DARBHANGA COLLEGE OF ENGINEERING

COURSE FILE OF INTERNAL COMBUSTION ENGINE AND GAS TURBINE



FACULTY NAME: Mr. VISHNU SINGH ASST. PROFESSOR DEPARTMENT OF MECHANICAL ENGINEERING

Institute / College Name	Darbhanga College of Engineering, Darbhanga		
Program Name	B. Tech		
Course Code	02 1722		
Course Name	Internal Combustion Engine and Gas Turbine		
Lecture / Tutorial (per week)	3/0	Course Credits 5	
Course Coordinator Name	Mr. Vishnu Singl	1	

1. <u>Scope and Objectives of the course</u>

Due to the wide range of applications of Internal Combustion Engines operated as energy machine in our live, teach the basic knowledge to the students studying Mechanical Engineering about the engine terminology within the scope of the curriculum disclosure of issues such as history, basic concepts, cycle calculation, mixture characteristics, combustion, the actual cycle, knock, power calculations and the gas exchange.

Students will learn analytical approach to the engineering problem and performance analysis of internal combustion engines. Study of thermodynamics, combustion, heat transfer, friction, and other factors affecting engine power, efficiency, and emissions. Design and operating characteristics of different types of engines.

Course Objectives

- 1. To make students familiar with the design and operating characteristics of modern internal combustion engines.
- 2. To apply analytical techniques to the engineering problems and performance analysis of internal combustion engines.
- 3. To study the thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency and emissions.
- 4. To introduce students to the environmental and fuel economy challenges facing the internal combustion engine.
- 5. To introduce students to future internal combustion engine technology and market trends.

2. <u>Textbooks</u>

TB1 Internal Combustion Engines - Fundamentals by Heywood
TB2 Internal Combustion Engines by Arcoumaris (Academic Press).
TB3: Internal Combustion Engines by V Ganesan (Tata McGraw-Hill)
TB4: Internal Combustion Engines by Theory and Practical – Taylor CF
TB5 Gas Turbine Theory by Cohen and Rogers
TB6 Fundamental of Gas Turbine by Bathie WW
TB7 Gas Turbine by V Ganesan (Tata McGraw-Hill)

3. <u>Reference Books</u>

RB1. Internal Combustion Engines - Fundamentals by Heywood **RB1** Gas Turbine by V Ganesan (Tata McGraw-Hill)

Other reading and relevant websites

S. No.	Link of Journals, Magazines, Websites and Research Papers
1	http://www.mechanicalbooster.com/2017/03/difference-between-si-engine-and-ci-engine.html
2	http://www.automobileandengines.com/2017/04/si-engine-working-application-advantages- and-disadvantages.html
3	https://www.linkedin.com/pulse/spark-ignition-vs-compression-engines-chikwado-ugwu
4	https://me-mechanicalengineering.com/differences-between-si-engine-and-ci-engine/
5	http://web.itu.edu.tr/~sorusbay/SI/LN04.pdf
6	https://www.youtube.com/watch?v=9eGgTXfyxbg&t=1829s
7	https://www.youtube.com/watch?v=DjjbItLWNVQ
8	https://www.youtube.com/watch?v=zjwK66zgf-Q
9	https://www.youtube.com/watch?v=3u7d-IIvRqs
10	https://www.youtube.com/watch?v=wtolhku0M
11	https://www.youtube.com/watch?v=qQW5e5hxNfg
12	https://www.youtube.com/watch?v=Kur5XTwmlGc
13	https://www.youtube.com/watch?v=cARVHusTns0
14	https://www.youtube.com/watch?v=QLcxx6MJnbA

4. <u>Course Plan</u>

Lecture Number	Date of Lecture	Topics	Web Links for video Lecture	Books	Page numbers of Text Books
1-3		Introduction:		TB1,RB1	1-39
		Classification of Two strokes, four stroke (SI and CI) engines, engines parts, engines working principle and valve timing diagram.	https://www .youtube.co m/watch?v= 9eGgTXfyx bg&t=1829		
4-6		Engine performance-test	5	TB1.RB1	40-78
		Engine performance-test purpose and types, measurement of power, Engine system & performance parameters evaluation.	https://www .youtube.co m/watch?v= DjjbItLWN VQ		
7-9		Combustion		TB1,RB1	79-152
		Theory of combustion, principle of combustion, S.I. & C. I. Engine combustion process & parameters their dependence on engine variables and operating parameters.	https://www .youtube.co m/watch?v= zjwK66zgf- Q		
10-14		Effects Combustion		TB1,RB1	153-207
		Adiabatic flame temperature, combustion processes & combustion chamber for SI and CI engines pollutant formation and control, effect of engine variables on combustion processes, knowing in SI & CI engines.	https://www .youtube.co m/watch?v= 3u7d-IlvRqs		
15-17		Fuels		TB1,RB1	208-266
		Petroleum based fuel, gasoline & diesel fuel and their properties. Chemically correct air-fuel ratio and load variation.	https://www .youtube.co m/watch?v= wtol hku0M		
18-23		Carburetors & modern air fuel systems		TB1,RB1	266-312
		Carburetors & modern air fuel systems,	https://www .youtube.co		

	compensating devices, venture and jet dimension calculation injection system.	m/watch?v= qQW5e5hx		
24-25	Super charging		TB1.RB1	313-458
		https://www		
	Super charging, engine lubrication and	.youtube.co		
	cooling.	m/watch?v=		
		Kur5XTwm		
		lGc		
26-30	Gas turbine		TB7, RB 2	1-94
		https://www		
	Principle. Simple, open gas turbine cycle,	.youtube.co		
	effect of operating variables on thermal	m/watch?v=		
	efficiency.	cARVHusT		
		ns0		
31-35	Cycles		TB7, RB 2	95-127
		https://www		
	Regenerative reheat cycles, gas turbine	.youtube.co		
	applications, closed cycle gas turbine	m/watch?v=		
		cARVHusT		
		ns0		
36-39	Jet propulsion		TB7, RB 2	128-206
		https://www		
	Working principle, thrust power,	.youtube.co		
	propulsive force and efficiency.	m/watch?v=		
		QLcxx6MJ		
		nbA		
40-42	Rocket engine		TB7, RB 2	207-316
		https://www		
	Theory of operation and its applications,	.youtube.co		
	propellant.	m/watch?v=		
		QLcxx6MJ		
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Evaluation Scheme

Component 1	Mid Semester Examination	20
Component 2	Assignment Evaluation	10
Component 3	End Term Examination ^{**}	70
	Total	100

** The End term Comprehensive Examination will be held at the end of the semester. The mandatory requirement of 75% attendance in all theory classes is to be met for being eligible to appear in this component.

Topics	No. of	Weightage
	Lectures	
Introduction : classification of Two strokes, four stroke (SI and CI) engines, engines parts, engines working principle and valve timing diagram	5	12%
Engine performance-test: purpose and types, measurement of power, Engine system & performance parameters evaluation.	3	7%
Theory of combustion , principle of combustion, S.I. & C. I. Engine combustion process & parameters their dependence on engine variables and operating parameters.	3	7%
Adiabatic flame temperature, combustion processes & combustion chamber for SI and CI engines pollutant formation and control, effect of engine variables on combustion processes, knowing in SI & CI engines.	3	7%
Petroleum based fuel , gasoline & diesel fuel and their properties. Chemically correct air-fuel ratio and load variation.	3	7%
Carburetors & modern air fuel systems , compensating devices, venture and jet dimension calculation, injection system	6	14%
Super charging, engine lubrication and cooling.	2	5%
Gas turbine: Principle. Simple, open gas turbine cycle, effect of operating variables on thermal efficiency.	5	12%
Regenerative reheat cycles, gas turbine applications, closed cycle gas turbine.	5	12%
Jet propulsion: working principle, thrust power, propulsive force and efficiency.	4	10%
Rocket engine: theory of operation and its applications, propellant.	3	7%

SYLLABUS

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Mr. Vishnu Singh	
H.O.D.	Dr. R K Singh	
Principal	Dr. A K Rai	
Date		

Evaluation and Examination Blue Print:

Internal assessment is done through quiz test, presentations, assignments and project work. Two sets of question paper are asked from each faculty and out of these two, without the knowledge of faculty, one question paper is chosen for concerned examination. Examination rules are uploaded on the student's portal. Evaluation is a very important process and the answer sheets of sessional tests, internal assessment assignments are returned back to the students.

The component of evaluations along with their weightage followed by the university is given below.

Sessional Test 1	10%
Sessional Test 2	10%
Sessional Test 3	10%
Assignments/ Quiz Tests/ Seminars	10%
End Term Examination	70%

(From amongst the three sessional tests best of two are considered)