NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF CIVIL ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech. /Civil Engineering**		
Course Title	**Marine Foundation Engineering**		
Course Code	**CEPE31**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)			
Session	**January, 2019/ VI SEM**	**Section (if, applicable)**	**Both A & B**
Name of Faculty	**Dr.K.Muthukkumaran**	**Department**	**Civil Engg.**
Official Email	**kmk@nitt.edu**	**Telephone No.**	**04312503168**
Name of Course Coordinator(s) (if, applicable)	**--**		
Official E-mail	**--**	**Telephone No.**	**--**
Course Type	**Elective course** √		

Syllabus (approved in BoS)

Offshore soil investigation: General characteristics of offshore soil exploration – sampling using free corer, gravity corer, tethered systems and manned submersibles – deep penetration sampling using wire line techniques – sampling disturbances – mechanical and environmental - In-situ determination of strength of submarine soils – penetrometer, piezocone, vane and pressure meter techniques – penetration tests from tethered submersible platforms, manned submersibles and using wire line techniques - classification of marine soils – relative distribution of marine soils in the different marine regions – general characteristics of marine deposits in some specific locations and in the Indian sub continent.

Foundations for gravity structures: Types of gravity structures – Installation techniques – movement of gravity structures – settlement of soil beneath gravity structures – stress distribution beneath gravity structures – stability of gravity structures under static and cyclic loads.

Foundation for jacket type structures: Types – installation techniques – design considerations – axial and lateral load capacity of piles – lateral load deformation behaviour of piles – calculation of bearing capacity of piles- design of piles subjected to lateral loads – Reese-Matlock method and p-y curves method.

Foundations for jack up platforms: Types of jack up platforms – piles and mat supported – spud cans – different types – installation techniques – techniques for removal of jack ups – stability of jack up platforms –determination of penetration of supports – stability under lateral loads –stability under static and cyclic load effects.

Sea bed anchors, submarine pipe lines: General introduction to sea bed anchors, moorings,

submarine pipe line etc., - general design considerations (brief outline only) – geotechnical aspects in the design and installation of sea bed anchors, moorings, submarine pipelines etc.

REFERENCE BOOKS

1. Arous, D.A. (Ed.), Offshore Site Investigation, Graham Trotman, 1985
2. Chaney, R.C and Demars, K.R , Strength Testing of Marine Sediments – Laboratory and In-situ Measurements, ASTM, STP-883, 1985
3. George P. and Wood D., Offshore Soil Mechanics, Cambridge University Press.
4. Pierre Le Tirant, Sea Bed Reconnaissance and offshore Soil Mechanics for the Installation of Petroleum Structures, Gulf Publ. Company, 1979
5. Poulos, H.G and Davis, E.H, Pile Foundation Analysis Design, John Wiley, New York, 1980
6. David Thompson and Diane Jarrah Beasley (Ed.), Handbook for Marine Geotechnical Engineering, NAVFAC, ENGINEERING SERVICE CENTER, Port Hueneme, California, 2012.

COURSE OBJECTIVES

- To emphasize the importance of offshore soil investigations for offshore structures
- To analysis the response of foundations of gravity structures under offshore environmental loading
- To analysis the foundation response of jacket and jack-up platforms under static and cyclic loading
- To provide a suitable foundation system for mooring structures and offshore pipe lines

MAPPING OF COs with POs

Course Outcomes	**Programme Outcomes (PO)** **(**Enter Numbers only**)**
1. Recommend suitable offshore investigation techniques for the proposed project and able to provide appropriate soil design parameters	1,2,3,4,5,6,7,8
2. Perform foundation analysis for gravity structures, jacket and jack-up kind of offshore structures	1,2,3,4,5,6,7
3. Analysis suitable anchor system for mooring structures and able to provide foundation system for offshore pipeline.	1,2,3,4,5,6,7

COURSE PLAN – PART II

COURSE OVERVIEW

Marine Foundation Engineering (MFE) is a sub-field of Geotechnical Engineering. It is concerned with geotechnical investigation, suitable foundation analysis and recommendation, suitable anchor analysis and recommendation for mooring systems, seabed stability and many other human made structures like offshore platforms, offshore wind farms, artificial island, submarine pipe lines in the sea. All these structures have to be supported by the seabed soil where the seabed soil may prone to many Geohazards. Therefore, the seabed soil characterization considering the Geohazards aspects is very important for any offshore structures. Due to the gradual depletion of hydrocarbon reserves onshore or near the

coastlines, new fields are being developed at greater distances in the offshore and in deeper water with a suitable adaptation of offshore geotechnical investigations. More than 7000 offshore platforms are operating water depth greater than 2000m.

The offshore structures are exposed to various environmental loads like wind, waves, currents, sea ice and icebergs over and above the regular dead and live load. Almost all the environmental loads are primarily in the horizontal direction and many of these loads are get transmitted to the foundation (the seabed). Therefore, carrying out a suitable offshore geotechnical investigation and recommending an appropriate foundation system for the proposed offshore structure is foremost important for any offshore project. This course will focus on the importance of offshore Geotechnical investigations and offshore foundation system analysis.

COURSE TEACHING AND LEARNING ACTIVITIES **(** Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week -1/ 3 hrs	General Introduction to coastal and offshore structures and role of offshore geotechnical investigation in offshore structures.	PPT
2	Week -2/ 3 hrs	Offshore soil investigation: General characteristics of offshore soil exploration – sampling using free corer, gravity corer, tethered systems and manned submersibles	PPT
3	Week -3/ 3 hrs	deep penetration sampling using wire line techniques – sampling disturbances – mechanical and environmental - In-situ determination of strength of submarine soils	PPT
4	Week -4 / 3 hrs	penetrometer, piezocone, vane and pressure meter techniques – penetration tests from tethered submersible platforms, manned submersibles and using wire line techniques - classification of marine soils – relative distribution of marine soils in the different marine regions – general characteristics of marine deposits in some specific locations and in the Indian sub continent.	PPT
5	Week -5 / 3 hrs	Foundations for gravity structures: Types of gravity structures – Installation techniques – movement of gravity structures	PPT/ Black board
6	Week -6 / 3 hrs	Settlement of soil beneath gravity structures – stress distribution beneath gravity structures	PPT/ Black board

7	Week -7 / 3 hrs	Stability of gravity structures under static and cyclic loads.	PPT/ Black board
8	Week -8 / 3 hrs	Foundation for jacket type structures: Types – installation techniques – design considerations	PPT/ Black board
9	Week -9 / 3 hrs	Axial and lateral load capacity of piles – lateral load deformation behaviour of piles	Black board
10	Week -10 / 3 hrs	Calculation of bearing capacity of piles- design of piles subjected to lateral loads – Reese-Matlock method and p-y curves method	Black board
11	Week -11 / 3 hrs	Foundations for jack up platforms: Types of jack up platforms – piles and mat supported – spud cans – different types	PPT/ Black board
12	Week -12 / 3 hrs	Installation techniques – techniques for removal of jack ups – stability of jack up platforms	PPT/ Black board
13	Week -13 / 3 hrs	Determination of penetration of supports – stability under lateral loads – stability under static and cyclic load effects.	PPT/ Black board
14	Week -14 / 3 hrs	Sea bed anchors, submarine pipe lines: General introduction to sea bed anchors	PPT/ Black board
15	Week -15 / 3 hrs	Moorings, submarine pipe line etc., - general design considerations (brief outline only) geotechnical aspects in the design and installation of sea bed anchors, moorings, submarine pipelines etc.	PPT/ Black board

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-I (Cycle Test-I)	6th Week/ 13 to 15, Feb, 2019	1 hr	20
2	Assessment-II (Cycle Test-II)	12th Week/ 25 to 29, March, 2018	1 hr	20
3	Assessment-III (Mini Project/ Seminar/Group task)	Conducted during the regular class work		20

CPA	Compensation Assessment	15th Week	1 hr	20
5	Final Assessment	16th – 17th Week	3 hr	40

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1. Class committee meetings.
2. Mid semester –feedback will be collected in the class room
3. Online - Feedback forms submission through MIS.

COURSE POLICY (including compensation assessment to be specified**)**

PASSING MINIMUM

The passing minimum shall be ***(Peak/3) or (Class Average/2) whichever is lower***

COMPENSATION ASSESSMENT

Retest would only be given to those students who have missed either Cycle Test 1 or Cycle Test 2 on genuine grounds. The portions of the retest would include the portions of both Cycle Test 1 and Cycle Test 2 combined.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY
The Course Coordinator is available for consultation during office hours at Civil Engineering Department, Room No. C-8. Queries can also be emailed to the Course Coordinator directly at kmk@nitt.edu
FOR APPROVAL
Course Faculty _____ CC- Chairperson _____ HOD _____