Name of Institute: Indus Institute of Technology and Engineering
Name of Faculty: Dr. Umang Patdiwala

Course code: ME0724
Course name: Steam and Gas Turbine

Subject: Steam and Gas Turbine (PE-5)								
Program: B. Tech. (Mechanical)				Subject Code: ME0724			Semester: VII	
Teaching Scheme				Examination Evaluation Scheme				
Lecture	Tutorial	Practical	Credits	University Theory Examination	University Practical Examination	Continuous Internal Evaluation (CIE) Theory	Continuous Internal Evaluation (CIE) Practical	Total Marks
2	0	2	3	16/40	16/40	24/60	24/60	200

Prerequisites: Engineering Thermodynamics
Credit points: 3
Offered Semester: VII

Course Coordinator
Full name: Dr.Bansi Raja
Department with siting location: HMT Lab, FF, Bhanwa Builiding,IITE - IU
Telephone: 3113,
Email: bansiraja.me@indusuni.ac.inConsultation
times: Working Hours

Course Lecturer
Full Name: Dr.Umang Patdiwala
Department with seating location: FM lab , FF,Bhanwar Building, IITE - IU
Telephone:3102
Email: umangpatdiwala.me@indusuni.ac.in
Consultation times: 3:00 PM to 5:00 PM working days

Students will be contacted throughout the session via mail with importantinformation relating to this course.

Course Objectives

1. The course is designed to give fundamental knowledge of construction and working of various types of turbines and their components
2. To create knowledge and understanding of steam turbine, gas turbine, nozzlesetc.

Course Outcomes:

1. Analyse thermodynamic cycles of steam turbine and understandconstruction, working and significance of its various components

2. Analyse thermodynamic cycles of gas turbine power plant and jet propulsion systems

Method of delivery

(Face to Face Lecture), PPT & Video, Self-study material, Problem Based Learning

List of Experiments

1. To study various types of steam nozzles
2. To study various types of steam turbine
3. To study various types of gas turbines
4. To study various types of vapour power cycles
5. To study various types of gas dynamics
6. To study about jet propulsion

Study time

(How many hours per week including class attendance)

	Lecture	Tutorial	Practical
No of hours	2	0	2

CO-PO Mapping (PO: Program Outcomes)

PO/PSO CO	PO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	√	√	√	√	√			-				√
CO2	√	√	√	√	√		-	-	-	-	-	√

The objectives of the Mechanical Engineering undergraduate program are to produce graduates who have:

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Blooms Taxonomy and Knowledge retention(For reference)

(Blooms taxonomy has been given for reference)

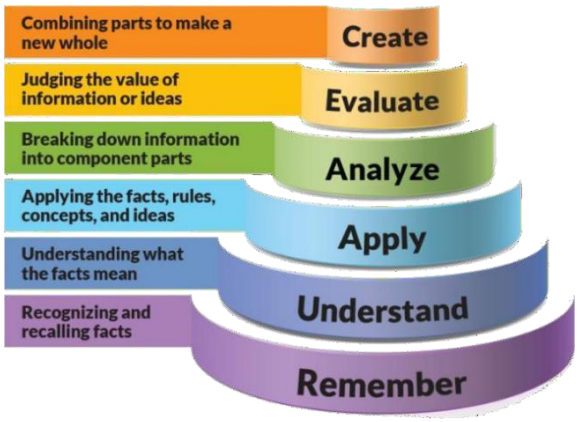


Figure 1: Blooms Taxonomy

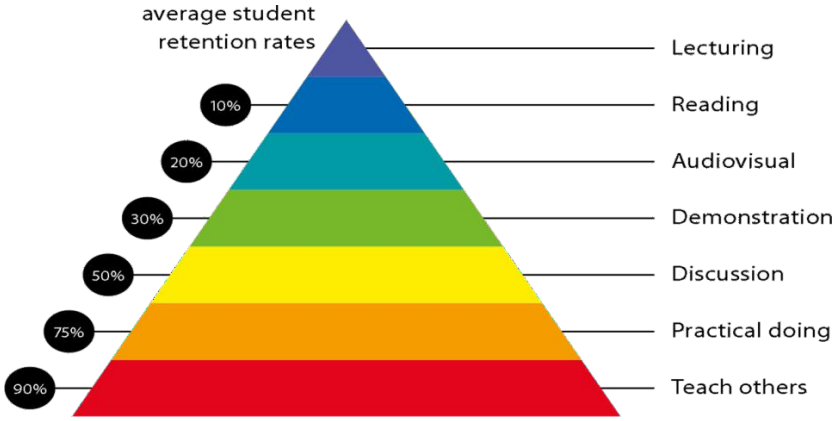


Figure 2: Knowledg eretention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of Graduate Capabilities
Informed Have a sound knowledge of an areaof study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge,grounding & awareness**
Independent learners Engage with new ideas and ways ofthinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing**
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills torespond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**
Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Lecture/tutorial times

Lecture: Wednesday: 11.10 am to 12.20 pm Thursday: 11.10 am to 12.20 am Lab:- Monday: 9.00 am to 11.00 pm (B2 Batch) Friday: 11.10 am to 1.20 pm (B1 Batch)

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for semester examinations.

Details of referencing system to be used

Texts Books

1. Power Plant Engineering, P.K. Nag, McGraw-Hill Education
2. Steam & Gas turbines, R. Yadav, Central publishing House, Allahabad.

Reference Books

1. Power Plant Engineering, R. K. Hegde, Pearson India Education
2. Gas Turbines, V. Ganeshan, McGraw Hill Education
3. Thermal Engineering, R.K.Rajput, Laxmi Publication
4. Steam Turbine Theory and Practice, William J. Kearton, CBS Publication
5. Gas Turbines, Cohen & Rogers, Pearson Prentice Hall

Additional Materials

https://nptel.ac.in/courses/112/107/112107216/

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

CIE Theory 60 Marks Bifurcation		Tentative Duration
10 Marks	Attendance/Class Participation	Academic Session
40 Marks	Mid Sem exam	As per academic Calendar
10 Marks	Assignment (minimum 2)	After Completion of unit/chapter
CIE Practical 60 Marks Bifurcation		**Tentative Duration**
10 Marks	Attendance/Lab Participation	Academic Session
40 Marks	File work/ Journal write up – Calculation etc. related to lab. work	After completion of experiment
10 Marks	Practical Performance /Lab Participation/Q&A based on experiments	After completion of experiment

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in internal component or less than 40% in the end semester will be considered for supplementary assessment in the respective components (i.e internal component or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (internal component or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

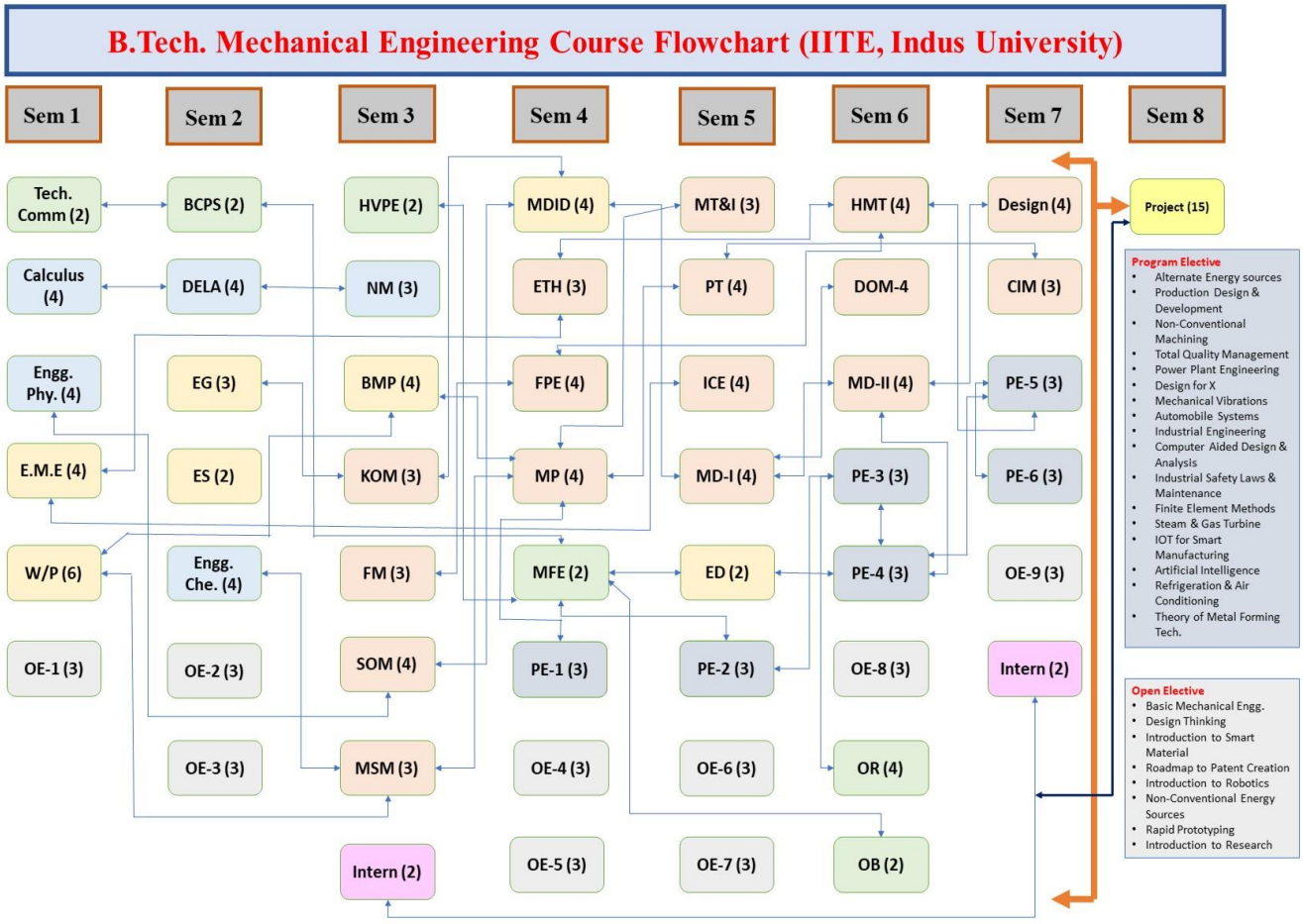
Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.
Do not share your work with other students (except where required for a group activity or assessment).

Course schedule (subject to change)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Steam Nozzles:-Types of nozzles, velocity of steam, discharge through nozzle	1,2	Assignment Submission
	Weeks 2	critical pressure ratio and condition for maximum discharge, physical significance of critical pressure ratio, nozzle efficiency	1,2	Assignment Submission
	Week 3	Steam Turbine Principle of operation, types of steam turbines,	1,2	Assignment Submission
	Week 4	Compounding of steam turbines, impulse turbine velocity diagram,	1,2	Assignment Submission
	Week 5	calculation of work, power and efficiency, condition for maximum efficiency,	1,2	Assignment Submission
	Week 6	Reaction turbines –velocity diagram, degree of reaction, reheat factor,	1,2	Assignment Submission
	Week 7	governing of steam turbine– throttle, nozzle and bypass governing, Methods of attachment of blades to turbine rotor,	1,2	Assignment Submission
	Week 8	Labyrinth packing, Losses in steam turbine, Special types of steam turbine-back pressure, pass out and mixed pressure turbine	1,2	Assignment Submission

	Week 9	Gas Turbine Classification, open and closed cycle, gas turbine fuels, actual Brayton cycle, optimum pressure ratio for maximum thermal efficiency, ,	1,2	Assignment Submission
	Week 10	work ratio, air rate, effect of operating variables on the thermal efficiency and work ratio, and air rate,	1,2	Assignment Submission
	Week 11	simple open cycle turbine with regeneration, reheating and Intercooling	1,2	Assignment Submission
	Week 12	Combined steam and gas turbine plant, requirements of combustion chamber, types of combustion chambers	1,2	Assignment Submission
	Week 13	Gas Dynamics and Jet PropulsionFundamentals of gas dynamics, energy equation	1,2	Assignment Submission
	Week 14	stagnation properties, isentropic flow through nozzle and diffusers, Introduction to shock waves,	1,2	Assignment Submission
	Week 15	Introduction to jet propulsion, advantages and disadvantages of jet propulsion turbojet engine with and without after burner, turboprop, ram jet, pulse jet,	1,2	Assignment Submission
	Week 16	rocket engines – operation, solid and liquid propellants	1,2	Assignment Submission


B.Tech. Mechanical Engineering Course Flowchart (IITE, Indus University)
Sem 1
Sem 2
Sem 3
Sem 4
Sem 5
Sem 6
Sem 7
Sem 8
Tech. Comm (2)
BCPS (2)
HVPE (2)
MDID (4)
MT&I (3)
HMT (4)
Design (4)
Project (15)
Calculus (4)
DELA (4)
NM (3)
ETH (3)
PT (4)
DOM-4
CIM (3)
Engg. Phy. (4)
EG (3)
BMP (4)
FPE (4)
ICE (4)
MD-II (4)
PE-5 (3)
E.M.E (4)
ES (2)
KOM (3)
MP (4)
MD-I (4)
PE-3 (3)
PE-6 (3)
W/P (6)
Engg. Che. (4)
FM (3)
MFE (2)
ED (2)
PE-4 (3)
OE-9 (3)
OE-1 (3)
OE-2 (3)
SOM (4)
PE-1 (3)
PE-2 (3)
OE-8 (3)
Intern (2)
OE-3 (3)
MSM (3)
OE-4 (3)
OE-6 (3)
OR (4)
Intern (2)
OE-5 (3)
OE-7 (3)
OB (2)
Program Elective
Alternate Energy sources
Production Design & Development
Non-Conventional Machining
Total Quality Management
Power Plant Engineering
Design for X
Mechanical Vibrations
Automobile Systems
Industrial Engineering
Computer Aided Design & Analysis
Industrial Safety Laws & Maintenance
Finite Element Methods
Steam & Gas Turbine
IOT for Smart Manufacturing
Artificial Intelligence
Refrigeration & Air Conditioning
Theory of Metal Forming Tech.
Open Elective
Basic Mechanical Engg.
Design Thinking
Introduction to Smart Material
Roadmap to Patent Creation
Introduction to Robotics
Non-Conventional Energy Sources
Rapid Prototyping
Introduction to Research