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<th>1.1.3 Average percentage of courses having focus on employability/entrepreneurship/skill development during the last five years (10)</th>
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<td>1.2.1 Percentage of new courses introduced of the total number of courses across all programmes offered during the last five years (30)</td>
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OFFICE OF THE REGISTRAR  
ACADEMIC SECTION  
A.M.U. ALIGARH  

No. Acad/D-810/Hz  
Dated: 25-07-2015  

NOTICE  

A Special Meeting of the Board of Studies of Department of Civil Engineering will be held on 06.08.2015 at 02:30 p.m. in the Conference Hall of the Department of Civil Engineering.  

Members are requested kindly to make it convenient to attend the meeting.  

AGENDA  

01. To approve the modification in the Guide to Admission from the academic session 2016-17 for admission to M.Tech. in Civil Engineering Programme.  

02. To approve the course structure of M.Tech. in Civil Engineering (Geotechnical)  

03. To accord the approval for organizing the Workshops, Seminars, Conferences and Training Programmes etc. during the academic session 2015-16.  

(Dr. Shah Mohammad Haris)  
Assistant Registrar  
(Academic)  

DISTRIBUTIONS:  
01. Dean, Faculty of Engineering & Technology  
02. Chairman, Department of Civil Engineering  
03. All members of the Board of Studies through the Chairman  
04. P.S. to Registrar.  

BOS-02/HZ
Department of Civil Engineering  
A.M.U. Aligarh

Dated: 08.08.2015

MINUTES

The Special Meeting of the Board of Studies of the Department of Civil Engineering, Z.H. College of Engg. & Technology, AMU held on 06.08.2015 at 02:30 P.M. in the Conference Room of the Department.

The following were present:

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<tr>
<th>S. No.</th>
<th>Name</th>
<th>Designation</th>
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<tr>
<td>1</td>
<td>Prof. Mohammed Arif</td>
<td>Professor &amp; Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Prof. Raisuddin Ansari</td>
<td>Professor (Assigned Member)</td>
</tr>
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<td>3</td>
<td>Prof. M. M. Ashhar</td>
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<td>4</td>
<td>Prof. Sarfaraz Ali Ansari</td>
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<td>Prof. Mohammad Muzzammil</td>
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<td>6</td>
<td>Prof. Abdul Baqi</td>
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<tr>
<td>7</td>
<td>Prof. I. H. Farooqui</td>
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<td>8</td>
<td>Prof. Shakeel Ahmad</td>
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<td>9</td>
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<td>10</td>
<td>Prof. Mohd. Athar</td>
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<td>11</td>
<td>Prof. Sabih Akhtar</td>
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<td>Prof. Talib Mansoor</td>
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<td>13</td>
<td>Prof. Arshad Umar</td>
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<td>14</td>
<td>Prof. Rehan Ahmad Khan</td>
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<td>Prof. Anwar Khursheed</td>
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<td>Prof. Kausar Ali</td>
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<td>Prof. Tazyeen Ahmad</td>
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<td>18</td>
<td>Prof. Asif Ali Siddiqui</td>
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<td>19</td>
<td>Mr. Syed Ashraf Ali</td>
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<td>26</td>
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<td>30</td>
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<tr>
<td>36</td>
<td>Dr. M. Rehan Sadique</td>
<td>Assistant Professor</td>
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The following decisions were taken:

ITEM No. 1:

Modifications in the Guide to Admission for admission to M.Tech in Civil Engineering Programme from the academic session 2016-17 were discussed and approved. (Annexure-I).

ITEM No. 2:

Discussed and approved the course structure of M.Tech. in Civil Engineering (Geotechnical) (Annexure-II).

ITEM No. 3:

The Board unanimously authorized the Chairman for organizing the Workshops, Seminars, Conferences and Training Programmes etc. during the academic year 2015-16 in consultation with Section Incharges and members of concerned section.

The meeting came to an end with a vote of thanks.

(Prof. Mohammed Arif)
Chairman

08.08.15
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## Programme Cores

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**Course Assessment Method**

1. Assignments and Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

**Course Objective**

1. To familiarise the students with different load and field conditions.
2. To decide the type of foundation for a specific project.
3. To evaluate the pile group capacity and settlement.
4. To deal with problematic soils.

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:

1. Understanding the bearing capacity of the soil under different field conditions.
2. Evaluate the importance of raft foundation and principles of design for buildings.
3. Analyse and design of pile foundations.
4. Overcome the problems faced by foundations in expansive soils.

**Topics Covered**

**Unit 1  Design Principles of Foundations**

Factors considered in foundation design; Total and differential settlements; Load calculation on footings; Proportioning and design of different types of footings; Methods of estimating bearing capacity.

**Unit 2  Design of Shallow Foundations:**

Eccentrically loaded foundations; Meyerhof’s useful width concept; Foundations on layered soils, landfill sites, near or on slopes, permafrost. Influence of adjacent footing. Design of raft foundation.

**Unit 3  Deep Foundations:**

Necessity of pile group. Load carrying capacity of pile groups in cohesive and cohesionless soils-shear and settlement criteria. Pile Loading test. Introduction to well foundation.

**Unit 4  Foundations in Expansive Soil:**

Properties of expansive soil. Providing foundations in expansive soil. Design and construction of under reamed pile foundation as per IS: 2911 (Part 3).

**Text Books / Reference Materials**

5. IS 2911 (Part 1-5), Bureau of Indian Standards for Pile Foundations.

**Additional Learning Source**

1. Web links to e-learning: nptel
2. L.C. Reese, Single piles and pile groups under lateral loading, Taylor & Francis, 2000
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<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
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**Course Assessment Method**

1. Assignments and Quizzes (15%)
2. Mid-Semester Examination (25%) - 1 Hour
3. End Semester Examination (60%) - 2 Hour

**Course Objective**

1. To understand lateral earth pressure theories for analysis and design of earth retaining structures.
2. To understand the stability analysis and design of retaining wall.
3. To design sheet pile wall anchored bulkheads by different methods.
4. To understand pressure envelops and design of various components in braced cuts, cofferdams and earth dams.

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:

1. Determine the earth pressures on retaining structures.
2. Compute stability of slopes and earthen embankment in the presence of ground water seepage and earthquake forces
3. Understand the design concepts of flexible and rigid earth retaining structures.
4. Design retaining walls, anchored bulkheads, braced cuts, cofferdams and earth embankments.

**Topics Covered**

**Unit 1 Earth Pressure**

Basic concepts, Rankine and Coulomb earth pressure theories, Graphical methods, Fundamental relationships between the lateral pressures and the strain with a back fill, Consideration of surcharge, earthquake, stratification, saturated and partially saturated backfills. Effect of wall friction and adhesion.

**Unit 2 Retaining wall**

Uses, types, materials and methods of construction of retaining wall, Forces acting on retaining wall, Stability analysis and design aspects, Application of theory of elasticity in analysis of earth pressure distribution, settlement and tilting.

**Unit 3 Sheet Pile wall**

Types, materials used in construction, Free earth and fixed earth system, Selection of soil parameters, Analysis and design of cantilever and anchored sheet pile walls, Dead man and continuous anchors, Diaphragm and bored pile walls

**Unit 4 Braced excavations and earth dam**

Lateral pressure distribution in sands and clays, Braced cuts and cellular cofferdams, Earth pressure against bracings in cuts, Heave of the bottom of cut in soft clays, Soil arching and open cuts, Recent advances in earth retaining structures, Embankment construction materials and construction, Slope protection, Grouting techniques.

**Text Books / Reference Materials**


**Additional Learning Source**

1. Web links to e-learning: [nptel], Swayam portal
### Course Details

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<tr>
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<td>7</td>
</tr>
</tbody>
</table>

#### Course Assessment Method
1. Assignments and Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

#### Course Objective
1. To familiarize with the vibration theory and the various terminologies to study the behavior of soil due to the effects of dynamic loads.
2. To understand the soil behavior under dynamic and cyclic loading, the nature of wave propagation through soil and liquefaction.
3. To study the dynamic soil properties and determination by field and laboratory tests and familiarize with general principles of analysis and design of machine foundation.
4. To understand the soil structure interaction under dynamic load conditions and guidelines of design codes.

#### Course Outcomes
Upon successful completion of this course, it is expected that students will be able to:
1. Understand the vibration theory.
2. Understand the soil properties and suitable remedial measures to improve their behavior.
3. Design of foundation and retaining structures under dynamic loads.
4. Analyze different geotechnical structures using Mass-Spring Dashpot models.
5. Understand about the importance of designing machine foundation for reciprocating and impact machines.

#### Topics Covered

**Unit 1 Theory of Vibration**
- Introduction, Nature of dynamic loads, Vibration of elementary systems, Degrees of freedom (SDOF and MDOF systems), Equation of motion for SDOF system, Types of vibrations, Earthquake excitation, Free and forced vibration under damped and undamped cases, Critical damping, Decay of motion, Constant force and rotating mass oscillators, Dynamic magnification factor, Transmissibility ratio, Arbitrary, impact and other types of forced vibrations, Duhamel’s integral, Vibration isolation, Vibration measuring instruments.

**Unit 2 Soil Behaviour under Dynamic and Cyclic Loading**
- Elastic response of continua, Wave equation, Response of non-plastic and plastic soils under cyclic loading, Stress-strain models (elastic, visco-elastic, nonlinear elastic, plasticity), Stresses in soil element, Stress-strain behavior of cyclically loaded soils, Liquefaction, Simplified procedure for liquefaction estimation and remediation.

**Unit 3 Dynamic Soil Properties and design of machine foundation**
- Determination of dynamic soil properties, Field tests, Laboratory tests, Estimation of shear modulus, Damping ratio, Linear, ranges and applications of dynamic soil tests, Cyclic plate load test, Factor of safety, Cyclic stress ratio, Cyclic resistance ratio, Correlations with SPT, CPT, SASW test values. Design criteria for machine foundation, Foundation for reciprocating machines, Block foundation.

**Unit 4 Dynamic Soil Structure Interaction**
- Dynamic earth pressures, Force and displacement based analysis, Pseudo-static and pseudo-dynamic analysis, Guidelines of design codes, Dynamic analyses of various geotechnical structures like retaining wall, Soil slope, Railway subgrade and ballast using MSD model.

#### Text Books / Reference Materials

#### Additional Learning Source
1. Web links to e-learning: npTEL, Swayam portal
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Pre-Requisites</th>
<th>Course Type</th>
<th>Credit Hours</th>
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<td>Ground Improvement and Geosynthetics</td>
<td>PC NIL Theory</td>
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</table>

**Course Assessment Method**

1. Assignments and Quizzes (15%)
2. Mid-Semester Examination (25%) - 1 Hour
3. End Semester Examination (60%) - 2 Hour

**Course Objective**

1. To inculcate the basic knowledge of problems in week soil and its appropriate engineering solution.
2. To learn basic concepts and applications of ground improvement methods.
3. To evaluate the different properties of geosynthetics including through laboratory tests.
4. To analyze the functions of geosynthetic and its suitability for different civil works.

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:

1. Recognize the problems regarding use of week soil and apply soil mechanics principles to obtain the solution of geotechnical engineering problems.
2. Understand the various in-situ methods and their significance for different ground improvement techniques, applicable to different soil type.
3. Understand the manufacturing processes of different geosynthetics and their functions.
4. Compute different properties of geosynthetics and their use in civil works.

**Topics Covered**

**Unit 1** Stabilization by admixtures

- Introduction - Scope and necessity of ground improvement in Geotechnical engineering - basic concepts and philosophy.

**Unit 2** In situ soil treatment methods

- Drainage- Ground Water lowering by well points deep wells, vacuum and electro-osmotic methods.
- Soil nailing, rock anchoring, micro-piles, design methods, construction techniques, case studies of ground improvement projects.

**Unit 3** Manufacture and Functions

- Historical Development; Materials used; Types of Geosynthetics (Geotextiles; Geogrids; Geonets; Geomembranes; Geocomposites) and manufacturing methods. Functions of geosynthetics (Reinforcement; Separation; Filtration; Drainage; Barrier).

**UNIT 4** Properties and Applications

- Physical properties (Mass per unit area; Thickness; Specific gravity); Hydraulic Properties (Apparent opening size; Permittivity; Transmissivity); Mechanical Properties (Uniaxial Tensile Strength; Burst and Puncture Strength); Soil Geosynthetic friction tests; Durability : Abrasion resistance – Ultraviolet resistance. Use of geosynthetics in Civil Engg. works

**Text Books / Reference Materials**

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
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<th>Pre-requisites</th>
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<td>Geotechnical Engineering</td>
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</table>

Course Assessment Method
1. Course Work (60%)
2. End Semester Examination (40%)

Course Objective
1. To develop an understanding of the relationship between strength and deformation characteristics of soils and to comprehend experimental measurement of the physical and mechanical properties of soil and rock commonly used in engineering practice.
2. To develop geotechnical report writing and data presentation skills.

Course Outcomes
Upon successful completion of this course, it is expected that students will be able to:
1. Understand the significance of the properties of soils, and also the experimental methods used to measure them.
2. Understand both the applications and limits of engineering methods commonly used to solve soil mechanics problems in Civil Engineering.
3. Develop improved design methodologies in the area of geotechnical engineering.
4. Recognize the importance of good written communication skills, and know how to write professional, concise technical reports and letters to clients and colleagues.
5. Understand the suitability of rock as a structural member and foundation/subgrade material.

List of Experiments
1. Relative Density Test
2. Swelling Index Test
3. Direct Shear and Triaxial Shear Strength Tests
4. Consolidation Test
5. Plate Load Test
6. Vane Shear Test
7. Standard Penetration and Dynamic Cone Penetration Tests
8. Point Load Index of rock specimen
9. Tensile and compressive strength tests of rock samples
10. Tests for characterization of pavement materials

Text Books/Reference Materials

Additional Learning Source
1. Web links to e-learning: nptel
2. Virtual Laboratory: http://www.vlab.co.in/
### Course Assessment Method
1. Class Work (60%)
2. End Semester Examination (40%)

### Course Objective
1. To prepare students for geotechnical report writing skills using advanced features of MS office.
2. To develop the software skills in students for analysis, design, simulation and modeling of geotechnical engineering problems.

### Course Outcomes
Upon successful completion of this course, it is expected that students will be able to:
1. Prepare the reports related to geotechnical engineering works.
2. Recognise advance features of MS office for preparing geotechnical reports.
3. Develop insight for modelling, analysis and design of geotechnical engineering problems.
4. Apply the knowledge of geotechnical Software (GEO Studio, GEO5, OptumG2, etc) for modeling, analysis and design.

### List of Experiments
1. Preparation of Index, references and charts /graph using MS Office
2. Introduction to programming in MS Excel
3. Introduction to basics of Geo Studio
4. Slope stability analysis using Geo Studio
5. Modeling and simulation of Soil-structure interaction problems using software (GEO5, OptumG2 etc.)
6. Analysis and design of geotechnical engineering problems using software (GEO5, OptumG2 etc.)

### Text Books / Reference Materials

### Additional Learning Source
1. Web links to e-learning: nptel
2. Video lectures at https://www.youtube.com/channel/UCTK_crr8Pt94p4R0_10d8Ug
3. Video lectures at https://www.youtube.com/user/GEO5 software
4. Virtual Laboratory: http://www.vlab.co.in/

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<td>Computational Lab</td>
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<td>Department</td>
<td>Course No.</td>
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<td>Civil Engineering</td>
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<td>Project</td>
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<td>NIL</td>
<td>Lab</td>
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**Course Assessment Method**

1. Class Work (60%)
2. End-Semester Exam (40%)

**Course Objective**

1. To utilize the expertise in geotechnical engineering to solve industry’s geotechnical issues.
2. To become innovative and professional in technology development using softwares.
3. To prepare professional reports for designing projects and data presentation skills.
4. To understand, interpret and properly apply project results for design of civil infrastructures.

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:

1. Design and conduct experiments to determine index properties of founding ground and to analyze and interpret data so obtained.
2. Design a foundation system and their components to meet desired needs within realistic, economic, environmental constraints.
3. Identify, formulate and solve problems by interacting with other streams of civil engineering to manage geotechnical issues and to write professional and concise technical reports.
4. Use techniques, skills, modern engineering tools necessary for engineering practice within ethical and professional responsibility.

**Topics**

The project work will be carried out in the following major subject areas:

1. Foundation Design
2. Highway Engineering
3. Ground Improvement
4. Rock Material and Rock Mass Characterization
5. Slope Stability
6. Underground Space Excavation and Stability
7. Numerical Modeling

**Text Books/Reference Materials**


**Additional Learning Source**

1. Journals related to Geotechnical Engineering
## Programme Electives

<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Pre-Requisites</th>
<th>Course Type</th>
<th>Credit Hours</th>
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<tr>
<td>Civil Engineering</td>
<td>CEE-6540</td>
<td>Advanced Rock Engineering</td>
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<td>None</td>
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</table>

### Course Assessment Method

1. Assignments and Oral Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

### Course Objective

Advanced Rock Engineering has been designed to give knowledge of civil engineering issues in construction and safety of slopes, underground excavations, tunnels and foundation of structures especially dams in rocky terrains and to:

1. Impart knowledge of mechanical behaviour of intact rock and rock mass.
2. Make understand problems encountered in rock mass due to the geological features.
3. Develop idea of rock slope failure and their stability analysis.
4. Use available codes and standards in design of underground excavations, rock foundations and tunnel support systems.

### Course Outcomes

Upon successful completion of this course, the students will be able to:

1. Understand engineering behaviour and testing procedures for rocks as constructional material and rock masses as founding ground.
2. Adopt pertinent exploration techniques and analyze different geotechnical issues in rock engineering.
3. Identify and predict behavior of founding ground due to loading, unloading and residual stresses and accordingly build necessary database for design and construction.
4. Produce technical reports and database for effective communication amongst stakeholders to comprehend and manage the problems of rock engineering.

### Topics Covered

**Unit 1 Rock and Rock Mass Properties:** Classification of rocks and rock masses, Deformation Structures, Quantitative Description of Discontinuities in Rock Masses, Engineering Classification of Rock Masses, Terzaghi Rock Load Theory, RQD, RMR, RMQ and GSI.

**Unit 2 Strength Behaviour of Rocks:** Compression, Tension and Shear strength of rocks, Stress-Strain relationships, Static - Elastic constants of rocks, Failure Criterion: Coulomb’s, Mohr’s, Griffith theory of brittle strength and other strength criteria. Residual Stresses.


**Unit 4 Foundations on Rocks:** Requirements for satisfactory performance of foundations on rocks, Effect of structural planes on rock foundations, Possible modes of failure of foundations on rock masses, Field tests and determination of Bearing capacity for rock foundations, Foundation of Dams, Pile Foundation on rock mass.

### Text Books / Reference Materials


### Additional Learning Source

1. NPTEL
2. MOOC Courses
3. Websites related to Mega Engineering Projects
<table>
<thead>
<tr>
<th>Department</th>
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<th>Course Type</th>
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<th>Contact Hours</th>
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<td>Civil Engineering</td>
<td>CEE-6570</td>
<td>Pavement Analysis and Design</td>
<td>PE NIL Theory</td>
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</table>

**Course Assessment Method**

1. Assignments and Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

**Course Objective**

1. To describe pavements design objectives, constraints and controlling factors.
2. To make students understand successful design procedure of flexible and rigid pavements, Aircraft runways and F1-race tracks including traffic data, material properties and other environmental factors.
3. To describe the various defects and their remedial measures in pavement.

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:

1. Understand the basic concepts of pavement design by applying fundamental concepts of Mathematics and Laws of Mechanics.
2. Proposes a feasible solution to fundamental highway engineering analysis/design problems.
3. Apply condition monitoring and maintenance of road pavements.
4. Develop technical skills for road pavement construction.
5. Design flexible and rigid pavements, aircraft runway and F1/car race tracks.
6. Develop the understanding of various standards (BIS, IRC & ISO) for pavements design and maintenance.

**Topics Covered**

**Unit 1 General Consideration**

Types of pavement, Approaches to pavement design, vehicle and traffic considerations, behaviour of road materials under repeated loading, stresses and deflections in layered system, IRC design guidelines for flexible pavements, Comparison of flexible and rigid pavements highway and airport pavement.

**Unit 2 Design Method of Rigid Pavements**

Analysis of stresses in concrete pavements due to various wheel loads, IRC design guidelines for rigid pavements, Design of distributed steel reinforcement, design of dowels and tie bars, Design of spacing of joints. Introduction to pavement modeling.

**Unit 3 Pavement Evaluation and Strengthening**

Method of pavement evaluation, Pavements Performance: Evaluation of performance of the flexible and rigid pavements, IRC guidelines Design of various types of overlays for flexible and rigid pavements, pavement maintenance, Pavement for sustainable development, Recycling of pavement.

**Unit 4 Advanced Pavements**

Considerations for the design of: aircraft runways and taxiway pavements, Formula-1/car racetracks.

**Text Books/Reference Materials**


**Additional Learning Source**

2. Web links to e-learning : npTEL
<table>
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<tr>
<th>Department</th>
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<th>Course Designation</th>
<th>Pre-Requisites</th>
<th>Course Type</th>
<th>Credit Hours</th>
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<td>Civil Engineering</td>
<td>CEE-6320</td>
<td>Earth and Rockfill Dams</td>
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<td>Theory</td>
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</table>

**Course Assessment Method**

1. Assignments and Quizes (15%)
2. Mid-Semester Examination (25%) - 1 Hour
3. End Semester Examination (60%) - 2 Hour

**Course Objective**

The course is aimed to train the students in planning and designing of earth and rockfill dams and inculcate the knowledge of construction, maintenance and safety of these dams.

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:
1. Plan and design earthen dams and adopt suitable measures for its safety.
2. Assess the seepage discharge and adopt suitable measures for its control.
3. Plan and design rockfill dams and adopt suitable measures for its safety.
4. Adopt appropriate methods of river diversion, monitor quality control during and after construction using proper instrumentation.

**Topics Covered**

Unit 1 Basic design aspects, Classification of embankment dams, Criteria for safe design, Free board, Upstream and downstream slope protection, Cracking of earth dams, Hydraulic fracturing, Causes of cracking, Preventive and remedial measures.

Unit 2 Seepage theory, Determination of free surface and seepage discharge through dams for isotropic as well as anisotropic soils. Flow net for earth dam under steady seepage condition, Various methods of seepage control, Selection of core materials, Drainage of embankments, Design of transition filters, Use of geo-textiles.

Unit 3 General characteristics of Rock fill dams, Materials for rock fill dams, testing of rockfill material, Design of dam section, Types of membrane, Rock fill placement, Deformation of rock fill dams, Flow through and over rockfill dam, Concrete faced rockfill dam.

Unit 4 Stability analysis, Method of slices, Graphical method, Foundation exploration for Earth and Rock fill dams, Treatment of foundations, Quality control and instrumentation, River diversion during construction of dam.

**Text Books / Reference Materials**


**Additional Learning Source**

1. Web links to e-learning: [npTEL](#)
<table>
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<tr>
<th>Department</th>
<th>Course No.</th>
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<tr>
<td>Civil Engineering</td>
<td>CEE-6040</td>
<td>Finite Element Analysis</td>
<td>PE NIL Theory 4</td>
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**Course Assessment Method**

1. Assignments and Oral Quizzes (15%)
2. Mid-Semester Examination (25%)- 1 Hour
3. End Semester Examination (60%)- 2 Hour

**Course Objective**

1. To provide the fundamental concepts in the theory of finite element analysis.
2. To analyze problems related to bar, truss, beam and plane elements using finite element approach.
3. To develop basic understanding in modeling considerations related to finite element programming

**Course Outcomes**

Upon successful completion of this course, it is expected that students will be able to:

1. Understand the basic concepts, significance and application of finite element analysis.
3. Recognize the difference between conventional and FE method of analysis.

**Topics Covered**

**Unit 1 Introduction**

Finite element method and other classical methods, historical background, advantages & disadvantages, finite element modeling – discretisation, nodes, elements types and shapes.

Basic equations in elasticity –stress and strain vectors, Hooke’s law, strain-displacement relationship, equilibrium equations, generalized compatibility equations.

**Unit 2 Finite element analysis of one dimensional problem**

Generation of stiffness matrix by displacement and energy method, energy and variational approaches (Rayleigh-Ritz method), numerical solutions.

**Unit 3 Isoparametric elements and shape functions**

Co-ordinate systems, Element shapes, Strain displacement matrix, Higher order elements: 1D, 2D and 3D.

**Unit 4. Finite element analysis of two dimensional problems**

Symmetry, Plane stress and plane strain problems, Bending of thin plates, Introduction to nonlinear FE analysis.

**Text Books / Reference Materials**


**Additional Learning Source**

NOTICE

An Ordinary Meeting of the Board of Studies of the Department of Civil Engineering will be held on 20.05.2017 at 03:00 p.m. in the Conference Hall of the Department of Civil Engg. Members are requested kindly to make it convenient to attend the meeting.

AGENDA

01. Confirmation of the minutes of the Ordinary Meeting of the Board of Studies held on 28.05.2016 and special meetings held on 22.09.2016, 31.12.2016 and 01.04.2017.

02. To approve the teaching load for B.Tech. (Civil), B.E. (Civil) and M.Tech. in Civil Engg. (Structural Engg., Hydraulics Engg., Environmental Engg. and Geotechnical Engg.) courses for the session 2017-18.

03. To approve the list of Moderators for the session 2017-18 for B.Tech. (Civil), B.E. (Civil) and M.Tech. in Civil Engg. (Structural Engg., Hydraulics Structures, Environmental Engg. and Geotechnical Engg.) courses.

04. To approve the list of examiners for B.Tech. (Civil), B.E. (Civil) and M.Tech. in Civil Engg. (Structural Engg., Hydraulics Structures, Environmental Engg. and Geotechnical Engg.) courses for the session 2017-18.

05. To approve the revised course structure of B.Tech. (Civil) w.e.f. the session 2017-18.

06. To approve the minor changes in syllabus of M.Tech. Environmental Engg & Hydraulic Structures.

07. To recommend the cancellation of the Ph.D. Admission of Mr. Shahzad Anwar, Faculty No. 15 PHD CED 054, En. No. GB 0409 in the light of his prolonged absence from the Department.

08. To approve the change of M.Tech. Dissertation topic of Mr. Vijay Kumar Paurush, F.No. 15CHEM013, En. No. GG-2539.


09. To approve the change of M.Tech. Dissertation topic of Mr. Anand Madhukar, F.No. 15CEEM024, En. No. CC-5018.

Old Topic: An Environmentally Sustainable Solid Waste Management Plan for Aligarh to be a Smart City.
New Topic: An Efficient and Sustainable Solid Waste Management System for Aligarh City under the Smart City Perspective.

Any other item(s) by the permission of the Chair.

(S. RUHUL KABIR)
Assistant Registrar (Academic)

DISTRIBUTION:
01. Dean, Faculty of Engineering & Technology
02. Chairperson, Department of Civil Engineering
03. All members of the Board of Studies through the Chairperson
04. P.S. to Registrar.
Department of Civil Engineering
A.M.U. Aligarh

May 31, 2017

MINUTES

of the Ordinary Meeting of the Board of Studies of the Department of Civil Engineering, Z.H. College of Engineering & Technology, AMU held on Saturday, 20th May 2017, at 03:00 p.m. in the Conference Room of the Department.

The following were present:

1. Prof. Mohammad Muzzammi - in the Chair
2. Prof. S.Q.A. Naqvi – Co-opted member
3. Prof. M.M. Ashhar
4. Prof. Sarfaraz Ali Ansari
5. Prof. Mohammed Arif
6. Prof. Abdul Baqi
7. Prof. I. H. Farooqui
8. Prof. Amjad Masood
9. Prof. Javed Alam
10. Prof. Mubeen Beg
11. Prof. M. Masroor Alam
12. Prof. Hassan Irtaza
13. Prof. Sabih Akhtar
14. Prof. Mujib Ahmad Ansari
15. Prof. Iqbal Khaleel Khan
16. Prof. Mehboob Anwer Khan
17. Prof. Arshad Umar
18. Prof. Malik Shoeb Ahmad
19. Prof. Rehan A. Khan
20. Prof. Kausar Ali
21. Prof. Tazyeen Ahmad
22. Prof. Asif Ali Siddiqui
23. Prof. Nadeem Khalil
24. Mr. Syed Ashraf Ali
25. Dr. M. Shamsuddin Jafri
26. Dr. Sohail Ayub
27. Dr. Syed Danish Hasan
28. Dr. Saif Saad
29. Dr. Mohd. Moonis Zaheer
30. Dr. Mohd. Shariq
31. Dr. Farrukh Basheer
32. Dr. Ajmal Hussain
33. Dr. M. Arsalan Khan
34. Dr. Syed Muhammad Ibrahim
35. Dr. M. Rehan Sadique
36. Mr. Sabahat Ali Khan
37. Mr. Zaid Mohammad
38. Mr. Md. Fozail Ahmad
39. Mr. Saifullah Khan
40. Mr. Naved

The following decisions were taken.

The Board welcomed Dr. Syed Mohammad Ibrahim as the member of the board.

Item No.1:
Confirmed the minutes of the ordinary meeting of the Board of Studies held on 28.05.2016 and special meetings held on 22.09.2016, 31.12.2016 and 01.04.2017.

Item No.2:
The teaching Load of B. Tech (Civil), B.E. (Civil) & M. Tech. (Civil) (Structural Engineering, Hydraulic Structures, Environmental Engineering, & Geotechnical Engineering) of the Department for the session 2017-18 was approved. The board also authorized the Chairperson for making minor changes, if required. (Annexure-I).

Item No.3:
The Moderators for B. Tech (Civil), B.E (Civil) & M. Tech (Civil) (Structural Engineering, Hydraulic Structures, Environmental Engineering, & Geotechnical Engineering) of the Department for the session 2017-18 were approved. The board also authorized the Chairperson for making minor changes, if required (Annexure-II- Confidential: Not for Circulation)

Item No.4:
The list of Examiners for B. tech. (Civil), B.E (Civil) and M. Tech. Civil (Structural Engg., Hydraulics Structures, Environmental Engg. and Geotechnical Engg.) courses for the session 2017-18 was approved. The Chairperson was authorized to incorporate changes in the list, if required. (Annexure-III- Confidential: Not for Circulation)
No. 5: The revised course structure of B.Tech. (Civil) was approved to be implemented w.e.f. the session 2017-18 (Annexure - IV).


No. 7: Ph.D. Admission of Mr. Shahzad Anwar, Faculty No. 15 PHD CED 054, En.No. GB 0409 was discussed in the meeting. In connection a letter was issued by the Supervisor through e-mail dated 15th August 2016 for his long absence then and he made a reply through e-mail dated 19th September 2016. The matter was put up in the Board of Studies meeting held on 01.04.2017. The board decided to issue a show-cause letter. A show-cause letter was issued to him vide No. 968/CED dated 07.04.2017. After a longed discussion under these circumstances and in light of his reply of show cause notice (copies enclosed), the Board recommended the cancellation of his admission to CASR. (Annexure - VI).

No. 8: The change in the M.Tech. Dissertation topic of Mr. Vijay Kumar Paurush, F.No. 15CHEM013, En.No.GG2539 was approved.

I Topic: Sediment Transport

No. 9: The item was withdrawn as per the request of the Supervisor.

v. Other Item
(i) The Board approved the suggestion of Prof. Amjad Masood and Prof. Tahassum Naqvi that the Department of Architecture should revise the content of the following design courses and curriculum as per their requirement with specific orientation of Architecture and give the numbers to these courses in AR series.
   Design of Concrete Structure (CE-311) – V Semester
   Design of Steel Structures (CE-318) – IV Semester

(ii) The board approved syllabus of CE-112 (Course Title: Structural Mechanics - I) was approved to be implemented w.e.f. 2017-18 (Annexure - VII).

(iii) The board approved that Soil Mechanics Section may be renamed as Geo-technical Engineering Section.

(iv) The board discussed and approved that the course CE-631 (Soil Engineering) should be included in the list of electives of M.Tech. (Structural Engineering) w.e.f. the session 2017-18.

(v) The board discussed and approved that the course CE-791G (Advanced Geotechnical and Software Lab.) in M.Tech. (Geotechnical Engg.) should be changed to CE-791G (Lab./Project) w.e.f. the session 2017-18.

(vi) The board discussed and approved that the course CE-635 (Rock Engineering) in M.Tech. (Geotechnical Engg.) should be changed to CE-635 (Advanced Rock Engineering) w.e.f. the session 2017-18.

(vii) The board discussed and approved that title of the course CE-427 (Geo-Engineering of Rock & Rock Masses) in B.Tech. (Civil Engg.) should be changed to CE-427 (Rock Engineering) w.e.f. the session 2017-18.

(viii) The Moderators for Ph.D. (Civil) (Structural Engineering, Hydraulic Structures, Environmental Engineering, & Geotechnical Engineering) of the Department for the session 2017-18 were approved as under. The board also authorized the Chairperson for making minor changes, if required.

Moderators for Ph.D. for the session 2017-18
1. Prof. Amjad Masood
2. Prof. Javed Alam
3. Prof. M. Mastroor Alam
4. Prof. Hassan Irtaza

(Prof. Mohammad Muzzammil)
Chairperson

Chairperson
Civil Engg. Deptt.
A.M.U., Aligarh

[Signature]
<table>
<thead>
<tr>
<th>Department</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Course Designation</th>
<th>Pre-Requisites</th>
<th>Course Type</th>
<th>Credit Hours</th>
<th>Contact Hours</th>
<th>Total Contact Hours</th>
</tr>
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<tbody>
<tr>
<td>Civil Engineering</td>
<td>CEA1120</td>
<td>Structural Mechanics-I</td>
<td>ESA</td>
<td>None</td>
<td>Theory</td>
<td>3</td>
<td>2 1 0</td>
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**Assessment Method**

- Assignments (15%)
- 1st Semester Examination (25%) - 1 Hour
- 2nd Semester Examination (60%) - 3 Hour

**Objective**

- Develop an appreciation of forces, stresses and strains on normal and inclined planes, principal stress and principal strains.
- Develop basic understanding of various types of stress conditions viz. shear, bending and torsion in structural members.
- Develop understanding of basic principles and methods of structural analysis and its application to determinate structures.

**Outcomes**

- Successfully completion of this course, it is expected that students will be able to:
  - Develop basic concepts of forces acting on simple structural elements and also the concept of combined stresses (2D stress state) in materials used in Civil Engineering.
  - Understand the behavior of simple structural elements under shear, bending and torsion.
  - Understand the fundamental principles used for the analysis of the determinate structures.
  - Analyse determinate arches and trusses.

**Topics Covered**

1. Analysis of stress and strain: Mechanical properties, analysis of simple state of stress and strains, elastic constants, example of state of tension, compression and shear. Analysis of two dimensional stresses and strains, Principal stress and Principal strain, Mohr’s circle.
2. Analysis of determinate structures: Concept of bending and shear forces in simple beams, Relationship between load, bending moment and shear force. Bending moment and shear force diagram for simple beams and cantilevers.
3. Bending shear and torsion: Bending and shear stresses in simple beams, concepts of torsion in circular shafts.
4. Analysis of statically determinate trusses and arches.

**Books and/or Reference Materials**

- Kazmi, S. M. A., “Solid Mechanics” TMH, Delhi, India.

**Interactive Learning Source**

- Web links to e-learning: [nptel](https://nptel.ac.in)
<table>
<thead>
<tr>
<th>Course Assessment Method</th>
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<tbody>
<tr>
<td>1. Class Work (60%)</td>
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<td>2. End Semester Examination (40%)</td>
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<table>
<thead>
<tr>
<th>Course Objective</th>
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<tbody>
<tr>
<td>1. To introduce computer aided analysis and design of reinforced concrete and steel structures, using simple examples of structural elements.</td>
</tr>
<tr>
<td>2. To understand interpretation of results obtained from software package.</td>
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<tr>
<td>4. To compare results obtained with computer aided analysis and design and manual methods of analysis and design.</td>
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<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>Upon successful completion of this course, it is expected that students will be able to:</td>
</tr>
<tr>
<td>1. Understand basics and commands of computer based design &amp; analysis.</td>
</tr>
<tr>
<td>2. Better understand and compare the behavior of different structural member under gravity loads.</td>
</tr>
<tr>
<td>3. Prepare design reports interpret results obtained with computer aided analysis and design.</td>
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<table>
<thead>
<tr>
<th>Topics Covered/List of Experiments</th>
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</thead>
<tbody>
<tr>
<td>1. To analyze and design reinforced concrete structural members like beams, slab, foundation, simple frame and stair case etc. using computer aided analysis and design software(s).</td>
</tr>
<tr>
<td>2. Validation of results obtained with computer aided design software and conventional methods of analysis and design.</td>
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<thead>
<tr>
<th>Text Books / Reference Materials</th>
</tr>
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<tbody>
<tr>
<td>1. Web link: <a href="mailto:bentley.institute@bentley.com">bentley.institute@bentley.com</a></td>
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