

NOTIFICATION

No. 50 /2018

Date : 7/06/2018

Subject :- Continuation of Prospectus No. 131741 prescribed for Sem. V & VI B.E. (CGS) for the session 2018-2019.

It is notified for general information of all concerned that the Prospectus No.131741 prescribed for Semester V & VI B.E. (CGS) for the session 2012-2013 and continued upto the session 2017-2018 shall be continued for the academic session 2018-2019 with the following substitutions (revised syllabi) for the examinations B.E. Sem. V & VI (Civil) and B.E. Sem. V & VI (Electrical & Electronics) as per Appendices A & B appended herewith as given below :

Sd
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SEMESTER - V : B.E. – (CIVIL)

5CE01: REINFORCED CEMENT CONCRETE – II

SECTION – A

Unit I :

1. Design of circular tanks with rigid and flexible base resting on firm ground by working stress method. (By IS code Method, IS 3370-2009)
2. Design of circular tanks with rigid base resting on firm ground by Limit State method. (By IS code Method, IS 3370-2009)

LIMIT STATE METHOD:

Unit-II :

- 1) Introduction to limit state method, basic concept of singly, doubly reinforced and flanged beams, shear and comparison with working stress method.
- 2) Analysis and design of one way single span and continuous slabs.

Unit-III :

- 1) Analysis and design of two way solid slabs.
- 2) Staircases, Design of Dog legged type staircase only.

SECTION-B

Unit-IV:

Transfer of load from slab on beams. Analysis and complete design of beams, rectangular and flanged sections for bending moment and shear.

Unit-V:

- 1) Transfer of load from beam on column. Analysis and design of columns for axial load, uniaxial and biaxial bending. (Problem on uniaxial bending only)
- 2) Design of Isolated footings: Square and rectangular footings of uniform depth subjected to axial load only.

Unit-VI:

- 1) Design of grid slab by I.S. code method.
- 2) Detailing for earthquake resistant construction. Introduction, Cyclic behaviour of concrete and reinforcement, significance of Ductility, Ductile detailing for beams, Columns, joints & shear walls.

BOOKS RECOMMENDED:

1. Jain A.K.: Plain & Reinforced Concrete, Vol. I & II
2. Sinha S.K. & Roy S.K.: Fundamentals of RCC.
3. Pillai & Menon: RCC Design.
4. Dr. Shah V.L. & Karve S.R.: Limit State Design.

5CE02: FLUID MECHANICS-II

SECTION – A

Unit-I:

Turbulent flow through pipes: Karman-Prandtl's equation (No Proof), Nikuradse's experiment, Velocity distribution laws & universal resistance laws, Hydrodynamically, smooth & rough pipes, Moody's diagram, Commercial pipes.

Unit –II:

Uniform flow, Open channel flow, Types of flow, geometric elements of rectangular & trapezoidal sections, Chezy's & Mannings equations, most efficient rectangular & trapezoidal section, Energy & momentum principles, Normal & critical depth, specific energy diagram, discharge diagram, specific force diagram.

Unit-III:

Gradually varied flow, Dynamic equation of G.V.F. with proof, Analysis of Surface profiles, single step method. Rapidly varied flow; Hydraulic jump in horizontal rectangular channel, elements of jump, relation between conjugate depth, elements of jump.

SECTION - B

Unit-IV:

Dimensional Analysis ; Buckingham's Pie theorem, it's application, similitude, Dimensionless numbers, Re, Fr, We, Predominant forces & their ratio, Model Analysis - Geometrically similar models, Reynolds law, Froude's law, Model study of spillways, distorted models, analysis of ship model.

Unit-V:

Impact of jet on stationary & moving plates, symmetrical, asymmetrical curved vanes; Moment of momentum equation (statement only), velocity diagrams. Elements of Hydroelectric Plant, Hydraulic turbines; classification of turbines, Description of Pelton wheel, Francis turbine & Kaplan turbine, calculation of work done, power & efficiency, specific speed.

Unit-VI:

Classification of pumps ; centrifugal pumps, main parts & working, velocity diagrams, work done, efficiency, priming of pumps, multi stage pumps, pumps in series & parallel.

Brief introduction of reciprocating pump, Jet pump, Submersible pump, Hydraulic Ram (No numerical).

BOOKS RECOMMENDED:

- 1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition, Standard Book House, New Delhi-6
- 2) Ranga Raju : Open Channel Flow.
- 3) Dr. Jain A.K. : Fluid Mechanics.
- 4) Subramanya K. : Flow in Open Channel.
- 5) Chow V.T. : Open Channel Hydraulics.
- 6) Garde & Mirajgaonkar : Fluid Mechanics.
- 7) Nagaratnam S.; Fluid Mechanics
- 8) Madan Mohan Das; Open channel flow
- 9) R.K. Rajput; Fluid Mechanics
- 10) Jagdish Lal Fluid Mechanics

5CE07: FLUID MECHANICS -II – Lab

PRACTICALS –

Minimum 8 practicals out of the list given below are to be performed: The practical examination shall consist of viva-voce based on theory & practicals.

1. Verification of momentum equation.
2. Determination of Chezy's coefficient.
3. Determination of coefficient of discharge of Venturiflume.
4. Study of Gradually Varied Flow.
5. Study of hydraulic jump, calculations of height of jump, length & energy loss.
6. Trial on Pelton wheel.
7. Trial on Francis turbine.
8. Trial on reciprocating pump.
9. Trial on Centrifugal pump.
10. Trial on Hydraulic Ram.
11. Study of Hot wire Anemometer, Laser Doppler Anemometer.
12. Study of CFD & its applications.

5CE03: BUILDING PLANNING AND CAD

SECTION – A

Unit- I: Introduction, importance of building drawing for Civil Engineering in construction & estimation, Methods of drawing, selection of scales for various drawings, types of line, methods of dimensioning in architectural drawing.

Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS: 962. Combined first angle & third angle method of projection. Layout of sheet for civil engineering drawing, Requirements of drawing as per plan sanctioning authorities.

Unit-II: Concept of line plan & working drawings of the building. Developing working drawings of the building from the given line plan. Details to be incorporated in the working drawing. Necessity and use of working drawing. Concept of site plan, block plan and layout plan. Importance and details to be incorporated. Concept of foundation plan, importance and use. Developing working drawing and foundation plan for load bearing and framed structures. Plumbing & electric plan.

SECTION - B

Unit-III: Building rules and by laws for residential buildings, conversion to land to non agricultural lands, layout for housing project. Types of public building and their requirements, planning of public building. Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post office. Perspective drawing, stair case planning and drawing.

Unit-IV: Planning of residential building. Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement. Climate and design consideration. Orientation of buildings, requirement of the owner, alternatives of building types viz. individual bungalows, semidetached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building. Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Criteria for earthquake resistant planning of building

Books Recommended :

1. Shah, Kale & Patki, Building Planning & Drawing, Tata McGraw-Hill publication
2. Dr. Kumar Swamy & Rao Swamy, Charotar publications
3. Chery R ,Auto cad Pocket reference, BPB Publication.

5CE08: BUILDING PLANNING AND CAD –Lab

1. Developing working drawing of single storied residential building from the given line plan.
2. Preparing line plan of residential building from the given data. Developing submission drawing of the above as per requirement of the plan sanctioning authority. (Separate data should be given to every student).
3. Developing working drawing of multistoried framed structures (Apartment building) from given line plan.
4. Developing line plans of public building from the given data (minimum 2 line plans)
5. Developing working drawing of single storied residential building from the given line plan by any drafting software.
6. Development of free hand sketches of components of building and elevation features of building such as chajjas, compound wall, steel grills and gates.

5CE04: SURVEYING-II

SECTION- A

Unit-I: Tachometry: Stadia methods-fixed hair and movable hair, tangential method, formulae for distance and reduced level determination. Theory of analytic lens, Beaman's stadia arc, Auto reduction tacheometer such as Jeffcot, Hammer fennel.

Unit-II: Curves: Classification, degree of curve, elements of circular and compound curves, theory and methods of setting out simple curves, Instrumental method of setting out compound curves.

Transition curves. : Ideal transition curves, characteristics methods of determination of length, Elements of different types and methods of setting out.

Unit-III :Triangulation : principles, classification of triangulation system, triangulation figures, their choice of station, phase of signals, towers, satellite station, reduction to center, field work, reconnaissance, Inter-visibility, angular measurements.

Basenet, extension of Basenet, adjustment of field observation, errors in observation, method of least square, weighted observations, figure adjustment (Triangle only).

SECTION – B

Unit-IV:Hydrographic surveying: necessity, controls, shore line surveys, gauges, sounding equipments and procedure of taking soundings, methods of location of sounding, three point problem in hydrographic surveying, analytical and graphical methods.

Underground Surveying: surface alignment, correlation of surface and underground surveys; Weisbach triangle, transferring levels and alignment underground.

Unit-V: Elements of photogrammetry: Basic definitions, terrestrial and aerial photography, scale of vertical photograph, Relief and relief displacements, heights from parallel measurements, flight planning, photographs required.

Remote sensing: Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics.

Unit-VI: 1. Field Astronomy : Elements of spherical trigonometry, Napier's rules of circular parts, celestial sphere, ecliptic, circumpolar stars, astronomical terms, Astronomical triangle, co-ordinate systems.
2. GIS & GPS: Components of geographical information system (GIS), advantages, function of GIS, advantages and disadvantages, Global positioning system (GPS) introduction, definitions, GPS receivers, antenna, advantages of GPS.

Books Recommended :

1. D. Clark. : Plane and Geodetic Surveying Vol II
2. T.P. Kanetkar & S.V.Kulkarni : Surveying and Levelling Part II
3. B.C.Punmia : Surveying Vol. II and III
4. A.M. Chandra: Higher surveying, New Age International publishers.
5. B.C. Punamia, Ashok Jain, Arun k. Jain: Higher surveying, Laxmi publications (P), Ltd,
6. Dr. S. Kumar: Basics of remote sensing and GIS, Laxmi publications (P), Ltd,

5CE09: SURVEYING -II - Lab

Practicals –

Practicals from the list mentioned below shall be performed by each student and observations, calculation and relevant work shall be submitted as a term work.

Practical examination shall consist of field exercise and viva voce examination based on the above syllabus & practicals.

LIST OF EXPERIMENTS:

1. Finding out tachometric constants and Finding out height & distances by tachometry.
2. Ranging circular curve by offset from long chord.
3. Ranging circular curve by offset from chord produced.
4. Ranging circular curve by Rankine's method by using total station.
5. Ranging of transition curve
6. Triangulation by satellite station
7. Base line measurement in triangulation system
8. To Find horizontal distance and difference in elevation between two points by using Total station
9. Study on Stereoscope
10. Study on GPS.

5FECE05: FREE ELECTIVE-I (i) INTRODUCTION TO EARTHQUAKE ENGINEERING

SECTION A

UNIT I:

Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, Propagation of earthquake waves .

UNIT II:

Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph, accelerogram recording), Determination of magnitude, Epicenter distance, Ground motion and their characteristics, Factors affecting ground motions.

UNIT III:

Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings

SECTION B

UNIT IV:

Projections & suspended parts, special construction features like separation of adjoining structure, crumble section, stair case etc, twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking

UNIT V:

Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures.

UNIT VI:

Behavior of R.C. building in past earthquakes. Concept of earthquake Resistant design, Introduction to IS: 1893

Reference Books:

- 1 Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007
- 2 Amita Sinvhal; Understanding Earthquake Disasters, Tata McGraw Hill.

5FECE05: FREE ELECTIVE-I (ii) BASICS OF BUILDING CONSTRUCTION

SECTION –A

Unit-I: Introduction: Definition of building as per national building code, components of buildings and their function , Types of structure-load bearing structure and frame structures, their relative advantages and disadvantages, load bearing walls and partition walls. Types of foundation- Definition and necessity and types of foundations, precautions to be taken against failure of foundations

Unit-II :Stone Masonry- Technical term, general principles to be observed during construction, selection of stone masonry. Brick Masonry Construction- Technical term, general principles to be observed during construction, commonly used types of bonds such as Stretcher, Header, English bond Flemish bond and their suitability.

Unit-III: Floors- Types of floors-Basement floor, ground floor and upper floor. Types of upper floors-R.C.C. slab floor, R.C.C. slab and beam floor, R.C.C. grid floor, R.C.C. flat slab floor. Floor Finishes-Types of flooring material, Shahabad , Kota, Granite, Ceramic tiles, Plain tiles, mosaic tiles ,glazed tiles ,different types of floor finishes , their suitability. Method of construction, criteria of selection. Roofs-Flat and pitched roof ,steel roof trusses- types and suitability ,fixing details at supports ,types of roof covering ,AC and GI sheets, acrylic sheets, fixing details of roof covering.

SECTION –B

Unit IV: Door –Purpose, criteria for location, size of door, door frames and its types, method of fixing Windows- Purpose, criteria for location, size and shapes of windows, types of windows and their suitability. Ventilators – Types and their suitability. Fixtures and Fastening for doors and windows. Glass- Types of glass and their suitability. Arches and Lintels - Types and their suitability. Details of R.C.C. lintels and chajja, precast lintels and arches

Unit-V:Stairs- Function, technical terms, criteria for location, types of staircases and their suitability. Plastering and Pointing- Necessity, types, processes of different types of plastering, defects in plaster work Painting and Coloring – Necessity, types, processes of painting and coloring to the wall surface, wooden surfaces, iron and steel surfaces, types of paints and their uses Scaffolding- Purposes, types, suitability.

Unit VI: Special Aspects of Construction, Damp proofing-causes of dampness, its effects, various methods of damp proofing, material used for damp proofing. Fire proof construction- Points to be observed during planning and construction. Fire protection requirement for a multistoried building, Sound proof construction –Sound absorbents and their characteristic. Joints- Expansion and construction joints necessity, details of expansion joint at foundation level and roof level of load bearing structure and framed structure, Provision of construction joints in slabs, beams and columns.

Books Recommended:

- Deshpande R.S.. and Vartak C.V.: A Treatise on Building Construction .
- Sharma S.K. Kaul and B.K. :A.T.B. Building Construction ,S Chand and co.
- Gurucharan Sing : Building Construction Engineering, Standard Book House ,Delhi-06
- Sane L.S.: Construction Engineering, Manak Talas, Mumbai
- Chudley R.: Construction Technology ,Volume I.II.III. and IV,Longmans Group Ltd. ISE National Building code of India,1970.

5FECE05: FREE ELECTIVE-I (iii)

WATERSHED MANAGEMENT

SECTION-A

- Unit I Engineering Hydrology: Definition and its importance, Hydrological Cycle, Hydrologic equation. Storages, concept of storages, the watershed Water and Energy: Energy movement, quality of energy, geometry of energy. The energy budget, Instruments and limitations. The role of water in energy sphere.
- Unit II Precipitation: Forms, Types. Factor affecting, Measurement
Evaporation: Processes, factor affecting, measurement and estimation
Evapotranspiration: Processes, factor affecting, measurement and estimation
Infiltration: Processes, factor affecting, measurement and infiltration indices
- Unit III Run-off: Factor affecting, estimation of runoff, Rainfall-Runoff co-relation
Floods: Floods classification importance, estimation of flood, flood control techniques, Brief description of flood routing.

SECTION-B

- Unit IV Common aquifer: Exploration of ground water hydraulics of ground water flow- Measurement of permeability of formations, flow net and their construction .
Boundary Conditions: Unconfined and confined, steady and unsteady flow in to wells and infiltration galleries.
- Unit V : Watershed development management-Definition, Need and scope, characterization of watershed criteria survey, Basic data collection and interpretation, Establishment of watershed research stations.
Hydrographs: Typical flood Hydrograph, base flow separation, Unit hydrograph, S-curve hydrograph.
- Unit VI Rain water harvesting: Necessity, method of rain water harvesting, water harvesting potentially, elements of typical water harvesting system, cost of water harvesting.
Roles of NGO's Government and Municipal Corporation Limitations, quality assurance of stored water.

Books Recommended:

- 1) Sharma R.K.: Hydrology and Water Resources Engineering .
- 2) Peter E.Black: Watershed Hydrology.
- 3) Dr. Reddy Jayarami P. :Hydrology, Laxmi Pub..Delhi.
- 4) R.N.Chaturvedi: Water Resources Systems,Planning and Management.
- 5) Raghunath H.M. :Hydrology,Wiley Eastern Ltd., New Delhi.
- 6) Subramanya S. : Hudrology, Tata McGRAW Hill

SEMESTER – VI

6CE01: NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION - A

Unit-I :

Spreadsheet software basics, Expressions, Mathematical Functions, Conditional Execution Functions like IF, COUNT,COUNTIF, SUM, SUMIF, AVERAGE, AVERAGEIF, VLOOKUP, HLOOKUP.Application to Civil Engineering Problems.

Unit-II :

1. Basic grammar of FORTRAN, use of library functions, FORTRAN coding sheet, input output statements, format for input output statement, flowchart.
2. Control statements: GO TO, computed GO TO, Assigned GO TO, arithmetic IF, logical IF, block IF, DO statement, implied DO loop

Unit-III :

1. Type declaration statement, DIMENSION statement, subscripted variables, DATA statement
2. Sub – programs: Statement function, function sub – program, subroutine sub program. Dummy and actual arguments.

SECTION-B

Computer Programming using FORTRAN 77

Unit-IV:

1. Matrix operations such as:
 - a. Addition and subtraction
 - b. Multiplication
 - c. Transpose
 - d. Testing summary etc.
2. Fourth order, Runge - Kutta method for solution of first order, second order differential equations and two simultaneous equations.

Unit-V:

1. Solution of quadratic equation
2. Numerical integral using Trapezoidal and Simpson rule
3. Finding root of equation $f(x) = 0$ by Newton -Raphson, Regula -Falsi and Bisection method.

Unit VI:

1. Centre of gravity, moment of inertia & radius of gyration of Tee section.
2. Bending moment and shear force ordinates for simply supported beam subjected to point and uniformly distributed load only.
3. Design of singly reinforced beam by limit state method.
4. Determination of coefficient of permeability in parallel and perpendicular direction of bedding plane
5. Reduce level by height of instrument method.
6. Determination of Chezy's constant.

BOOKS RECOMMENDED:

1. Rajaraman, Computer Programming in FORTRAN
2. Schaum Series, FORTRAN Programming.

6CE07: NUMERICAL METHODS AND COMPUTER PROGRAMMING -Lab

PRACTICALS:

Preparation and execution of at least six computer programs using FORTRAN. Solution of at least two civil engineering problems using spreadsheet software. A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE02: DESIGN OF RCC & PRESTRESS CONCRETE STRUCTURES

SECTION-A

(DESIGN OF R.C.C. STRUCTURES BY LIMIT STATE METHOD)

Unit-I

1. Design of interior panel of flat slab by direct design method. (Problem on square panel only)
2. Design of cantilever retaining wall and Counterfort retaining wall.

Unit II:

1. Design of combined footing.
2. Complete design of simple, small structures like Canopies & Parking shed.

SECTION-B

PRESTRESSED CONCRETE:

Unit-III

1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress
2. Analysis of beams for flexure, under working load for Rectangular and flanged sections.

Unit-IV

1. Basic Design of rectangular sections for flexure by limit state method, Design of one way single span slabs.
2. Design of prestressed concrete circular water tanks by IS code method.

Students may be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Jain, A. K., Reinforced Concrete (Limit State Design)
2. Jaikrishna and Jain, Plain and Reinforced Concrete, Volume I and II
3. Sinham S. N., Reinforced Concrete (Limit State Design)
4. Edward G. Nawy "Prestressed Concrete- A fundamental Approach", Prentice Hall
5. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
6. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi)
7. Dr. Shah V.L. & Karve S.R.: Limit State Design.

6CE08: DESIGN OF RCC & PRESTRESS CONCRETE STRUCTURES – Lab

Practicals:

1. Candidates are required to prepare at least two designs based on theoretical course detailed workings are necessary.
2. A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE03: WATER RESOURCES ENGINEERING – I

SECTION – A

Unit-I

Engineering Hydrology: Definition and its importance, Hydrologic Cycle, **Hydrologic data**, Hydrologic equation, **Precipitation:** Definition, Forms, Types, Measurement, Rain gauge Network, Estimation of Missing data, Consistency of data, Mean Areal Precipitation,

Unit II:

Evaporation: Process, factors affecting, measurement and estimation, control of evaporation. **Evapotranspiration:** Factors affecting, measurement and estimation **control of evapotranspiration**
Infiltration: Process, factors affecting, measurement, Infiltration indices.
Run-off: Factors affecting, estimation of runoff, Rainfall- Runoff co-relation.

Unit-III

Floods: Flood classification, importance, estimation of flood, flood control techniques, **Reservoir & channel routine.**
Hydrographs: Typical flood hydrograph, base flow separation, Unit hydrograph, S-curve hydrograph.

SECTION-B

Unit IV:

Irrigation Engineering: Necessity and advantages of irrigation, suitability of soils for different crops, standards for irrigation water.
Minor Irrigation Works: Necessity and general layout of Bandhara and percolation Tank, **design & construction of bridge cum bandharas, cement plus across nala in the water shed of the village.**
Lift Irrigation: Necessity and general layout, main components

Unit-V

Crop Water Requirements: Principal Indian crop seasons and water requirements for different crops, Duty and Delta, Consumptive use of water and its estimation, Irrigation efficiencies.
Irrigation methods: Comparative study of different irrigation methods, **basic of drip & sprinkler irrigation, its scope and applicability**

Unit VI:

Ground water: Aquifer parameters, Well hydraulics for steady **and unsteady** flow condition, safe yield and yield tests.
Water Harvesting: Definition, Need for water harvesting, water harvesting potentially, elements of typical water harvesting system, Methods of water harvesting, cost of water harvesting,

BOOKS RECOMMENDED :

Engineering Hydrology

1. Dr. Reddy Jayarami P. : Hydrology, Laxmi Pub., Delhi.
2. Subramanya S. : Hydrology, Tata McGraw Hill.
3. Raghunath H.M. : Hydrology, Wiley Eastern Ltd., New Delhi.
4. Sharma R.K. : Hydrology & Water Resources Engg.

Irrigation Engineering

1. Dr. Modi P.N. : Irrigation, Water Resources & Water Power Engg.
2. Punmia : Irrigation & Water Power Engg.
3. Garg S.K. : Irrigation & Water Power Engg.
4. Dahigaonkar J.G. : T.B. of Irrigation Engg., Wheeler & Co.
5. Dr. T.K. Sharma & R.K. Sharma, Irrigation Engineering
6. Dr. A.R. Arora, Irrigation & Water Power Engineering

6CE04: TRANSPORTATION ENGINEERING - II

SECTION – A

Unit-I

RAILWAY: Railway transportation, classification Railway surveying, track standard terminology, track sections in embankment & cutting, high speed trains. Traction and tractive resistance, hauling capacity and tractive effort of locomotives, different types of traction.

Unit-II

Permanent way: requirement, gauges, coning of wheels, components of permanent way, Rail types and functions, defects in Rails, Rail joints, Sleeper density, Rail fixtures & fastening. Geometric design of railway track, gauge, gradients, speed, superelevation, cant deficiency, negative superelevation, grade compensation, curves, Railway accidents and causes.

Unit-III

Points and crossing Left & right hand turnouts, design calculations for turnout & cross over, types of Track junction, long welded rails. Station and yards- types, function, facilities & equipment. Railway signalling and interlocking, objects, classification & types of signals, control & movement of trains.

SECTION - B

Unit-IV

AIRPORT: Development of air transportation in India, Agencies controlling national & international aviation, Various surveys to be conducted, airport site selection, Airport drainage, Aeroplane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, imaginary surfaces approach and turning zone Runway and Taxiway design: orientation of runway, wind rose diagram, basic runway length and corrections, runway geometric design standards.

Unit-V

Airport layout, Terminal area, Terminal area, unit terminal concept, Apron, Apron layout, Aircraft parking & parking system. Visual aids, Airport parking & lighting of runway, taxiway and other areas. Airport traffic control, need of control aids, instrumental landing systems, accidents in the air.

Unit-VI

TUNNELS: Tunnels necessity, types, tunnel economics, tunnel alignment, tunneling methods in soft soil & hard rock. Needle beam method, drift method. Size and shape of tunnels, Tunnel lining, drainage, ventilation & lighting of tunnels.

BOOKS RECOMMENDED :

- 1) Saxena & Arora : Railway Engineering.
- 2) Agrawal M.M. : Railway Engineering.
- 3) Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
- 4) Srinivasan : Tunnel Engineering.

6FECE05: FREE ELECTIVE-II (i) DISASTER MANAGEMENT

SECTION – A

Unit I

What is disaster, types, damage caused, pre-disaster preparedness, post-disaster preparedness, early warning strategies, National disaster management guidelines, role of NGO'S in disaster management, different phases of disaster management cycle.

Unit II

Principles of emergency management, crisis management, International organizations such as Red cross, United Nations, European Union, Indian organizations, Natural hazards in coastal states in India, what is Tsunami, its characteristics.

Unit III

Monsoon in India, its calculations, flood hazard in India. Regions of country prone to floods, flash floods, damages caused due to floods, Do's and Don'ts in Earthquake.

SECTION – B

Unit IV

Role of GIS, GPS and Remote sensing in disaster management, flood forecasting and warning in India, coordination of central water commission and Indian meteorological department, action plan for flood forecasting and warning.

Unit V

Disaster risk reduction programme, institutional strengthening and capacity building for DRR by Central Govt., State disaster management authority, its functions human resource support required at SDMA, need of psychosocial support and mental health in disasters.

Unit VI

Training of human resource in disaster risk reduction planning at state level, awareness among people, key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster, plan to counter, threats to water supply.

Books Recommended :

1. Cuny, Fred C; Disasters and management, oxford Uni. Press.
2. Alexander, David; Principles of emergency planning & management, Terra publishing, ISBN 1-903544-10-6
3. National Disaster Management Authority, Govt. of India, Report.
4. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994.

6FECE05: FREE ELECTIVE-II (ii) ENVIRONMENTAL MANAGEMENT

SECTION – A

Unit I : The nature, scope and components of environmental management.

Environmental impact analysis- need and importance, step involved methods of EIA, public participation and communication.

UNIT II: Environmental policy analysis- micro level and macro level, methods of policy analysis, steps involved. : Operational methods, quantitative methods, static analysis public policy analysis resource allocation, environmental economics etc.

UNIT III: Environmental management plan (EMP): components of Environmental Management Plan, Preparation of Environmental Management Plan

SECTION – B

UNIT IV : Environmental Legislation and Acts: Water (prevention and control of pollution) Act1974,Air (prevention and control of pollution) Act 1981, Environmental protection Act (EPA) 1986, Hazardous waste rules1989, Factory Act 1984 amendments in 1987, Environmental Management System: ISO 14000(EMS)

Environmental Audits: methods, components and preparation.

UNIT V: Various agencies for Environmental Managements in India: Ministry of environment and forest, central pollution control boards, state pollution control boards, local bodies, - their scopes, organizational and functional issues, their working etc.

UNIT VI: Basics of Data Base Management System (DBMS), Geographic Information System (GIS) and remote sensing in Environmental Management.

Information of software for EIA

Books Recommended :

- 1) Environmental Impact Analysis- a decision Making Tool: By R K Jain
- 2) Theory and Practice of Environmental Impact Assessment: By Abbasi AND Ramesh
- 3) Environmental Impact Assessment: By Shrivastava
- 4) Environmental laws and policy in India, Armin Rozencaranz, Sham Diwan Marhta L. Nobel, Tripathi publication.
- 5) Environmental Legislation: V Krishnamurthi.

6CE06: ESTIMATING AND COSTING

SECTION – A

Unit-I : General: Importance of the subject, purpose of quantity estimates, Modes of measurement and units of measurement as IS1200. Methods of cost estimating in general, various methods of stage-I (approximate) estimates. Specification: Purpose and principles of specification writing, types of specification writing and developing detailed specification of a few items related to building, Irrigation Work, Road work. Problem on Four rooms for measurement only

Unit –II: Cost Building-up: purpose and principles, importance of Schedule of Rates in cost estimates, factors affecting analysis of rates. Fixed, variable prime and supplementary cost, overhead costs and its allocation. Recommendations from N.B.O. for Task work, No. of workman etc., Schedule of rates, market rate analysis of some specific items including transportation cost. Workout quantities of various materials required for construction, such as cement, steel, bricks, aggregates, timber.

Unit-III : Cost & Quantity Estimate: Methods of detailed estimates, forms used, detailed estimates of Civil Engineering works, Building, Quantity estimates:

SECTION – B

Unit-IV : Earth work estimates in Roads including hill road. Earthwork calculations for earthen dam.

Unit-V : Valuation - Purpose of valuation, value and cost, market value, potential value, sentimental value, scrap value, etc.

Real estate, Guilt edged security. Net & gross return, tenure of land, free hold & lease hold property. Sinking fund, Depreciation, capitalized value, annualized value, of a old building.

Unit-VI : Organisation for construction industry specific to Govt. organisation. P.W.D.Organisation, Site administration, Labour contracts, BOT. Role of Govt. deptt. as a construction agency, Arranging Works: Methods of carrying out works, Arranging contract work, Tender Notices, acceptance of tender, essentials of contracts, types of contracts, contract documents, Indian contract law and Engineering contracts, land acquisition Act, Legal aspects of various contract provision. Cost accounting, various methods; classification of cost, direct & indirect charges, distribution of overheads, MAS account, issue rate of store account.

BOOKS RECOMMENDED :

1. R.H. Namavati. : Estimating and Valuation
2. B.N. Datta : Estimating & Costing – S. Datta Lucknow.
3. V.N. Vazirani, S.P. Chandola: C.E. Estimating & Costing, Khanna Publisher Delhi.
4. B.S. Patil: Estimating Costing – Orient Longmans.
5. P.W. & H. Deptt. Govt. of Maharashtra: Standard Specification
6. S.C. Rangawala: Valuation (Charotar Book Stall)
7. Dhanpat Rai: Text book of Estimates Costing – Anand & Sons, Delhi.
8. B.C. Chakraborty: Principles of Estimation & Costing.

6CE09: ESTIMATING AND COSTING –Lab

PRACTICALS –

The candidates submit the following :

- Preference must be given to use of Spreadsheet software wherever possible
- 1) Detailed estimate of a, single story load bearing structure building (given plan)
 - 2) Detailed estimate of any one of the following
 - a) Compound wall of residential building with steel gate.
 - b) Septic tank for a colony
 - c) Culvert
 - 3) Detailed estimate of bituminous road- one Km length
 - 4) Detailed estimate R.C.C. single story building
 - 5) Specification for 6 items as below.
 - Building works 4 Items.
 - Road Work 1 Items.
 - Irrigation work 2 Items.
 - 6) Rate analysis of any 8 building items.
 - 7) Tender documents for the Building in problem No. 1
 - a) Tender Notice.
 - b) Tender.
 - c) Schedule A and Schedule B.
 - d) Conditions of contracts regarding time, labour payment, damages.
 - 8) Valuation of building, existing Building.

NOTE:- Practical Examination shall consists of viva-voce and a test based on syllabus and sessional work.

6CE10: MINOR PROJECT

Any one Group Project in details.

- 1) Irrigation Project
- 2) Rehabilitation of Village / Town
- 3) Water Supply Project
- 4) Sewerage System
- 5) Bridge on River

Students should conduct a detailed survey in a seven day camp.

Data Analysis, Design & Submit Report & Drawing sheets.

SEMESTER - V : B.E. (ELECTRICAL & ELECTRONICS ENGG.)
5EX01 CONTROL SYSTEMS

Course learning objectives

- To introduce history, importance and components of control system engineering, concepts of automatic control, time response analysis, stability of system, frequency response analysis, and state variable analysis ,and current scenario of control system engineering.

SECTION-A

Unit I : Introduction to automatic control : open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graphs. Effect of feed back on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components : Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Unit III: Time response analysis : time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series. Approximate methods for higher order system, proportional, derivative and integral control.

SECTION-B

Unit IV: Stability : stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability. Root Locus : construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V : Frequency response methods : frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer function from the frequency response., Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis.

Unit VI : State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation – Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response – SISO Systems. Concept - controllability and observability, Kalman & Gilbert test

Text Book :

1. Nagrath I.J., Gopal M. : Control System Engineering, “New age international publishers”.

Reference Books:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010.
2. Ogata K. : Modern Control Systems, Prentice Hall of India.
3. Control System Engineering, R Anandanatarajan, P Ramesh Babu, SCITECH Pub., Chennai, 2nd ed., 2010.

5 EX02 DIGITAL ELECTRONICS

Course objective :

Able to represent numerical values in various number systems and perform number conversions, design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits and to analyze sequential digital circuits like flip-flops, ROM, RAM, PROM.

SECTION-A

Unit-I : Number systems and codes: Binary Number System, Binary to decimal Conversion, Decimal-to-binary Conversion, Octal Numbers, Hexadecimal Numbers , The ASCII Code, The Excess 3 Code, The Gray Code. Unsigned Binary Numbers, Sign magnitude Numbers, 2’S Complement Representation.

Unit-II: Combinational Logic circuits: Boolean Laws And Theorems, Sum-of-products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications Don’tcare Conditions, Product-of-sums Method , Product-of-sums Simplification, Simplification by Quine-McCluskey Method, Hazards and Hazard Covers.

Unit-III: Data-processing circuits: Multiplexers, Demultiplexers, 1-of- 16 Decoder, BCD-to-decimal Decoders Seven-segment Decoders, Encoders, Exclusive-or GATES, Parity Generators and Checkers , Magnitude comparator , Read-only Memory .

SECTION-B

Unit-IV: Definitions for Digital Signals, Digital Waveforms, Digital Logic, Moving and Storing Digital information, Digital Operations, The Basic Gates—NOT, OR, AND, Universal Logic Gates—NOR, NAND AND-OR-Invert GATES, Positive and Negative Logic.

Unit-V: Arithmetic circuits: Binary Addition, Binary Subtraction, 2’S Complement Arithmetic, Arithmetic Building Blocks, The Adder-subtractor , Fast Adder, Arithmetic Logic Unit , Binary Multiplication & Division.

Unit-VI: Clocks and Timers: Clock Waveforms, TTL Clock, Schmitt Trigger. Flip-Flops: RS Flip-flops, Gated Flip-flops, Edge triggered RS Flip-flops, Edge-triggered D Flip-flops, Edge triggered JK Flip-flops, Flip-flop Timing, JK Master-slave Flip-flops, Analysis of Sequential Circuits.

Text-Book :

Jain R.P. "Modern Digital Electronics" (TMH).

Reference books:

1. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).
2. Taub & Schilling "Digital Integrated Electronics" (TMH).
3. Donald P Leach, Albert Paul Malvino, Goutam Saha, "Digital Principles & Applications" (6/e) (McGraw-Hill).

5 EP03/5EX03/5EL03/5EE03 ELECTRICAL MACHINES - II

Course Learning Objectives:-

This subject aims to educate students with basic laws governing the electrical machines. Analyze the behavior of the machines performance calculation of the machine; characteristics of the machine know the application of different electrical machines in industries.

SECTION-A

Unit I : Fundamentals of AC rotating machines. AC windings- integral slot, fractional slot and fractional pitch windings- distribution factor, pitch factor and winding factor-harmonic mmf of distributed windings, EMF equation.

Unit II : Synchronous Generators : constructional details, armature reaction-circuit models and phasor diagram of salient and non salient pole machines - determinations of parameters of the circuit models - methods of determining regulations and efficiency, transient and subtransient reactances.

Unit III : A) Synchronous Motors : principle of operation – torque equation - circle diagrams- V-curves - hunting and damping starting applications.

B) Methods of synchronization - synchronous machine on infinite busbars - parallel operation of generators. Introduction to conducting and reporting the test on synchronous machine as per IS.

SECTION – B

Unit IV : Three phase induction motor : rotating magnetic fields, principles of operation-constructional details - circuit models and phasor diagram, performance equations direct and indirect testing-circle diagram.

Unit V : Methods of starting and speed control of 3 phase IM-double cage motor-methods of braking-single phasing, cogging and crawling, scharge motor.

Unit VI : A) Single phase IM : different types - starting methods - characteristics and applications.

B) AC commutator machines-series motors - characteristics and applications.

C) Small machines-principle of operation, construction characteristics and applications of Printed Circuit Motor (PCM), Syn, ind motor, reluctance motor and hysteresis. Introduction to conducting and reporting the test on single phase induction motor as per IS.

Text Book:-

Electrical Machines by Smarajit Ghosh, Pearson Education- II edition 2008

Reference Books:-

1. Theory of AC Machines: A.S.Langsdorf (McGraw Hill)
2. Performance and Design of AC Commutator Motors - Openshov - Taylor (McGraw Hill)
3. Performance and Design of Alternating Current Machines: M.C.Say,
4. Electrical Machines - Nagrath, Kothari. (Tata McGraw Hill)

5EX04 ELECTRICAL POWER I

Course Objectives: To provide in depth knowledge about understanding the fundamentals of both electrical and mechanical components design aspects in power system.

Unit I : **Transmission line parameters :** Calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on capacitance, interference with communication lines.

Unit II : **Electrical characteristics of transmission line :** V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal Π and nominal T representations, Ferranti effect, corona phenomenon, effect of corona. **Representation of power systems:** per unit system and one-line reactance diagrams.

Unit III: **Voltage control and power factor improvement:** Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers. (10)

Unit IV: **Load flow studies:** Load flow problem, classification of buses, network modeling, Y-bus matrix, load flow equation, Gauss-Seidal and Newton-Raphson methods, and comparison of these methods. (10)

Unit V: **Mechanical design:** Materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Line supports for LV, HV and EHV, sag calculation.

Unit VI: **Underground cables:** Material used for conductor & insulation, different types of cables and their manufacture, parameters of underground cable, grading of cable.

Text Book:-

Power System Engineering by D.P.Kothari, I.J.Nagrath TMH 2nd edition, 9th reprint 2010.

Reference Books:-

1. Electrical Power Systems, C.L.Wadhwa, 6th Edition 2010, New Age International Pub.
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010.
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal, 2nd Edition, 2009, Pearson Education.
4. Power System Analysis by Hadi Saadat TMH, 1st Edition reprint 2004.

5FEEP05/5FEEX05/5FEEL05/5FEEE05

FREE ELECTIVE- I (i) ENERGY AUDIT AND MANAGEMENT

Course Learning Objectives:-

To understand general energy problem, sector wise energy consumption, demand supply gap, scope for energy conservation and its benefits.

SECTION -A

Unit -I : Energy Scenario & Management: Indian energy scenario, Energy needs of growing economy, Energy pricing in India Energy sector reforms, various forms of energy, Primary and secondary energy, commercial and noncommercial energy, Global primary energy reserves, Energy and environment, Necessity of conserving energy, Energy strategy for the future, Electrical energy management, Concept of supply side management and demand side management, Methods of implementing Demand side management and advantages to consumer, utility and society.

Unit-II: Energy Audit: Definition, Need of energy audit, Preliminary and detailed energy audit. Procedure for carrying out energy audit, Instruments used for energy audit, Data Analysis-Energy-production relationship, specific energy consumption, Sankey diagram, CUSUM Technique, Bench marking energy performance, Recommendations for energy conservation, Action plan, Executive Summary.

Unit III: Economics of energy conservation: Cost factors, Budgeting, Standard costing and Sources of capital, Cash flow diagram and activity chart, Simple Payback period analysis, Time value of money, Net present value method, internal rate of return method, Profitability index for benefit cost ratio.

SECTION -B

Unit IV: Energy Conservation: Energy conservation in motive power, Illumination, Heating & cooling systems, Pumping systems, Thermal power stations and Transmission & Distribution Sector. Cogeneration & Waste heat recovery systems.

Unit-V: Energy Audit Case Studies: Energy Intensive Industries, Commercial, Industrial, Municipal and Agriculture Sector, IT industries, Hospitals.

Unit VI : Fundamentals of Harmonics: Harmonic distortion, voltage versus current distortion, Power systems quantities under non sinusoidal conditions- active reactive and apparent power, displacement and true power factor, harmonic phase sequences, triplen harmonics, harmonic indices- Total harmonic distortion(THD), Total demand distortion(TDD) , Harmonic sources from commercial and industrial load, Locating harmonic sources, Power quality monitoring.

Books Recommended :

Text Book :Electrical Energy Utilization & Conservation Dr. S.C. Tripathi, TMC

Reference Books :

1. Energy Conservation and Audit Thumman.
2. Energy Audit and Conservation TERI.
3. Guide book for national certification examn. for Bureau of Energy Efficiency energy managers & energy auditors.
4. Electrical power system quality systems Surya Santoso/ H. W. Beaty, TMH Publication.

6EX01/8EL03/8EP03/8EE03 DIGITAL SIGNAL PROCESSING

Course Learning Objectives:

To enable the students to obtain essential understanding of Stability criteria, DFT, Sampling of Bandpass signals in order to design the various Digital filters.

SECTION A

UNIT-I : Introduction to DSP, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties, Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III : Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION B

UNIT-IV : Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI : DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts.

TEXT BOOK:

Digital Signal Processing, P Ramesh Babu, SCITECH Publications, Chennai, 4th edition, 2010.

REFERENCE BOOKS:

1. Proakis & Monolakis D.G, 'Digital Signal Processing', PHI Publication.
2. Mitra S.K, 'Digital Signal Processing', TMH Publication.
3. Oppenheim & Schaffer, 'Discrete Time Processing', John Wiley Publication.

6EX02 OPTIMISATION TECHNIQUES

Course Objectives: To Develops Students Analytical Power By Verious Mathematical Model Of Linear And Non Linear Programming, Analyze The Concept Of Project Management And Its Application To Electrical Engineering

SECTION A

Unit I: Introduction, engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem, optimization techniques. Classical optimization techniques - single and multi variable optimization with and without constraints.

Unit II : Linear programming I - standard form, definitions and theorems, graphical method, solution of system of linear simultaneous equations, simplex method, two phase simplex method, revised simplex method.

Unit III: Linear programming II - duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis, balanced transportation problems.

SECTION B

Unit IV: Non linear programming: Unimodal function, unrestricted search, Fibonacci search method and Golden section method, unconstrained optimization, direct search methods steepest descent method, conjugate gradient and variable metric method.

Unit V: CPM and PERT introduction - Network representation of project, critical path, optimum scheduling by CPM, crashing of project.

Unit VI: Dynamic programming: multistage decision processes, principle of optimality, sub optimization, conversion of final value problem into initial value problem, solution of linear programming.

TEXT BOOK: S.S.Rao : Optimization - Theory & Application, Wiley Eastern Ltd.

REFERENCE BOOKS:

- 1) L.S.Srinath : PERT and CPM Principles & Application, Affiliated East West Pvt. Ltd., New Delhi.
- 2) Fredrick S.Hiller Gerald J.L. Lieberman : Introduction Operations Research, Tata McGraw Hill Pub. Co., New Delhi.
- 3) H.A.Taha : Operations Research, PHI, New Delhi.
- 4) P.K.Gupta & D.S.Hira : Operations Research, S.Chand & Co. Ltd, New Delhi.
- 5) J.C.Pant : Introduction to Optimization, Jain Brothers, New Delhi

6EX03 ELECTRICAL POWER - II

Course Objectives: To provide in depth knowledge about understanding the fundamentals of symmetrical components & its significance.

Unit I : Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank-sequence voltages and currents relationship; power system elements – sequence impedance and sequence networks ; Various three phase transformer connections – zero sequence rules.

Unit II : Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults on unloaded conditions.

Unit IV : Overvoltages

Causes – internal and external; Voltage surge, Basic insulation level, Protection – earthing screen, overhead ground wire, lightning arresters.

Unit V : HVDC Transmission

Basic principle, Transmission equipments, Comparison with AC links, Inverters – reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)

FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

Text Book:-

- 1.Electrical Power Systems, C.L.Wadhwa, 6th Edition 2010, New Age International Publishers.

Reference Books:-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9threprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal 2nd Edition, 2009, PEARSON Education
4. Narain G. Hingorani and Lazlo Gyugyi – “Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.

6EX04 MICROPROCESSORS & MICROCONTROLLERS

Course Learning Objectives: To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

SECTION-A

Unit I : 8085 : architecture, register structure, addressing modes, instruction set of 8085, timing diagrams.

Unit II : Assembly Language Programming of 8085, counters and time delays, stack and subroutines, Memory mapped I/O and I/O mapped I/O, address decoding techniques. Interrupt system of 8085 (software and hardware interrupts). Data transfer schemes, serial data transfer through SOD and SID line.

Unit III : Interfacing devices (I) : internal architecture and programming of PPI (8255), PIC (8259), USART (8251).

SECTION-B

Unit IV : Interfacing devices (II) : architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237). Introduction to architecture 8086.

Unit V : Microprocessors applications : hardware & software developments : signal conditioning & data acquisition system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc. Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities (resistance, inductance, capacitance, phase angle, power factor).

Unit VI : **Introduction to microcontroller:** 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOK :

1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Pub. - 2006

REFERENCE BOOKS :

1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980.
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005.

6FEFP05/ 6FEEX 05/ 6FEEL05/ 6FEEL05 FREE ELECTIVE – II POWER SUPPLY SYSTEMS

Course Learning Objectives :

To enable the student to acquire fundamental knowledge of structure of power system, the function of different component in generation ,transmission and distribution system, various power generating station and working of various of power plant.

SECTION-A

Unit I:

Structure of Power System –

Generation, transmission and distribution. Power generating stations – different types.

Steam power stations: Main parts and working, types of boilers and their characteristics. Characteristics of steam turbines and alternators. Main flow circuits of steam power station. Power station auxiliaries, cooling system of alternators. Starting up and shut down procedures of thermal units.

Unit II:

Gas-turbine power stations- Main parts, plant layout and Bryton cycle operation. Combined cycle generation & Cogeneration. Nuclear power stations- Layout of nuclear power station, types of power reactors, main parts and control of reactors, nuclear waste disposal, radioactivity and hazards.

SECTION B

Unit III:

Hydroelectric stations: Arrangement and location of hydroelectric stations, principles of working, types of turbines and their characteristics, Pumped storage plants. Coordination of operation of different power stations .

Unit IV:

Substation - Classification of substations, Major equipments in Substation ,Selection & location of site for substation, Main Electrical connections, Graphical symbols for various apparatus & circuit elements in substation, connection diagram, Key diagram for typical substation, Busbar layouts. Auxillary supply, substation earthing.

Unit V:

Power distribution system: Primary and secondary distribution, types of conductors in Distribution system, comparison of distribution systems. Distributor design, radial and ring main, current and voltage profiles along a distributor, economics of feeder design.

Unit VI:

Electrical wiring and installation - Domestic, commercial and industrial wiring, estimation of main, submain and sub circuit wiring. Earthing practice. Testing of installation. Special lighting connections. Conductors, Fuse and disconnecting devices.

BOOKS RECOMMENDED :

TEXT BOOK : Principles of power system by V.k mehta & Rohit mehta. S chand.

REFERENCE BOOKS :

1. A Course in Power Plant Engineering, by Arora Domkundwar, Dhanpat Rai.
2. Elements of Electrical Power Station Design, by M.V.Deshpande, Wheeler.
3. Electrical Installation Estimating & Costing by J.B.Gupta.
4. Transmission & Distribution, by H.Cotton .

6EX05 POWER ELECTRONICS - I

SECTION-A

- Unit I :** SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits, introduction to GTO, power transistor, power MOSFET & IGBT & their construction & characteristics.
- Unit II :** Series -parallel operation of SCRs, firing ckts. for series and parallel operation, static & dynamic equalising ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.
- Unit III:** Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.
Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

SECTION-B

- Unit IV:** Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.
- Unit V:** Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper, step-down chopper and AC chopper. Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.
- Unit VI:** Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, speed control of three phase induction motor by stator voltage control, v/f control . Static ckt. braker, UPS, fan speed regulator, Zero voltage Switch.

Text Book : M.D.Singh & K.B.Khanchandani : Power Electronics, Tata McGraw Hill, New Delhi

Reference books :

- 1.M.H.Rashid : Power Electronics Circuits Devices and Application, PEARSON Education., 3rd edn. 2004.
- 2.3) Principles of Popwer Electronics, J.G.Kassakian,M.F.SchlechtG.C.Vergheese, PEARSON Education 2010
- 3.G.K.Dubey, S.R.Doradia, A.Joshi, R.M.Sinha : Thyristorised Power Controllers, New Age Intern., New Delhi.
