, Methods of Construction Index Numbers-(1) Simple Aggregate Method (2) Weighted Aggregate Method (3) Fisher's Ideal Index Numbers (4) const of living Index Numbers (5) Chain Base Index Numbers. Base Shifting. Limitations of Index Numbers.

Foreign Trade (HU-407T)
L P T (3 1 0) CREDIT-4

- UNIT:1** **Nature of foreign Trade:** Meaning, Nature, Scope and Distinct Features of International Transactions.
- UNIT:2** **Theories of International Trade:** The Classical Theory:-Absolute Advantage Model of Adam Smith, comparative Advantage Model of David Ricardo, the Neo-classical Analysis:-International trade Equilibrium under Constant cost, Increasing Cost and Decreasing cost conditions.
- UNIT:3** **Tariffs and Quota:** types and Effect of tariffs and Quotas, Quota vs. Tariff.
- UNIT:4** **International Monetary fund (I.M.F.):** Nature, Objectives and functions of I.M.F. International Monetary System, since the demise of Bretton Woods System.
- UNIT:5** **International Financial Institutions:** World Bank (IBRD, International Financial Corporation (I.F.C.), International Development Association (I.D.A.).
- UNIT:6** **India's Trade Policy:** Trends of Exports and Imports of India since independence, Composition of India's Foreign Trade.