DEPARTMENT OF CIVIL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**M.Tech Structural Engineering**		
Course Title	Structural Dynamics		
Course Code	CE653	**No. of Credits**	3
Course Code of Pre-requisite subject(s)			
Session	July 2022	**Section (if, applicable)**	NA
Name of Faculty	Dr. Greegar George	**Department**	Civil Engineering
Email	greegar@nitt.edu	**Telephone No.**	9483742674
Name of Course Coordinator(s) (if, applicable)			
E-mail		**Telephone No.**	
Course Type	☑ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Introduction to Dynamic analysis - Elements of vibratory systems and simple Harmonic Motion - Mathematical models of SDOF systems - Principle of Virtual displacements - Evaluation of damping resonance.

Fourier series expression for loading - (blast or earthquake) - Duhamel's integral - Numerical methods - Expression for generalized system properties - vibration analysis - Rayleigh's method - Rayleigh-Ritz method.

Evaluation of structural property matrices - Natural vibration - Solution of the Eigen value problem - Iteration due to Holzer and Stodola.

Idealization of multi-storeyed frames - analysis to blast loading - Deterministic analysis of earthquake response - lumped SDOF system.

Differential equation of motion - Beam flexure including shear deformation and rotatory inertia - Vibration analysis using finite element method for beams and frames.

COURSE OBJECTIVES
1. To introduce the concepts of dynamic loading and to study the dynamic response of SDOF, MDOF and continuous systems subjected to different types of dynamic loads. 2. To learn free and forced vibration response of structural systems. 3. To familiarize students with mathematical models representing real time problems of discrete and continuous vibratory systems. 4. To make students understand the principle of virtual displacements. 5. To expose students to the concept of resonance.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
At the end of the course student will be able	
1. To analyse structures subjected to blast loading and apply finite element method.	1, 2, 3, 5, 6, 11, 12
2. To analyse structures using various methods of vibration analysis.	1, 2, 3, 5, 6, 11, 12
3. To use structural property matrices to study structural behaviour.	1, 2, 3, 5, 6, 11, 12
4. To arrive at solution to Eigen value problem and idealize multi storied frames	1, 2, 3, 5, 6, 11, 12
5. To perform deterministic analysis for earthquake response.	1, 2, 3, 5, 6, 11, 12

COURSE PLAN – PART II

COURSE OVERVIEW

- This is a 3 Credit course offered to 1st semester Structural Engineering M.Tech. students
- Three theory classes (3 x 50 minutes) will be conducted per week.
- The course provides a broad overview of dyanamic analysis of structures involving single degree of freedom system, multi-degree of freedom system, and continuos system.
- Different techniques to develop the equation of motion and their solutions are introduced.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	Week 1	Introduction and Free Vibration of SDOF system	PPT and black board
2.	Week 2	SDOF system – Free Vibration	PPT and black board
3.	Week 3	SDOF system – Response due to Harmonic excitation	PPT and black board
4.	Week 4	SDOF system – analysis under general forcing function	PPT and black board
5.	Week 5	Numerical techniques to determine response of SDOF system	PPT and black board

6.	Week 6	Elastic Response Spectra – Earthquake excitation	PPT and black board
7.	Week 7	Two degrees of freedom system	PPT and black board
8.	Week 8	Multi-degree of freedom system	PPT and black board
9.	Week 9	Multi-degree of freedom system	PPT and black board
10.	Week 10	Analysis to blast loading	PPT and black board
11.	Week 11	Deterministic Response under Earthquake loading	PPT and black board
12.	Week 12	Continuous system – Differential equation of motion	PPT and black board
13.	Week 13	Continuous system – Approximate Methods	PPT and black board
14.	Week 14	Finite element method for beams and frames	PPT and black board

COURSE ASSESSMENT METHODS

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1.	Cycle Test 1	Week 5	1 hour	15
2.	Cycle Test 2	Week 10	1 hour	15
3.	Quizzes	-	-	15
4.	Compensation assessment (for Students who have missed a cycle test for genuine reasons)	Week 14	1 hour	15
5.	Assignment/Tutorials	After Each Unit	-	15
6.	Final Assessment	Week 15	2 hours	40

COURSE EXIT SURVEY

The feedback from students during Class committee meetings will be considered. It is also proposed to take feedback from the students, at the end of the semester to evaluate the execution of the course.

COURSE POLICY

- The Closing date of attendance for the subject is Week 14.
- 100% attendance is desirable for every student, with minimum attendance being 75%.
- Attendance during each assessment is mandatory.
- Compensation assessment would only be given to those students who have missed either cycle tests on genuine grounds and upon prior intimation to the respective faculty.
- Submission of assignments as per schedule is compulsory.

MODE OF CORRESPONDENCE (email/ phone etc)

Apart from the interactions with the students in the class, the students can contact the concerned faculty member.

Email: greegar@nitt.edu **Phone:** 9483742674

The faculty is available for consultation during office hours at room number C105 of Department of Civil Engineering.

COMPENSATION ASSESSMENT POLICY

One compensation assessment for absentees in assessments (other than final assessment) will be conducted. Only genuine cases of absence shall be considered. The syllabus of the retest would include the portions from both of the cycle tests.

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

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

ACADEMIC DISHONESTY & PLAGIARISM

1. Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
2. Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
3. 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

- Queries if any can also be emailed to the faculty or through MS Teams

FOR APPROVAL

Dr. Greegar George	Dr. Deendayal R	Dr. G. Swaminathan
Course Faculty	**CC-Chairperson**	**HOD**

Guidelines:

1. The number of assessments for a course shall range from 4 to 6.
2. **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**
3. **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**
4. **The passing minimum shall be as per the regulations.**

B.Tech. Admitted in				P.G.
2018	**2017**	**2016**	**2015**	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

5. **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**
6. **Absolute grading policy shall be incorporated if the number of students per course is less than 10.**
7. Necessary care shall be taken to ensure that the course plan is reasonable and is objective.