Model Template for Scheme of Course Work

to be submitted by the Faculty of B.Tech/M.Tech/MCA I semester on or before 11.10.2013 to bhanucvk@gvpce.ac.in and yadavalliraghu@yahoo.com

SCHEME OF COURSE WORK

Course Details:

Course Title	**:Fuels &Combustion**		
Course Code	**:** 13ME2312	**L P C**	**: 4 0 3**
Program:	**: M.Tech.**		
Specialization:	**: THERMAL ENGINEERING**		
Semester	**:II**		
Prerequisites	**: Engineering Chemistry , Thermodynamics**		
Courses to which it is a prerequisite	**:NO**		

Course Outcomes (COs):

At the end of the course, the student will be able to

1	Differentiate between various fuels
2	Explain different steps in refinery process of petroleum.
3	Analyze exhaust and flue gases
4	Design of burners
5	Explain methods for emission control in different combustion processes

Program Outcomes (POs)

At the end of the programme, the students in THERMAL ENGINEERING will be able to

PO Code	Program Outcome (PO)
PO 1	exhibit in-depth knowledge in thermal engineering specialization
PO 2	think critically and analyze complex engineering problems to make creative advances in theory and practice
PO 3	solve problem, think originally and arrive at feasible and optimal solutions with due consideration to public health and safety of environment
PO 4	use research methodologies, techniques and tools, and will contribute to the development of technological knowledge
PO 5	apply appropriate techniques, modern engineering tools to perform modeling of complex engineering problems with knowing the limitations
PO 6	understand group dynamics, contribute to collaborative multidisciplinary scientific research
PO 7	demonstrate knowledge and understanding of engineering and management principles and apply the same with due consideration to economical and financial factors
PO 8	communicate complex engineering problems with the engineering community and society, write and present technical reports effectively
PO 9	engage in life-long learning with a high level of enthusiasm and commitment to improve knowledge and competence continuously
PO 10	exhibit professional and intellectual integrity, ethics of research and scholarship and will realize the responsibility towards the community
PO 11	examine critically the outcomes of actions and make corrective measures

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Course Outcome Versus **Program Outcomes:**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		M	M	S	M	M	M				
CO2	M	S		M			M	M				
CO3	M	S	S	M	S	M	M	S				
CO4		S	S	M	S		M	M				
CO5		S	S	M		M	M	S				

S - Strongly correlated, *M* - *Moderately* correlated, *Blank* - *No correlation*

AssessmentMethods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Classification of coal, analysis and properties of coal, oxidation of coal, hydrogenation of coal	CO1	1. Give a brief note on properties of Coal 2. Explain Oxidation and Hydrogenation of coal	▫ Lecture	Assignment (Week 4 - 6) Mid-Test 1 (Week 9)
2	agro fuels, solid fuel handling, analysis of coal	CO1	The following data are available for a coal of certain coal field: Proximate analysis, per-cent air dried Moisture : 1.3, Ash: 16.0, Volatile Matter: 30.1, Fixed Carbon: 52.6 Ultimate analysis per cent d.m.m.f. Carbon: 86.52, Hydrogen: 5.27, Sulphur: 0.64, Nitrogen: 2.37, Oxygen: 5.20 CV: 6890 Kcal/Kg air- dried.(Experimental). Calculate its CV using Goutal formula and modified Dulong formula and compare the computed value with the experimental.	▫ Lecture / Discussion = Problem solving	Mid-Test 1 (Week 9)
3	Classification of petroleum products, Handling and storage of petroleum products, Refining and other conversion processes	CO2	1. Explain briefly about the properties and testing of petroleum. 2. Explain the different stages of petroleum refinery process.	▫ Lecture	Seminar (Week 3 – 4) Mid-Test 1 (Week 9)
4	property and testingof petroleum products, other liquid fuels. Types of gaseous fuels, natural gases, methane from coal mines	CO2	1. Types of gaseous fuels 2. Discuss about the testing of petroleum products	▫ Lecture / Discussion	Assignment (Week 4 - 6) Mid-Test 1 (Week 9)
5	manufactured gases, producer gas, water gas, blast furnace gas, refinerygas, LPG, cleaning and purification of gaseous fuels.	CO2	1. Give a brief notes onproducer gas. 2. Discuss about purification of gaseous fuels	▫ Lecture/ Discussion	Assignment (Week 4 - 6) Mid-Test 1 (Week 9)
6	Stoichiometry relations, theoretical and minimum air required forcomplete combustion, calculation of dry flue gases	CO3	Determine the flue gas analysis and air- fuel ratio by weight when a medium viscosity fuel oil with 84.9% C, 11.4% H, 3.2% S, 0.4% O and 0.1% ash isburned with 30% excess air. Assume complete combustion.	▫ Lecture = Problem solving	Mid-Test 1 (Week 9)

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7	exhaust gas analysis, flue gas analysis	CO3	The flue gas from a coal fired furnace gives the followingOrsat Analysis: CO2 11.5%, CO 1.5% and O2 6.5%. Calculate excess air	▫ Lecture/ Discussion = Problem solving	Mid-Test 1 (Week 9)
8	Orsat analysis	CO3	Determine the flue gas analysis and air- fuel ratio by weight when a medium viscosity fuel oil with 84.9% C, 11.4% H, 3.2% S, 0.4% O and 0.1% ash isburned with 30% excess air. Assume complete combustion.	▫ Lecture/ Discussion = Problem Solving	Mid-Test 1 (Week 9)
9	**Mid-Test 1**	CO1, CO2, CO3			
10	Principles of combustion, rapid methods of combustion	CO3	Explain different types of combustion processes	▫ Lecture ▫ Discussion	Seminar (Week 10) Mid-Test 2 (Week 18)
11	Flamepropagation, various methods of flame stabilization	CO3	1. Explain the methods of flame stabilization	▫ Lecture ▫ Discussion	Mid-Test 2 (Week 18)
12	Basic features of burner, types of solid, liquid and gaseous fuel burners	CO4	1. Explain solid burners 2. Explain different types od gaseous burners	▫ Lecture ▫ Discussion	Assignment (Week 14 - 16) (Mid-Test 2 (Week 18)
13	different types of burners, recuperative and regenerative burners, Pulverised fuel furnaces–fixed, entrained, and fluidized bed systems	CO4	1. Recuperative burners 2. Explain fluidized bed systems	▫ Lecture ▫ Discussion	Seminar (Week 13) (Mid-Test 2 (Week 18)
14	Design of burners	CO4	Explain different design considerations for burners – Solid burners	▫ Lecture	Assignment (Week 14 - 16) (Mid-Test 2 (Week 18)
15	premixed and non-premixed combustion	CO4	Explain the fuel spray behavior for CI Engine	▫ Lecture	Assignment (Week 14 - 16) (Mid-Test 2 (Week 18)
16	Emissions, Emission index, corrected concentrations	CO5	Explain the formation of HC Explain the tradeoff between NOx and HC.	▫ Lecture	Assignment (Week 14 - 16) (Mid-Test 2 (Week 18)
17	**Mid-Test 2**	**C03,CO4,CO5**	Explain the concepts of GDI Give a short notes on HCCI engines	▫ Lecture	Assignment (Week 14 - 16) (Mid-Test 2 (Week 18)
18/20	**END EXAM**				