DEPARTMENT OF MECHANICAL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I

Name of the programme and specialization	B.Tech – EEE		
Course Title	EEPC28 - THERMODYNAMICS AND MECHANICS OF FLUIDS		
Course Code	EEPC28	No. of Credits	03
Course Code of Pre-requisite subject(s)	-		
Session	Jul. 2019	Section (if, applicable)	EEE A
Name of Faculty	B. VIBIN	Department	MECHANICAL
Name of Course Coordinator(s) (if, applicable)	-		
E-mail	vibin@nitt.edu	Telephone No.	9443844944
Course Type	* Core course		Elective course

Syllabus

Basic concepts: Thermodynamic equilibrium, quasi-static process, Temperature and zeroth law, work and heat interactions, properties of pure substances, phase equilibrium diagrams. First law for a cycle and a process, steady flow processes.

Heat engine, second law statements, reversibility, Carnot theorem, Clausius inequality, entropy Principle. Available energy: Availability and irreversibility.

Otto, diesel and dual cycles, Brayton cycle with regeneration, inter-cooling reheat, Joule-Thompson effect, Rankine cycle, reheat and regenerative cycle, properties of ideal gas, Stirling and Ericson cycles.

Classification of fluids and their physical properties, Fluid statics, manometers, pressure on submerged bodies. Basics of fluid properties - Vapour Pressure – Pressure at a point its variation – Measurement with Piezo meter, manometers and gauges - Continuity equation in one dimension – Bernoulli's equation – Venturi meters and Orifice meters.

Pumps – General principles of displacement and Centrifugal pumps – Efficiency and Performance Curves of Pumps – Cavitation in Pumps – Turbines – Efficiency – Governing of turbines.

COURSE OBJECTIVES

1. To achieve an understanding of the principles of thermodynamics and to be able to use it in accounting for the bulk behavior of simple physical systems.
2. To provide in-depth study of thermodynamic properties of various working fluids.
3. To enlighten the basic concepts of energy interacting devices through various thermodynamic cycles.
4. To provide basic awareness about fluid behavior under rest and dynamics conditions.
5. To impart knowledge about hydraulic machines.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
On completion of this course, the students will be able to,	
1. Understand the fundamentals of first and second laws of thermodynamics and their application to a wide range of systems	5,10,12
2. Familiarize with calculations of the efficiencies of heat engines and other engineering devices.	5,10,
3. Familiarize the construction and principles governing the form of simple and complex one – component phase diagrams such as pressure-temperature, volume-temperature & pressure-volume and the steam tables in the analysis of engineering devices and systems.	5,10,
4. Calculate various fluid flow parameters.	5
5. Determine the optimum working conditions for hydraulic machines.	5,10

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topic	Mode of Delivery
1	1 Week	Basic concepts of thermodynamics: Thermodynamic equilibrium, quasi-static process, zeroth law.	PPT, Chalk and Board
2	2 Week	work and heat interactions, first law for a cycle and a process,	PPT, Chalk and Board
3	3 Week	Steady flow energy equations, control volume approach various devices (boiler, turbine, condenser)	PPT, Chalk and Board
4	4 Week	Second law statements, Heat Engine, Carnot theorem, Carnot cycle, reversed Carnot cycle, Heat pump, Refrigerator.	PPT, Chalk and Board
5	5 Week	Entropy principle, Clausius inequality, Available energy: Availability and irreversibility.	PPT, Chalk and Board
6	6 Week	Otto, diesel and dual cycles, properties of ideal gas, Stirling and Ericson cycles.	PPT, Chalk and Board
7	7 Week	Brayton cycle with regeneration, inter-cooling reheat, Joule- Thompson effect,	PPT, Chalk and Board
8	8 Week	properties of pure substances, phase equilibrium diagrams Rankine cycle, reheat and regenerative cycle,	PPT, Chalk and Board
9	9 Week	Classification of fluids and their physical properties Fluid statics, manometers, pressure on submerged	PPT, Chalk and Board

		bodies, Vapour Pressure.	
10	10 Week	Measurement with Piezo meter, manometers and gauges, Continuity equation in one dimension: Bernoulli's equation Venturi meters and Orifice meters.	PPT, Chalk and Board
11	11 Week	Pumps: General principles of displacement and Centrifugal pumps	PPT, Chalk and Board
12	12 Week	Efficiency and Performance Curves of Pumps, Cavitations in Pumps	PPT, Chalk and Board
13	13 Week	Turbines – Efficiency – Governing of turbines.	PPT, Chalk and Board

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment-I (Unit 1 & 2)	5th Week	1 hour	20
2	Assessment-II (Unit 3 & 4)	11th Week	1 hour	20
3	Google classroom-Assignments/Home work problems	1 to 12th week	-	20
4	Compensation Assessment (Retest) (Unit 1 to 4)	13th Week	1 hour	20
5	Final Assessment	14th Week	2 hours	40

Reference Book:

1. Gordan Van Wylen, Richard Sonntag., 'Fundamentals of Classical Thermodynamics', John Wiley and Sons, 1994.
2. Yunus A.Cengel and Michel A.Boles, 'Thermodynamics: An Engineering Approach', McGraw-Hill Higher Education, 2006.
3. T.R.Banga and S.C.Sharma, 'Hydraulic Machines', Khanna Publishers, 2004.
4. Kothandaraman. C.P., `A Course in Thermodynamics and Heat Engines', Dhanpat, Rai and Sons, 1992.
5. Nag, P.K., `Engineering Thermodynamics', Tata McGraw Hill, 1997.
6. R.K.Rajput, 'Thermal Engineering', Laxmi Publications, 2006.
7. Nagarathnam, S. 'Fluid Mechanics', Khanna Publishers, New Delhi, 1995.
8. Dr.R.K.Bansal, 'A Text Book of Fluid Mechanics and Hydraulic Machines', Laxmi Publications(P) Ltd, 2005.

COURSE EXIT

Feedback from the students during class committee meetings.

Anonymous feedback through questionnaire and unknown formats.

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

MODE OF CORRESPONDENCE (email/ phone etc)

All the students are advised to come to the class regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/any other information regarding this course) will be intimated in the Class only.

ATTENDANCE

➤ 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.

COMPENSATION ASSESSMENT
- ➤ Retest will be conducted for 20 marks.

ACADEMIC HONESTY & 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 programmes.
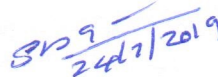
ADDITIONAL INFORMATION
- • The faculty is available for consultation at times as per the intimation given by the faculty.
- • Be aware of the B.Tech requlations in the institute website for passing minimum, redo, formative assessment, grades, credits etc
- • Queries (if required) to the course teacher shall only be emailed to the email id specified by the teacher(vibin@nitt.edu)

FOR APPROVAL

Course Faculty _____   CC-Chairperson _____24/7/2019____   HOD _____
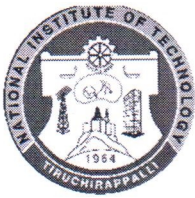
Guidelines

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

b) Every theory 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. Only genuine cases of absence shall be considered.

d) 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%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

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