SHRI VENKATESHWARA UNIVERSITY

Syllabus

M. TECH
Thermal Engineering
(Part -Time)
IV Semester

(w.e.f. 2019-20)

SCHOOL OF ENGINEERING & TECHNOLOGY

	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester			
			L	T	P	CT	TA	Total	PS	TE	PE	Total	Credit
	WTE-401	Steam Engineering	3	1	0	20	10	30		70		100	4
	WTE-042	Modeling of IC Engines	3	1	0	20	10	30		70		100	4
	WTE-411	Refrigeration and cryogenics Lab	0	0	4				25		25	50	2
	WTE-441	Mini-Project	0	0	4				50		50	100	2
		Total										**350**	**12**

WTE-401 Steam Engineering

Course Outcomes:

At the end of the course:

1. Students will have the ability to explain working of different boilers and significance of mountings and accessories.
2. Students will have the ability to use techniques, skills, and modern engineering tools necessary for boiler performance assessment.
3. Students will have a theoretical and practical background in thermal systems, and will have a good understanding of energy conservation fundamentals. Students will have the ability to analyze thermal systems for energy conservation.
4. Students will have the ability to design a steam piping system, its components for a process and also design economical and effective insulation.
5. Students will have the ability to analyze a thermal system for sources of waste heat design a systems for waste heat recovery.

Students will have the ability to design and develop controls and instrumentation for effective monitoring of the process.

Syllabus Contents: **L T P**

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Unit 1 Introduction Fundamentals of steam generation, Quality of steam, Use of steam table, Mollier Chart Boilers ,Types, Mountings and Accessories, Combustion in boilers, Determination of adiabatic flame temperature, quantity of flue gases, Feed Water and its quality, Blow down; IBR, Boiler standards

Unit 2 Piping & Insulation Water Line, Steam line design and insulation; Insulation-types and application, Economic thickness of insulation, Heat savings and application criteria, Refractory- types, selection and application of refractory, Heat loss.

Unit 3 Steam Systems Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Steam Engineering Practices; Steam Based Equipments / Systems.

Boiler Performance Assessment Performance Test codes and procedure, Boiler Efficiency, Analysis of losses; performance evaluation of accessories; factors affecting boiler performance.

Unit 4 Energy Conservation and Waste Minimization Energy conservation options in Boiler; waste minimization, methodology; economical viability of waste minimization

Unit 5 Instrumentation & Control Process instrumentation; control and monitoring. Flow pressure and temperature measuring and controlling instruments, its selection

References:

1. T. D. Estop, A. McConkey, Applied Thermodynamics, Parson Publication
2. Domkundwar; A Course in Power Plant Engineering; Dhanapat Rai and Sons
3. Yunus A. Cengel and Boles, "Engineering Thermodynamics ",Tata McGraw-Hill Publishing Co. Ltd
4. Book II - Energy Efficiency in Thermal Utilities; Bureau of Energy Efficiency
5. Book IV - Energy Performance Assessment for Equipment & Utility Systems; Bureau of Energy Efficiency
6. Edited by J. B. Kitto & S C Stultz; Steam: Its Generation and Use; The Babcock and Wilcox Company
7. P. Chatopadhyay; Boiler Operation Engineering: Questions and Answes; Tata McGrawHill Education Pvt Ltd, N Delhi

WTE-042 Modelling of IC Engine

Course Outcomes:

At the end of the course:

1. Students will demonstrate a basic understanding of several types of engine models that will include zero dimensional thermodynamic model, one dimensional and multi-dimensional, single zone, two zone etc models.
2. Students will develop models and simulate them for diesel engine petrol engine, gas engine**.**

Students will demonstrate the performance evaluation and emission standards for such modeled engines

Syllabus Contents: **L T P**

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Unit1

Fundamentals: Governing equations, Equilibrium charts of combustion chemistry, chemical reaction rates, and approaches of modeling, model building and integration methods, gas exchange through valves, engine and porting geometry, exhaust gas recirculation, valve lift curves.

Unit 2

Thermodynamic Combustion Models of CI Engines: Single zone models, premixed and diffusive combustion models, combustion heat release using wiebe function, wall heat transfer correlations, ignition delay, internal energy estimations, two zone model, application of heat release analysis.

Unit 3

Fuel spray behavior: Fuel injection, spray structure, fuel atomization, droplet turbulence interactions, droplet impingement on walls.

Unit 4

Modeling of charging system: Constant pressure and pulse turbo charging, compressor and turbine maps, charge air cooler.

Unit 5

Mathematical models of SI Engines: Simulation of Otto cycle at full throttle, part throttle and supercharged conditions. Progressive combustion, Autoignition modeling, single zone models, mass burning rate estimation, SI Engine with stratified charge. Friction in pumping, piston assembly, bearings and valve train etc. friction estimation for warm and warm up engines.

References:

1. Haywood, "I.C. Engines", Mc Graw Hill.
2. Ramos **J** (1989**)** Internal Combustion Engine Modeling**.** Hemisphere Publishing Company
3. C. D. Rakopoulos and E. G. Giakoumis, "Diesel Engine Transient
4. Operation Principles of Operation and Simulation Analysis", Springer, 2009.
5. V. Ganeshan, "Internal Combustion Engines", Tata McGraw Hill, New Delhi, 1996.
6. P.A. Lakshminarayanan and Y. V. Aghav, " Modelling Diesel Combustion" Springer, 2010
7. Bernard Challen and Rodica Baranescu, "Diesel Engine Reference Book" Butterworth-Heinemann, 1999.