

**SHRI VENKATESHWARA UNIVERSITY**



**Syllabus**

**M. TECH  
Thermal Engineering  
(Part -Time)  
III Semester**

**(w.e.f. 2019-20)**

**SCHOOL OF ENGINEERING & TECHNOLOGY**

## M.Tech Thermal Engineering (Part Time)

## SEMESTER- III

Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
		L	T	P	CT	TA	Total	PS	TE	PE		
WTE-301	Advanced Fluid Dynamics	3	1	0	20	10	30		70		100	4
<b>WTE-032</b>	<b>Gas Turbines</b>	3	0	0	20	10	30		70		100	3
MLC-101	Research Methodology and IPR	2	0	0	20	10	30		70		100	2
WTE-311	Advanced Fluid Dynamics Lab	0	0	4				25		25	50	2
	<b>Total</b>										<b>350</b>	<b>11</b>

## WTE-301 Advanced Fluid Dynamic

**Course Outcomes:**

At the end of the course:

1. The Students shall be able to understand and define the fluid flow problems along with range of governing parameters
2. The student shall be eligible to take up the fluid flow problems of industrial base.
3. The students shall be able to devise the experiments in the field of fluid mechanics.
4. The Students shall be able understand the flow patterns and differentiate between the flow regimes and its effects.

**Syllabus Contents:****L T P**

3 - -

**Unit 1**

Governing equations in Fluid Dynamics: Derivation of Continuity and Momentum equations using integral and differential approach, dimensionless form of governing equations, special forms of governing equations, integral quantities

**Unit 2**

Exact Solutions of Navier-Stokes Equations: Fully developed flows, parallel flow in straight channel, Couette flow, Creeping flows Potential Flow: Kelvin's theorem, Irrotational flow, Stream function-vorticity approach,

**Unit 3**

Laminar Boundary layers: Boundary layer equations, flow over flat plate, Momentum integral equation for boundary layer, approximate solution methodology for boundary layer equations

**Unit 4**

Turbulent Flow: Characteristics of turbulent flow, laminar turbulent transition, time mean motion and fluctuations, derivation of governing equations for turbulent flow, shear stress models, universal velocity distribution

**Unit 5**

Experimental Techniques: Role of experiments in fluid, layout of fluid flow experiments, sources of error in experiments, data analysis, design of experiments, review of probes and transducers, Introduction to Hot wire Anemometry, Laser Doppler Velocimetry and Particle Image Velocimetry

## References:

1. Muralidhar and Biswas, Advanced Engineering Fluid Mechanics, , Alpha Science International, 2005
2. Irwin Shames, Mechanics of Fluids, , McGraw Hill, 2003
3. Fox R.W., McDonald A.T , Introduction to Fluid Mechanics, John Wiley and Sons Inc, 1985
4. Pijush K. Kundu, Ira M Kohen and David R. Dawaling, Fluid Mechanics, Fifth Edition, 2005

## MTE-032 Gas Turbines

### Course Outcomes:

At the end of the course:

1. Student should understand construction and design features of gas turbines as used for power generation.
2. Student should understand thermodynamics cycles a, and different sizes and layouts of gas turbine plant.
3. Able to understand thermodynamics and fluid mechanics component for enhancing the efficiency and effectively of gas turbines.

### Syllabus Contents:

L T P

3 - -

#### Unit 1

Introduction, Cycles, Performance characteristics and improvement,

#### Unit 2

Gas dynamics, Centrifugal, axial and mixed flow compressor, principles and characteristics, Turbine construction, Blade materials, manufacturing techniques, blade fixing,

#### Unit 3

Problems of high temperature operation, blade cooling, practical air cooled blades Combustion Systems, various fuels and fuel systems,

#### Unit 4

Jet propulsion cycles and their analysis, parameters affecting performance, thrust augmentation, environmental considerations and applications.

### References:

1. H Cohen, GFC Rogers and HIH Saravanamuttoo, "Gas Turbine Theory", Pearson Education, 2000.
2. V. Ganesan, "Gas Turbines", Tata McGraw Hill, 2003.
3. S.M.Yahya "Turbines, Compressors and Fans", Tata McGraw Hill, 1992.
4. Vincent "The theory and design of Gas Turbine and Jet Engines", McGraw Hill, 1950.
5. W W Bathic, "Fundamentals of Gas Turbines", John Wiley and Sons.

**Course Outcomes:**

At the end of this course

Students will be able to Understand research problem formulation.

1. Analyze research related information
2. Follow research ethics
3. Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

**Syllabus Contents:****L T P**

3 - -

**Unit 1:** Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

**Unit 2:** Effective literature studies approaches, analysis Plagiarism, Research ethics,

**Unit 3:** Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

**Unit 4:** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

**Unit 5:** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

**Unit 6:** New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

**References:**

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

3. Ranjit Kumar, 2 nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall , "Industrial Design", McGraw Hill, 1992.
6. Niebel , "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technologies"
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008