Sri Satya Sai University of Technology & Medical Sciences, Sehore (M.P)
CEC-601 THEORY OF STRUCUTRE-II

Unit- I

Moment distribution method in analysis of frames with sway, analysis of box frames, analysis of portals with inclined members, analysis of beams and frames by Kani's method.

Unit- II

Plastic analysis of beams and frames.

Unit-III

Analysis of tall frames, wind and earthquake loads, codal provisions for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads.

Unit-IV

Matrix method of structural analysis: force method and displacement method.

Unit -V

Influence lines for intermediate structures, Muller Breslau principle, Analysis of Beam-Columns.

Reference Books :-

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Streling J. Indeterminate structural Analysis, Addison Wesley.
3. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
4. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo.
5. Weaver W &Gere JM, Matrix Methods of Framed Structures, CBS Publishers & Distributors, Delhi

List of Experiments:-

1)Experiment on a 2 hinged arch for horizontal thrust and influence line for horizontal thrust.
2) Experimental and analytical study of a 3 bar pin jointed truss.
3) Experimental and analytical study of deflection and unsymmetrical bending of a cantilever beam.
4) Begg defometer- verification of Muller Breslau principle.
5) Experimental and analytical study of an elastically coupled beam.
6) Sway in portal frames- demonstration.
7) To study the cable geometry and statics for different loading condition.
8) To plot stress –strain curve for concrete. Use of mechanical and electrical strain and stress gauge.

CEC-(602) GEOTECHNICAL ENGINEERING

UNIT - I Basic Definitions & Index Properties: Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on Engineering behavior. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.

UNIT - II Soil Water and Consolidation: Soil water, Permeability Determination of permeability in Laboratory and in field. Seepage and seepage pressure. Flow nets, uses of a flow net, Effective, neutral and total stresses. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of reconsolidation pressure, settlement analysis. Calculation of total settlement.

UNIT - III Stress Distribution in Soils and Shear Strength of Soils: Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. New mark's influence chart. Contact pressure distribution. Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Tri axial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

UNIT - IV Stability of Slopes: Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

UNIT - V Lateral Earth Pressure: Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wall friction. Arching in soils. Reinforced earth retaining walls.

Suggested Books: -

1. Soil Mech. & Found. Engg. by Dr. K.R. Arora - Std. Publishers Delhi.
2. Soil Mech. & Found. by Dr. B.C.Punmia- Laxmi Publications, Delhi.
3. Modern Geotech Engg. by Dr.l Aram Singh - IBT Publishers, Delhi.
4. Geotech Engg. by C. Venkatramaiah - New Age International Publishers, Delhi
5. Soil Mech. & Found. Engg. by S.K. Garg- Khanna Publishers, Delhi.
6. Soil Testing for Engg. by T.W. Lambe - John Wiley & Soms. Inc.
7. Relevant I.S. Codes

List of Experiments:

1. Determination of Hygroscopic water content
2. Particle - size analysis
3. Determination of Specific gravity of soil particles
4. Determination of plastic limit
5. Determination of liquid limit
6. Determination of shrinkage limit
7. Permeability tests
8. Direct shear test

9. Consolidation test

CEC-(603) ENVIRONMENTAL ENGG.-I

UNIT - I Estimation of ground and surface water resources. quality of water from different sources, Demand & quantity of water, fire demand, water requirement for various uses, fluctuations in Demand, forecast of population.

UNIT - II Impurities of water and their significance, water-borne diseases, physical, chemical and Bacteriological analysis of water, water standards for different uses. Intake structure, Conveyance of water, pipe materials, pumps - operation & pumping stations.

UNIT - III Water Treatment methods-theory and design of sedimentation, coagulation, filtration, disinfection, aeration & water softening, modern trends in sedimentation & filtration, miscellaneous methods of treatment.

UNIT - IV Layout and hydraulics of different distribution systems, pipe fittings, valves and appurtenances, analysis of distribution system. Hardy cross method, leak detection, maintenance of distribution systems, service reservoir capacity and height of reservoir.

UNIT - V Rural water supply schemes, financing and management of water supply project, water pollution control act, conservancy & water carriage system, sanitary appliance and their operation, building drainage system of plumbing.

Suggested Books and Reading Materials:-

1. Water Supply Engineering by B.C. Punmia - Laxmi Publications (P) Ltd. New Delhi
2. Water Supply & Sanitary Engg. by G.S. Birdi - Laxmi Publications (P) Ltd. New Delhi
3. Water & Waste Water Technology by Mark J.Hammer - Prentice - Hall of India, New Delhi
4. Environmental Engineering - H.S. Peavy & D.R.Rowe-Mc Graw Hill Book Company,New Delhi
5. Water Supply & Sanitary Engg. by S.K. Husain
6. Water & Waste Water Technology - G.M. Fair & J.C. Geyer
7. Relevant IS Codes

List of Experiments:

1. To study the various standards for water.
2. To study of sampling techniques for water.
3. Measurement of turbidity.
4. To determine the coagulant dose required to treat the given turbid water sample.
5. To determine the conc. of chlorides in a given water samples.
6. Determination of hardness of the given sample.
7. Determination of residual chlorine by “Chloroscope.”
8. Determination of Alkalinity in a water samples.
9. Determination of Acidity in a water samples.

10. Determination of Dissolved Oxygen (DO) in the water sample.

CEC-604(A) WATER RESOURCES AND IRRIGATION ENGINEERING

UNIT - I Irrigation water requirement and Soil-Water-Crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation methods surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

UNIT - II Ground Water and Well irrigation: Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow Conditions, infiltration galleries. Ground water recharge-necessity and methods of improving Ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence causes and effects. reclamation of water logged and salt affected lands. Types of wells, well Construction, yield tests, specific capacity and specific yield, advantages and disadvantages of well irrigation.

UNIT- III HYDROLOGY : Hydrological cycle, precipitation and its measurement, recording and non-recording rain gauges, estimating missing rainfall data, rain gauge networks, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

UNIT - IV Canals and Structures: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, lining-objectives, materials used, economics. Introductions to Hydraulic Structures viz. Dams, Spillways, Weirs, , Barrages, Canal Regulation Structures.

UNIT- V Floods: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control,

Suggested Books:-

1. Irrigation & Water Power Engg. by Punmia & Pandey B.B.Lal
2. Engg. Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
3. Engg. Hydrology - J.NEMEC - Prentice Hall
4. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
5. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
6. Engg. Hydrology by H.M. Raghunath

CEC-604(B) GROUND WATER HYDROLOGY

UNIT-I INTRODUCTION: Ground water utilization & historical background, ground water in hydrologic cycle, ground water budget, ground water level fluctuations & environmental influence, literature/ data/ internet resources.

UNIT-II OCCURRENCE AND MOVEMENT OF GROUND WATER: Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics/classification, groundwater basins & springs, Darcy's Law, permeability & its determination, Dupuit assumptions, heterogeneity &anisotropy, Ground water flow rates & flow directions, general flow equations through porous media.

UNIT-III POLLUTION AND QUALITY ANALYSIS OF GROUND WATER: Municipal ,industrial ,agricultural ,miscellaneous sources & causes of pollution, attenuation, underground distribution, potential evaluation of pollution, physical ,chemical ,biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples, graphical representations of ground water quality.

UNIT-IV SURFACE & SUB-SURFACE INVESTIGATION OF GROUND WATER: Geological ,geophysical exploration, remote sensing , electric resistivity ,seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground water investigation through geophysical , resistivity ,spontaneous potential ,radiation , temperature ,caliper , fluid conductivity , fluid velocity ,miscellaneous logging.

UNIT-V ARTIFICIAL GROUND WATER RECHARGE: Concept & methods of artificial ground water recharge, recharge mounds & induced recharge, wastewater recharge for reuse, water spreading.

Reference books: -

1. D.K. Todd and L. F. Mays,"Groundwater Hydrology", John Wiley and sons.
2. K. R.Karanth,"Hydrogeology", TataMcGraw Hill Publishing Company.
3. S. Ramakrishnan,"Ground water",S. Ramakrishnan.

CEC-604(C) GEOTECHNICAL INVESTIGATIONS FOR CIVIL ENGINEERING STRUCTURES

UNIT-I

Need and importance of site investigations, sits exploration and phasing of site exploration program me, Spacing and depth of bore holes, significant depth.

UNIT-II

Methods of site exploration soundings, bore holes, drilling methods and equipment wash boring, rotary boring and percussion boring in soils.

UNIT-III

Stabilization of bore holes, Procuring and handling of disturbed and un disturbed samples, various types of samplers and sampling techniques, their relative merits and suitability in particular cases, lowering of water table.

UNIT-IV

Geophysical methods of soil exploration. Observation of ground water level and pressure Soil testing techniques used in Laboratory, field tests for permeability, in place density, vane test, plate bearing test, standard penetration test.

UNIT-V

Discussion and seminar on published papers of recent origin connected with exploration and testing of soils, case histories of failure of structures.

Reference books:-

1. Basic and Applied Soil Mechanics- A.S. Rao and Gopal Ranjan, New Age International.
2. Soil Mech. & Found. Engg. by Dr. K.R. Arora - Std. Publishers Delhi.
3. Soil Mech. & Found. by Dr. B.C.Punmia- Laxmi Publications, Delhi.
4. Modern Geotech Engg. by Dr.l Aram Singh - IBT Publishers, Delhi.

CEC 605(A) STRUCTURAL DESIGN & DRAWING – I (STEEL)

UNIT - I

Various loads and mechanism of the load transfer, partial load factors, structural properties of Steel, Design of structural connections -Bolted, Riveted and Welded connections.

UNIT - II

Design of compression members, Tension members, Roof Trusses - Angular & Tubular, Lattice Girders.

UNIT- III

Design of simple beams, Built-up beams, Plate girders and gantry girders.

UNIT – IV

Effective length of columns, Design of columns-simple and compound, Lacings & battens. Design of footings for steel structures, Grillage foundation.

UNIT – V

Design of Industrial building frames, multistory frames, Bracings for high rise structures, Design of transmission towers. NOTE: - All the designs for strength and serviceability should strictly be as per the latest version Of IS:800.

Reference Books :-

i) Design of steel structures by Arya & Azmani Nemchand & Bros, Roorkee
ii) Design of steel structures by P.Dayaratnam
iii) Design of steel structures Vol. I & II by Ramchandra
iv) Design of steel structures by L.S. Negi
v) Design of steel structures by Ramammutham
vi) Design of steel structures by Punmia

CEC-605(B) HIGHWAY GEOMETRIC DESIGN

UNIT-I INTRODUCTION

Geometric Control factors like Topography –design speed – design vehicle – Traffic – Capacity – volume – environment and other factors as per IRC and AASHTO standards and specifications- PCU concept – factors controlling PCU for different design purpose

UNIT-II CROSS SECTIONAL ELEMENTS

Pavement surface characteristics –friction – skid resistance – pavement unevenness- light reflecting characteristics – camber – objectives – types of camber – methods of providing cambers in the field – problems – carriage way – kerb – median –shoulder – foot path – parking lanes – service roads – cycle tracks –Driveways – Right of way – Factors influencing right of way – Design of Road humps as per latest I RC provisions

UNIT-III SIGHT DISTANCE Important, types, Side distance at uncontrolled intersection, derivation, factors affecting side distance, IRC, AASHTO standards, problems on above.

UNIT-IV HORIZONTAL ALIGNMENT Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum and maximum radius, Assumptions – problems – method of providing super elevation for different curves – Extra widening of pavement on curves – objectives – Mechanical widening – psychological widening – Transition curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve – Setting the transition curve in the field, set back distance on horizontal curve and problems on above

UNIT-V VERTICAL ALIGNMENT Gradient – Types of gradient – Design criteria of summit and valley curve – Design of vertical curves based on SSD – OSD– Night visibility considerations – Design standards for hilly roads –problems on the above. Principle – At grade and Grade separated junctions – Types – channelization – Features of channelizing Island –median opening – Gap in median at junction.

Reference Books:-

1. Khanna, S.K. & Justo, C.E.G., Highway Engineering, NemChand & Bros, Roorkee (U.A).
2. Kadiyali, L.R., Traffic Engineering & Transport Planning, Khanna Publishers, New Delhi.
3. Kadiyali, L.R. & Lal, N.B., Principles & Practices of Highway Engineering, Khanna Publishers, New Delhi.
4. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand & Co., New Delhi.
5. IRC – 37 “Guidelines for Design of flexible Pavements”, IRC, New Delhi, 2001.
6. IRC – 67 “Code of Practice for Road Signs”, IRC, New Delhi – 2001. 30
7. IRC: 58, 2002: “Guidelines for the Design of Plain Jointed Rigid Pavements for Highways”, IRC, N. Delhi, December, 2002.
8. IRC:70, 1977: “Guidelines on Regulation and Control of Mixed Traffic in Urban Areas”

9. IRC:106, 1990: “Guidelines for Capacity of Urban Roads in Plain Areas”

CEC-605(C) NEW TECHNOLOGIES FOR TRANSPORTATION ENGINEERING

UNIT-I ANALYSIS AND DESIGN OF PAVEMENT STRUCTURES Introduction , Importance and Functions of Various Components of Pavement Structures, Analysis of Stresses in Flexible and Rigid Pavements, Methods for Design of Flexible and Rigid Pavements, Design and Construction of Joints.

UNIT-II TRAFFIC ENGINEERING AND MANAGEMENT Introduction, Traffic Characteristics, Traffic Studies, Urban Travel Characteristics, Design, Operation and Control of Traffic Facilities, Techniques for Traffic Management. Road Safety. Advance topic like Road Safety, traffic forecasting etc.

UNIT-III TRANSPORT PLANNING Hierarchical Levels of Planning, General Concept and Process, Travel Demand Estimation and Forecasting, Regional Transport Planning, Trip Generation Methods, Modal Split Analysis, Behavioral Approach, Two Stage Model Split Models. Trip Distribution, Growth Factor Method, Gravity Models, Intervening Opportunity and Competing Opportunity Models, Land Use Transport Planning Models, Network Assignment.

UNIT-IV HIGHWAY CONSTRUCTION AND MAINTENANCE Sub-grade analysis and design, type of highway construction: WBM, WMM, DLC, type of bituminous construction: construction techniques and quality control, type of cement concrete construction, joints etc. highway maintenance.

UNIT-V PUBLIC TRANSPORT SYSTEM Mass Transportation Characteristics, Urban Public Transportation Planning, Terminals and their Functions, Basic Concepts for Analysis and Design of Public Transport Routes, Economic Evaluation Methods.

Reference books:-

1. Traffic Engineering and Transport Planning- L.R. Kadiyali, Khanna Publisher
2. Principles of Transportation Engineering, Chakroborti and Das, PHI Learning Pvt. Ltd
3. Highway Engineering- S.K.Khanna& C.E.G. Justo, Nem Chand and Bro.
4. Public Transportation Planning, Operation ,& Management- Gray, GE Hoel, L.A, Prentice Hall.
5. Principles & Practice of Highway Engg.- L.R. Kadiyali, Khanna Publishers

CEC-606(A) INDUSTRIAL WASTE TREATMENT

UNIT I : INTRODUCTION

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II : CLEANER PRODUCTION

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III : POLLUTION FROM MAJOR INDUSTRIES

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT IV : TREATMENT TECHNOLOGIES

Equalization – Neutralization – Removal of suspended and dissolved organic solids – Chemical oxidation – Adsorption – Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal

UNIT V : HAZARDOUS WASTE MANAGEMENT

Hazardous wastes – Physico chemical treatment – solidification – incineration – Secure land fills

REFERENCES:

- Rao M. N. & Dutta A. K. , “Wastewater Treatment”, Oxford – IBH Publication, 1995.
- Eckenfelder W.W. Jr., “Industrial Water Pollution Control”, McGraw Hill Book Company, New Delhi, 2000.
- Patwardhan. A.D., Industrial Wastewater Treatment”, Prentice Hall of India, New Delhi 2010.

CEC-606(B) IPR (INTELLECTUAL PROPERTY RIGHTS)

UNIT I Introduction;

Introduction and Justifications of IPR, Nature of IP, Major forms of IP- Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property. Major international documents relating to the protection of IP - Berne Convention, Paris Convention, TRIPS.

UNIT II Copyright;

Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, Civil, Criminal, Administrative, Registration Procedure.

UNIT III Patents;

Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI Trade Marks:

Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board. Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs. Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorized user.

UNIT V Contemporary Issues & Enforcement of IPR;

IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

References:

1. P. Narayanan, Intellectual Property Law, Eastern Law House
2. . Neeraj Pandey and Khushdeep [Dharni, Intellectual Property Rights, PHI, 2014
3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.
4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.
5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.
6. Prabuddha Ganguli, " Intellectual Property Rights" Mcgraw Hill Education, 2016.

CEC-606(C) RENEWABLE ENERGY SYSTEMS

UNIT-I Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions. Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

UNIT-II Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

UNIT-III Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes. power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

UNIT-IV Production of biomass, Classification of biomass; Physicochemical characteristics of biomass as fuel Biomass conversion routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values. Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

UNIT-V Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues..

References:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, NonConventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application