NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

Department of Instrumentation and Control Engineering

COURSE OUTLINE TEMPLATE			
Course Title	**ENGINEERING MECHANICS**		
Course Code	**IC102**	**No. of Credits**	**3**
Department	**ICE**	**Faculty**	**Mr. Goldin R. Bennet Mr. Bharath Kanna**
Pre-requisites Course Code	**None**		
Course Coordinator	**Mr. Goldin R. Bennet**		
E-mail of the Course Teacher	**bennet@nitt.edu**	**Telephone No.**	**---**
Course Type	[X] **Core course** [ ] **Elective course**		

COURSE OVERVIEW

This is a fundamental course on mechanical science. The control and instrumentation field uses many aspects of mechanical engineering. The instrumentation used in industry is mainly for the measurement of many mechanical parameters and the control engineering uses many mechanical systems to achieve desired outcomes. Hence, the instrumentation and control engineer must be familiar with the fundamentals of the mechanical engineering. Engineering mechanics consists of two broad components, namely statics and dynamics. This course introduces the students to the fundamentals of both. The students should work out the numerical problems themselves to get a better understanding of the engineering mechanics.

COURSE OBJECTIVES

1. To introduce the fundamentals of mechanics and machines in engineering to the instrumentation and control engineering students.
2. To explain the application of basic mechanical science concepts.
3. To apply different physical principles to the analysis of mechanics and machines.
4. To identify the different elements of a mechanical system and write the mathematical equations for them.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
After successfully completing this course, the student will be able to 1. identify simple mechanisms and their principle of	1

operation 2. write the mathematical equations for static and dynamic loading in simple mechanical systems 3. write the equations for energy and power in simple mechanical systems 4. analyze free and forced oscillations in simple dynamic systems	 1 1 1

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week**	**Topic**	**Mode of Delivery**
1	1 (3 contact hours)	Forces and equilibrium – Free body diagram – Forces in equilibrium. Stress and strain – Poisson's ratio – Bulk modulus.	All topics will be taught using lectures and relevant video clips
2	2 (3 contact hours)	Beams – Types of beams – Bending moment and shearing force – Bending stresses. Torsion – Torsion of circular shafts – Transmission of power.	
3	3 (3 contact hours)	Strain energy – Dynamic loading – Strain energy due to shear – Impact torsional loading – Strain energy due to bending – Impact loading of beams.	
4	4 (2 contact hours)	Linear and angular motion – Linear motion – Curvilinear motion – Relative velocity – Angular motion – Torque and angular motion	
5	4 (1-contact hour)	**Test-1**	
6	5 (3 contact hours)	Balancing of rotational masses – Momentum – Work and energy.	
7	6 (3 contact hours)	Mechanisms – Velocity diagrams – Acceleration diagrams. Flywheels. Machines – Transmission of rotational motion.	

8	7 (3 contact hours)	Geared systems – Gear trains. Friction – Friction clutches. Bearings. Belt drives. Gyroscopic motion – Gyroscopic couple.	
9	8 (2 contact hours)	Free vibrations – Simple harmonic motion. Linear and torsional vibrations of an elastic system. Transverse vibrations of beams – Whirling of shafts.	
10	8 (1 contact hour)	**Test-2**	
11	9 (3 contact hours)	Damped and forced oscillations – Free oscillations – Damped oscillations –	
12	10 (3 contact hours)	Undamped forced oscillations – Damped forced oscillations – Degrees of freedom.	
13	11	**End-semester Exam**	
14	14	**Supplementary Exam**	

COURSE ASSESSMENT METHODS

Students are expected to pass each individual assessment. **The pass/fail cut-off for each assessment is (mean of the class)/2.**

Students who fail in any assessment or are absent in any test even for valid reasons (other than leave on-duty) will have to appear for the supplementary exam and pass it before the semester grades are assigned. Those who are absent due to any valid leave on-duty, will get an z-score for that assessment that is an average of all z-scores they get for the other assessments. There will not be any retests during the course of the semester.

The supplementary exam will be conducted after the end-semester papers are evaluated. This exam will be for three hours and will cover the entire syllabus.

If they pass this special exam, those students who have not passed only one test earlier, will have their marks reset to the pass mark in that test and the grades will be calculated normally.

Those students who have failed in more than one test previously will get an 'E' grade if they pass this supplementary exam.

Those who fail in the supplementary exam also, will have to pass this course by registering for Formative Assessment only.

Students who do not pass the course before the semester grades are assigned, will be awarded 'F' grade only.

Those who are awarded 'F' grade will have to apply for formative assessment only after that.

S.No.	Mode of Assessment	Week	Duration	% Weightage (On normalized z-scores)
1	Written test	4	1-hour	15
2	Written test	8	1-hour	20
3	Group assignment	---	---	15
4	End-semester	11	3-hour	50

ESSENTIAL READINGS

Website
A course intranet site is maintained at http://10.0.0.27/~bennet

Textbook
1. Bolton, W. ***Mechanical Science, 3rd edition. 2006***, Wiley-Blackwell Publishing. ISBN: 978-1-4051-3794-2

Reference Books
1. Shames, Irving H., ***Engineering Mechanics: Statics and Dynamics, 4th edition. 2006***,Pearson Education. ISBN: 978-81-7758-123-2.
2. Beer, Ferdinand P., Johnston, E. Russel, Mazurek, David F., and Cornwell, Phillip J., ***Vector Mechanics for Engineers: Statics and Dynamics, 10th edition. 2013,*** McGraw-Hill Education (India). ISBN: 978-12-5906-291-9.

COURSE EXIT SURVEY

An anonymous exit survey will be taken from the students at the end of the semester through a questionnaire.
Feedback from the students during the class committee meetings will also be taken.

COURSE POLICY

Academic dishonesty

All students are expected to do their own work and expected to put their best effort in the tests and assessments. The taking of information by means of copying homework assignments, or looking or attempting to look at another student's paper during an examination is considered dishonest. The tendering of information, such as giving your work to another student to be used or copied is also considered dishonest.

Preventing or hampering other students from pursuing their academic activities is considered as academic dishonesty.

Colluding to reduce the pass/fail threshold for any test is also considered to be academic dishonesty. If a large number of students perform badly in any test, the faculty member reserves the right to set a higher pass/fail cut-off threshold than the (class mean)/2 threshold to preserve the integrity of the assessment process.

Any evidence of such academic dishonesty will result in the loss of all marks on that assignment or exam. Additionally, the names of those students so penalized will be reported to the Office of Dean (Students) and the Office of Dean (Academic) for the records.

1. Students opting for plagiarism during exams will be summarily sent out and awarded zero marks for that exam.

2. Students honestly producing original work will be rewarded with better marks.

Exam hall code

Students must abide by the exam hall code given in the course website.

Attendance requirement

Students who consistently perform well in the tests (above average marks) are treated leniently regarding their attendance requirements. They are considered to have natural flair for the subject. These students are encouraged to participate in various co-curricular and extra-curricular activities to enrich the campus life. But, even their

attendance must not fall below 50%.
Students who do not perform well in the tests (below average marks) or fail, must necessarily attend a minimum of 75% of the classes. Otherwise, they will have to redo the course.
Once students satisfy the requirement of attending a minimum of 75% of the classes, they may voluntarily opt for formative assessment by giving a letter in writing. In that case, they need not appear for the end-semester exam and the supplementary exam. They can directly register for the formative assessment after the results are published.

ADDITIONAL COURSE INFORMATION

Students may fix appointments for detailed discussions by sending email to ***bennet@nitt.edu*** two days prior to the desired appointment date with the topic to be discussed. The students must come prepared for the scheduled discussion with thorough background preparation.
Minor doubts will be clarified after the contact hours without any prior appointment.

FOR SENATE'S CONSIDERATION

Course Faculty: Goldin R. Bennet 30.12.2015

Class Committee-Chairperson: 01/01/2016

HOD: _____ **Date:** 6/1/16