DEPARTMENT OF MECHANICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	**ENGINEERING MECHANICS**		
Course Code	**MEPC10**	No. of Credits	**3**
Course Code of Pre-requisite subject(s)	**NIL**		
Session	**Jan 2018**	Section (if, applicable)	**B (II Semester)**
Name of Faculty	**Dr. T.SUTHUKAR** **Dr. U.S.HAKEEM NIYAS**	Department	**MECHANICAL ENGINEERING**
Email	**hakeem@nitt.edu**	Telephone No.	**9976677804**
Name of Course Coordinator(s) (if, applicable)	**NIL**		
Course Type	☑ **Core course** ☐ **Elective course**		

Syllabus (approved in BoS)

Fundamentals Mechanics and its relevance, concepts of forces, laws of mechanics - parallelogram law, Lami's theorem, law of polygon, concept of free-body diagram, centroids, center of gravity, area moment of inertia, mass moment of inertia.
Friction Laws of friction, static friction, rolling friction, application of laws of friction, ladder friction, wedge friction, body on inclined planes.
Statics Principles of statics, types of forces, concurrent and non-concurrent forces, composition of forces, forces in a plane and space, simple stresses and strains, elastic coefficients.
Kinematics Fundamentals of rectilinear and curvilinear motion, application of general equations, concept of relative velocity, analytical and graphical techniques.
Dynamics Principles of dynamics, D'Alembert's principle, conservation of momentum and energy, vibrations of simple systems.

COURSE OBJECTIVES

- To explain the importance of mechanics in the context of engineering and conservation equations.
- To explain the significance of centroid, centre of gravity and moment of inertia. To introduce the techniques for analyzing the forces in the bodies.
- To apply the different principles to study the motion of a body, and concept of relative velocity and acceleration.

- To describe the trajectory of a particle under projectile motion.
- To identify the basic elements of a mechanical system and write their constitutive equations.

COURSE OUTCOMES (CO)	**Aligned Programme Outcomes (PO)**
Upon completing this course, students will be able to:	
1. Solve problems dealing with forces in plane or in space and equivalent forces systems.	**1,2,3,5,7**
2. Identify, analyse and solve problems related to rigid body mechanics involving friction.	**1,2,3,4,5,7**
3. Understand the fundamentals of laws of motion and their application in the area of dynamics.	**1,2,3,5,10**

COURSE PLAN – PART II

COURSE OVERVIEW

This is one of the most important fundamental courses of mechanical engineering. The purpose of this course is to introduce the students to the concepts of both the branches of engineering mechanics – statics and dynamics, and improve their stand on the subject by solving application oriented problems given in the form of problem sets (P.S) in the Text Book.

COURSE TEACHING AND LEARNING ACTIVITIES

L.No.	**Topic (as per the sequence followed in the prescribed Text Book)**	**Homework Problems**	**Mode of Delivery**
0	Introduction to Engineering Mechanics	–	Lecture C & T /PPT
1	1.1 Principle of Statics	–	
2	1.2 Composition and resolution of Forces	PS 1.2 – 9	
3	1.3 Equilibrium of concurrent forces in a plane	PS 1.3 – 12	
4	1.4 Method of projections	PS 1.4 – 16	
5	1.5 Equilibrium of three forces in a plane	PS 1.5 – 12	
6	1.6 Method of moments	PS 1.6 – 13	
7	1.7 Friction	PS 1.7 – 18	
8	2.1 Two parallel forces	PS 2.1 – 5	
9	2.2 General case of parallel forces in a plane	PS 2.2 – 12	
10	2.3 Centre of parallel forces and centre of gravity	PS 2.3 – 10	
11	2.4 Centroids of composite plane figures and curves	PS 2.4 – 19	
12	2.5 Distributed force in a plane	PS 2.5 – 10	
13	3.1 Composition of forces in a plane	PS 3.1 – 5	
14	3.2 Equilibrium of forces in a plane	PS 3.2 – 15	
15	3.8 Distributed force in a plane	PS 3.8 – 5	

16	4.1 Concurrent forces in space – Method of projections	PS 4.1 – 12	Lecture C & T /PPT
17	4.2 Concurrent forces in space – Method of moments	PS 4.2 – 9	
18	4.3 Couples in space	PS 4.3 – 7	
19	4.4 Parallel forces in space	PS 4.4 – 9	
20	4.5 Centre of parallel forces and centre of gravity	PS 4.5 – 15	
21	4.6 General case of forces in space	PS 4.6 – 20	
22	6.1 Kinematics of Rectilinear Translation	PS 6.1 – 14	
23	6.2 Principle of Dynamics 6.3 Differential Equation of Rectilinear Motion	PS 6.3 – 12	
24	6.4 Motion of a particle acted upon by a constant force	PS 6.4 – 10	
25	6.5 Force as a function of time	PS 6.5 – 8	
26	6.6 Force proportional to displacement free vibrations	PS 6.6 – 12	
27	6.7 D' Alembert's Principle	PS 6.7 – 14	
28	6.8 Momentum and Impulse	PS 6.8 – 6	
29	6.9 Work and Energy	PS 6.9 – 9	
30	6.10 Ideal systems: Conservation of Energy	PS 6.10 – 10	
31	6.11 Impact	PS 6.11 – 10	
32	7.1 Kinematics of Curvilinear motion	PS 7.1 – 8	
33	7.2 Differential Equation of Curvilinear Motion	PS 7.2 – 10	
34	7.3 Motion of a projectile	PS 7.3 – 10	
35	7.4 D' Alembert's Principle in Curvilinear Motion	PS 7.4 – 9	
36	7.5 Moment of Momentum	PS 7.5 – 6	
37	7.6 Work and Energy in Curvilinear Motion	PS 7.6 – 13	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	6th Week	60 min	15
2	Cycle Test 2	11th Week	60 min	15
3	Daily Assignments & Home Work Problems	–	–	20
CPA	Compensation Assessment*	13th Week	60 min	Corresponding Weightage
4	Final Assessment*	14th Week	180 min	50

*mandatory; refer to guidelines on page 6

ESSENTIAL READINGS: Textbooks, Reference books.

Text Book

1. Timoshenko, S. and Young, D. H., Engineering Mechanics, 4th Edition, McGraw Hill, 1956.

Reference Books

1. Hibbeler, R.C., Engineering Mechanics – Statics and Dynamics, 14th Edition, Pearson, 2017.
2. Nelson, A., Engineering Mechanics – Statics and Dynamics, McGraw Hill, 2009.
3. Shames, I.H. and Rao, G.K.M., Engineering Mechanics – Static and Dynamics, Pearson Education, 2009.
4. Beer, F.P., and Johnson Jr. E.R., Vector Mechanics for Engineers, McGraw Hill, 2009.

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

- Feedback from the students during class committee meetings.
- Feedback on the achievement of Course Outcomes during the end of the course.

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism)

MODE OF CORRESPONDENCE

All the communication (schedule of assessment / course material /any other information regarding this course) will be intimated through the class representative.

ATTENDANCE

1. Attendance will be taken by the faculty in all the contact hours.
2. Every student should maintain minimum of 75 % physical attendance in these contact hours along with assessment criteria to attend the end semester examination.
3. Any student, who fails to maintain 75 % attendance are not eligible for attending the end semester examination and have to RE DO the course.

ASSESSMENT

1. Attending all the assessments are MANDATORY for every student.
2. If any student is not able to attend any of the Assessments due to genuine reason and prior intimation to the faculty, student is permitted to attend the compensation assessment (CPA) with the corresponding weightage.

3. The passing minimum shall be the $\left[\frac{\text{Class Mean}}{2}\right]$ or $\left[\frac{\text{Class Maximum}}{3}\right]$, whichever is lower, but not less than 35.
4. Please refer B.Tech Regulations 2015 (B.12.1) for the corresponding grades.

ACADEMIC HONESTY & PLAGIARISM

1. All the students are expected to be genuine during the course work. Taking information by means of copying assignments, looking or attempting to look at another student's paper or bringing and using study material in any form for copying during any assessments is considered as dishonest.
2. Preventing or hampering other students from pursuing their academic activities is also considered as academic dishonesty.

Any evidence of such academic dishonesty will result in the loss of marks on that assessment. Additionally, the names of those students so penalized will be reported to the class committee chairperson and HoD of the concerned department.

ADDITIONAL INFORMATION

The faculty is available for consultation at times as per the intimation given by the faculty. Queries (if required) to the course teacher shall be emailed to the course faculty directly at hakeem@nitt.edu

FOR APPROVAL

Dr. U.S. HAKEEM NIYAS	Dr. M. UDAYAKUMAR	Dr. S.P. SIVAPIRAKASAM
Course Faculty	Class Committee Chairman	Head of Department
Mechanical Engineering	I Year Mechanical Engineering	Mechanical Engineering

Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

b) Every course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. This is not applicable for project work/industrial lectures/internship**.

d) The policy for attendance for the course should be clearly specified.

e) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.