SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Syllabus of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

Course Content

VIII SEMESTER

CEA-801

Geotechnical Engineering-II

CEA-801	**Geotechnical Engineering-II**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:-

- To impart knowledge to plan and execute a detail site investigation programme, to select geotechnical design parameters and type of foundations. Also to familiarize the students for the geotechnical design of different type of foundations and other structures.

UNIT - I **10Hr**

Shallow Foundations: Type of foundations shallow and deep. Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity - Prandle, Terzaghi, Balla, Skempton, Meyerh of and Hansan. I.S. code on B.c. Determination of bearing capacity. Limits of total and differential settlements. Plate load test.

UNIT - II **9Hr**

Deep Foundation: Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae.. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons. Well foundation. Equilibrium of wells. Analysis for stability tilts and shifts, remedial measures.

UNIT - III **10Hr**

Soil Improvement Techniques: Compaction. Field and laboratory methods, Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.

Soil stabilisation: Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilisation and sabilisation by grouting. Geo-synthetics, types, functions, materials and uses.

UNIT - IV **8Hr**

Soil Exploration and Foundations on Expansive and Collapsible soils: Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them. Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

UNIT - V **10Hr**

Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications. Modes of vibration. Mass-spring analogy, Natural

frequency. Effect of vibration on soils. Vibration isolation. Criteria for design. Design of block foundation for impact type of machine.

LABORATORY WORK: Laboratory work will be based on the course of Geotech. Engg. I & II as required for soil investigations of engineering projects and not covered in the lab. Work of Geotech. Engg. I

Outcome:-

On completion of the course, the student is expected to be able to-
- Graduate will demonstrate an ability to plan and execute a detailed site investigation to select geotechnical design parameters and type of foundation.
- Graduate will demonstrate an ability to design shallow foundations, its component or process as per the needs and specifications.
- Graduate will demonstrate an ability to design combined footings and raft foundations, its component or process as per the needs and specifications.
- Graduate will demonstrate an ability to design deep foundations, its component or process as per the needs and specifications.

REFERENCE BOOKS :-

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi
2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publiscations Delhi
3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.
4. Geotech. Engg. by C.Venkatramaiah- New AGE International Publishers, Delhi
5. Found. Engg. by GALeonards McGraw Hill Book Co. Inc.
6. Relevant IS Code

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

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Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

CEA-801

Geotechnical Engineering-II

CEA-801	**Geotechnical Engineering-II**	**0L:0T:2P**	**1 credits**	**2Hrs/Week**

LIST OF EXPERIMENTS **30Hr**

1. Indian Standard Light Compaction Test/Std. Proctor Test
2. Indian Standard Heavy Compaction Test/Modified Proctor Test
3. Determination of field density by Core Cutter Method
4. Determination of field density by Sand Replacement Method
5. Determination of field density by Water Displacement Method
6. The corifiled Compression Test
7. Triaxial compression test
8. Lab. Vane Shear test
9. CBR Test
10. Demonstration of Plate Load Test SPT & DCPT

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Syllabus of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

Professional Elective-V

CEA-802 (A)
Structural Design And Drawing-II (Steel-II)

CEA-802 (A)	**Structural Design And Drawing-II (Steel-II)**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:-

• To introduce the students to limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections. To provide the students the tools necessary for designing structural systems such as roof trusses and gantry girders as per provisions of current code (IS 800 - 2007) of practice.

Unit – I **9Hr**
Plate girder bridges (Riveted and welded)

Unit – II **11Hr**
Trussed girder bridges for railways and highways (IRC & IRS holding). Bearings for bridges.

Unit – III **12Hr**
Water Tanks: Pressed steel tanks, tanks with ordinary plates, square, rectangular, circular with hemispherical bottom and conical bottom.

Unit - IV **8Hr**
Chimneys: Guyed and self-supporting steel stacks.

Unit – V **9Hr**
Bunkers, Silos & Towers

OUTCOME:
Upon completion of this course, students will be able to:
• Recognize the design philosophy of steel structures and identify the different failure modes of bolted and welded connections, and determine their design strengths
• Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria

PRACTICAL & SESSIONAL WORK:
Laboratory work will be based on the course of STEEL-II as required for The design of engineering projects.

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Syllabus of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

CEA-802 (B)
Earthquake Resistant Design of Structures

CEA-802 (B)	**Earthquake Resistant Design of Structures**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:-

- Apply seismic coefficient and response spectrum methods for analysis of multi storied buildings.
- Apply concepts of ductility in the design of multi-storeyed structures.
- Analyse a water tank structure based on latest earthquake code.
- Understand the concepts of base isolation

UNIT I **8Hr**

Seismic Strengthening of Existing Buildings: Cases Histories-Learning from earthquakes, seismic strengthening procedures.

UNIT II **10Hr**

Torsion & Rigidity: Rigid Diaphragms, Torsional moment, Center of mass and center of rigidity torsion effects. Lateral Analysis of Building Systems: Lateral load distribution with rigid floor diaphragms, moment resisting frames, shear walls, lateral stiffness of shear walls, shear wall-frame combination, examples.

UNIT III **11Hr**

Concept of Earthquake Resistant Design: Objectives of seismic design, Ductility, Hysteric response & energy dissipation, response modifications factor, design spectrum, capacity design, classification of structural system, IS code provisions for seismic design of structures, multi-storied buildings, design criteria, P-A effects, storey drift, design examples ductile detailing of RCC structures.

UNIT IV **10Hr**

Seismic Design of Special Structures: Elevated liquid storage tanks, Hydrodynamic pressure in tanks, stack like structures, IS-1893 code provisions for bridges; Superstructures, substructures, submersible bridges, dams; Hydrodynamic effect due to reservoir, concrete gravity dams.

UNIT V **8Hr**

Engineering Seismology: Basic terms, seismic waves, earthquake magnitude and intensity, ground motion, dynamic response of structures, normalized response spectra, seismic coefficients and seismic zone coefficients.

Outcome:-

Students who successfully complete this course will be able to-

- Understand the seismic coefficient and response spectrum methods for analysis of multi storied buildings.
- Understand design concepts of ductility in the design of multi-storeyed structures.
- Understand the design of water tank structure based on latest earthquake code.
- Understand the concepts of base isolation.

Reference Books:

1. Chopra A.K., Dynamics of Structures', Theory & Applications to Eqrthquake Engineering, Prentice Hall India, New Delhi-1995
2. Clough & Penzien, Dynamics of Structures , McGraw Hill Book CO. Inc.
3. Paz M, Structural Dynamics, Van Nostrand Reinhold, New York
4. Paz, M, International Handbook of Earthquake Engineering, Chapman & Hall, New York.
5. IS-1893-1984, Indian Standard Criteria for Earthquake Resistant Design of Structures, B.I.S., New Delhi.
6. IS-4326-1993, Indian Standard Code of Practice for Earthquake Resistant Design and Construction of Buildings, B.I.S., New Delhi.

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Syllabus of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

Open Core Elective-IV

CEA-803 (A)

Pavement Design

CEA-803(A)	**Pavement Design**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:-

• Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, the student will be in a position to assess quality and evaluate the serviceability conditions of pavements.

UNIT –I **12Hr**

Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

UNIT –II **10Hr**

Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory, Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

UNIT –III **9Hr**

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

UNIT –IV **9Hr**

Rigid pavement design : IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis.
PAVEMENT JOINTS: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

UNIT –V **7Hr**

Evaluation and Strengthening of Existing Pavements : Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Outcome:-

Upon completion of this course, students will be able to-
•Explain concepts and standards adopted in Planning, Design and construction of Pavements.

- Apply the knowledge of science and engineering fundamentals in designing flexible pavement. by adopting various design standards.
- Apply the standards adopted in designing rigid pavement.
- Select appropriate methods for construction and evaluation of Pavements.
- Address the problem statement in construction of pavement and to impart knowledge in stabilization techniques.

Reference Books:--

1. Principles of pavement design by E.J.Yoder & M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C.
3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Syllabus of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

Open Core Elective-IV

CEA-803 (B)

Urban Transportation Engineering

CEA-803(B)	**Urban Transportation Engineering**	**3L:0T:0P**	**3 credits**	**3Hrs/Week**

Preamble:-

•Student will understand and apply basic concepts and methods of urban transportation planning. Student will learn methods of designing, conducting and administering surveys to provide the data required for transportation planning. In addition students will understand and be able to apply travel demand modelling, project development and financing, regulations and policies, environmental related issues, land use and contemporary issues in transportation planning.

UNIT- I **10Hr**

Transportation Planning Process: Definition of Study Area; Zoning Principles; Types of Surveys: Home Interview Studies, Commercial Vehicle Surveys, Road Side Interview Methods, Public Transport Studies, Land Use Inventory; O-D Matrix and Desire Line Diagram. Accident Studies & Mass Transportation: (i)Accident Studies : Causes of accidents, accident studies and records, condition and collision diagram, preventive measures. (ii) Expressways and freeways, problems on mass transportation and remedial measures, brief study of mass transportation available in the country.

UNIT – II **12Hr**

Trip Generation: Four Stage UTP Process; Travel Demand Models; Sequential Models and Direct Demand Models; Factors affecting Travel Demand; Trip Generation; Multiple Regression Analysis; Category Analysis; Aggregate and Disaggregate Models. TRIP Distribution: Trip Distribution Models- Growth Factor Models: Uniform Growth Factor, Average Growth Factor, Fratar Method and Furness Method; Limitations of Growth factor Models; Gravity Model – Calibration of Gravity Model.; Opportunity Models. Traffic Assignment: Purpose of Traffic Assignment; Assignment Techniques-All-or-Nothing Assignment, Multiple Route Assignment, Capacity restraint assignment; Use of Diversion Curves in Assignment.

UNIT –III **10Hr**

Mode Split: Factors affecting Mode Split; Pre–distribution Mode Split; Post Distribution Mode Split; Advantages and Disadvantages; Probit, Logit and Discriminant Analysis in Mode Split. Land use and transportation system: Urban system components, Concept and definitions, criteria for measuring and comparing urban structure, land use and transportation.

UNIT – IV **12Hr**

Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads. Flexible Pavements Design: Component parts of the

pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory ,Burmister's two layered theory, methods of design, Group Index method, CBR method, IRC method, AASHTO method, Burmister's method and North Dakota cone method. Applications of pavement design software.

UNIT –V **10Hr**

Rigid Pavements: Evaluation of sub grade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions. Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and expressways as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design.

Outcome:-

Students who successfully complete this course will be able to-

- Design, conduct and administer surveys to provide the data required for transportation planning. [
- Learn and understand zonal demand generation and attraction regression models.
- Understand transportation project planning and development.
- Knowledge on principles of planning, surveys and analysis. in developing an urban area.
- Knowledge on development of regional, master plan and norms for development of smart cities.
- Planning of standards, implanting and financing of Urban projects.

Reference Books:-

1.Adib Kanafani.(1983). Transportation Demand Analysis. Mc Graw Hill Series in Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.
3. John W.Dickey. (1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.
4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.
5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.
6. Yoder and Witczak, Priniciples of Pavement Design, John Wiley and Sons
7. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
8. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)
9. W.Ronald Hudson, Ralph Haas and Zeniswki , Modern Pavement Management, Mc Graw Hill and Co Academic Session 2016-17
10. Relevant IRC Codes
11. Bruton M J (1981), "Introduction to transportation planning", Hutchinson of London
12. Dickey J W(1980), "Metropolitan Transportation Planning", Tata McGraw Hill
13. Principles of Transportation Engineering : P. Chakraborty and A. Das
14. Fundamentals of Transportation Engineering: : C.S. Papacoastas
15. Traffic Engineering and Transport Planning: : L.R. Kadyal

SCHOOL OF ENGINEERING

SRI SATYA SAI UNIVERSITY OF TECHNOLOGY AND MEDICAL SCIENCES

Syllabus of Examination - AICTE Pattern

Undergraduate Degree Courses in Engineering & Technology

Department of Civil Engineering

CEA-804

Major Project-II

CEA 804	**Major Projects-II**	**0L:0T:16P**	**8 credits**	**16Hrs/Week**

Preamble:-

The object of Major project II or dissertation is to enable the student to extend further the investigative study taken up under civil engineering projects, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under civil engineering construction projects.
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee.