DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	MICRO ELECTRO MECHANICAL SYSTEMS		
Course Code	ICPE12	**No. of Credits**	3
Course Code of Pre-requisite subject(s)	ICPC11	SENSORS AND TRANSDUCERS	
Session	Jan. 2018	**Section (if, applicable)**	A and B
Name of Faculty	B.S.THAMARAI SELVI	**Department**	ICE
Email	thamaraibs@nitt.edu	**Telephone No.**	8072930378
Name of Course Coordinator(s) (if, applicable)	-NIL-		
E-mail	-NIL-	**Telephone No.**	-NIL-
Course Type	Elective course		

Syllabus (approved in BoS)

Course Content:

Introduction, emergence, MEMS application, scaling issues, materials for MEMS, Thin film deposition, lithography and etching.

Bulk micro machining, surface micro machining and LIGA process.

MEMS devices, Engineering Mechanics for Micro System Design – static bending of thin plates,

Mechanical vibrational analysis, Thermomechanical analysis, fracture mechanics analysis, Thin film mechanics

Theory and design: Micro Pressure Sensor, micro accelerometer – capacitive and piezoresistive, micro actuator

Electronic interfaces, design, simulation and layout of MEMS devices using CAD tools.

COURSE OBJECTIVES

The objective of this course is
1. To introduce the concepts of microelectromechanical devices.
2. To introduce the state-of-art micromachining techniques including surface micromachining, bulk micromachining, and related methods.
3. To know the design concepts of micro sensors and micro actuators.
4. To acquire knowledge about computer aided design tools for modeling MEMS device.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
At the end of the course student will be able to	
1. Gain a fundamental understanding of standard microfabrication techniques.	1,2,3
2. Know the major classes, components, and applications of MEMS	1,2,3

	devices/systems and to demonstrate an understanding of the fundamental principles behind the operation of these devices/systems.		
3.	Apply knowledge of microfabrication techniques to design a MEMS device or a microsystem.		6,7,9,12
4.	Acquire skills in Computer aided design tools for modeling and simulating MEMS device.		4,5,6,7

COURSE PLAN – PART II

COURSE OVERVIEW

This course deals with the introduction and fabrication of micro devices such as sensors, actuators ,etc., and its applications. It also covers various fabrication techniques and the materials for MEMS. It covers design, simulation and layout of MEMS devices using software.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st week	Introduction, emergence	Chalk and talk
2	2nd week	MEMS Applications, Scaling issues	PPT
3	3rd week	Materials for MEMS	Chalk and talk
4	4th week	Thin film deposition, Lithography and etching	PPT
5	5th week	Bulk micro machining	PPT
6	6th week	Surface micro machining, LIGA process	PPT
7	7th week	MEMS devices, Engineering Mechanics for micro system design	PPT
8	8th week	Static bending of thin plates, mechanical vibrational analysis	Chalk and talk
9	9th week	Thermomechanical analysis, fracture mechanics analysis, thin film analysis	Chalk and talk
10	10th week	Micro pressure sensor, micro accelerometer	PPT
11	11th week	Capacitive and piezo resistive micro actuator	PPT
12	12th week	Electronic interface, Introduction about design and simulation of MEMS devices using software	PPT

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Text Books:
1. Tai Ran Hsu, MEMS & Microsystem Design and Manufacture, Tata McGraw Hill, New Delhi 2002.

2. Marc Madou, Fundamentals of Micro fabrication, 2/e CRC Press, 2002.
3. Julian W. Gardner and Vijay K. Varadan, Microsensors, MEMS, and Smart Devices, John Wiley & Sons Ltd, 2001.

Reference Books:
1. Elwenspoek, Miko, Wiegerink, R, Mechanical Microsensors, Springer Science & Business Media, 2001.
2. Simon M. Sze, Semiconductor Sensors, Jihn Wiley & Sons, Inc 1994. 3. Chang Liu, Foundations of MEMS, Pearson International Edition, 2011.

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	1ST Assessment	6th week	1 hour	20
2	2nd Assessment	11th week	1 hour	20
3	Assignment/ Seminar	-------	-------	10
4	Retest	13th week	1 hour	20
5	Final Assessment	14th week	3 hours	50

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

1. Direct feedback from the students.
2. Feedback from the students during the class committee meetings.

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

MODE OF CORRESPONDENCE (email/ phone etc)

Any suggestions, Queries and feedback can be emailed to the Course Coordinator directly at thamaraibs@nitt.edu.

ATTENDANCE

The student must have 75% attendance who fails they should redo this course.

COMPENSATION ASSESSMENT

The student absent for any one assessment must attend their retest before their final assessment.

ADDITIONAL INFORMATION

1. The student absent for final assessment with genuine reasons will have 50% weightage in reassessment and the student fails in final assessment will have 100% weightage in reassessment.
2. The student fails in reassessment must do their formative assessment.
3. The Assessment date and time will be fixed by the faculty in consultation with class representative as per the evaluation schedule.
4. The grade will be awarded based on relative grading system. The passing minimum will be class average/2 or class maximum/3, which is smaller.

FOR APPROVAL

BS.Th— 20/3/2018.
B.S.THAMARAI SELVI

Course Faculty _____   **CC-Chairperson** _____ 20/3/18   **HOD** _____ 20/3/18