NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF CIVIL ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	**M. Tech. – Structural Engineering**		
Course Title	**Structural Dynamics**		
Course Code	**CE661**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)			
Session	**July 2021**	**Section (if, applicable)**	**-**
Name of Faculty	**Dr. Kamal Krishna Bera**	**Department**	**Civil Engineering**
Email	kamal@nitt.edu	**Telephone No.**	+91 - 9301481280
Name of Course Coordinator(s) (if, applicable)	**-**		
E-mail	-	**Telephone No.**	
Course Type	☐ **Core course**	☑ **Elective course**	

Syllabus (approved in Senate)

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)**
By the end of this course the students will be able to	
1. To analyse structures subjected to blast loading and apply finite element method	-
2. To analyse structures using various methods of vibration analysis.	-
3. To use structural property matrices to study structural behaviour.	-
4.To arrive at solution to Eigen value problem and idealize multi storied frames.	-
5. To perform deterministic analysis for earthquake response.	-

COURSE PLAN – PART II

COURSE OVERVIEW

This course gives 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. Application of harmonis loading as well as earthquake and blast loading on structures are discussed.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery (for all lectures)
1	1st week – 3 hours	Introduction and Free Vibration of SDOF system	• PPT and Explanation through Digital Writing Pad (online platform Webex and MS Team) • Lectures notes are shared after class • Recording links are shared on requirement/demand
2	2nd week – 3 hours	SDOF system – Free Vibration, and Response due to Harmonic excitation	
3	3nd week – 3 hours	SDOF system – Free Vibration, and Response due to Harmonic excitation	
4	4rd week – 3 hours	SDOF system – analysis under general forcing function (periodic and pulse loading)	
5	5rd week – 3 hours	SDOF system – analysis under general forcing function (periodic and pulse loading)	
6	6th week – 3 hours	Numerical techniques to determine response of SDOF system	
7	7th week – 3 hours	Elastic Response Spectra – Earthquake excitation	
8	8th week – 3 hours	Two degrees of freedom system	
9	9th week – 3 hours	Multi-degree of freedom system	

10	10th week – 3 hours	Multi-degree of freedom system	
11	11th week – 3 hours	Multi-degree of freedom system	
12	12th week – 3 hours	Continuous system – exact method	
13	13th week – 3 hours	Continuous system – Approximate methods	

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	2 Quizes	5th & 10th week	20 -30 min duration each	25
2	Assignment	9th week	Weekends	15
3	Mid sem	11th week	1.5 hrs	20
3	Viva	13th week	10 min for each student	10
4	End semester exam (Handwritten and scanned)	During end sem	2 hours	30

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

First feedback will be collected from students through the class representative (at the third week of October) to improve the online teaching methods. Also at the end of the semester for course evaluation as per institute norms.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

MODE OF CORRESPONDENCE (email/ phone etc)

Apart from interactions with the students in the regular class, extra classes will be conducted if required. Students can also contact the concerned faculty member (24*7 with prior appointment) as given below:

Dr. Kamal Krishna Bera
Email: kamal@nitt.edu
Mob: +91 - 9301481280

COMPENSATION ASSESSMENT POLICY

To be decided for the students with genuine reasons.

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.**

MINIMUM PASS MARK POLICY

The Passing minimum mark: As per Institute norms.

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 programs.

FOR APPROVAL

Course Faculty **CC-Chairperson** _____ **HOD** _____