

Course Code	PEC1D_DE301				<b>Semester -3 (Three)</b>
Course Category	Professional Elective Courses				
Course Title	Mechanics of Composite Materials				
Scheme and Credits	L 2	T 1	P 2	Credits 4	

Introduction to composite materials, constituents application, general characteristics, characteristics of fibers and matrices, lamina constitutive equations, lamina assumptions, macroscopic viewpoint, generalized Hooke's law, reduction to homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix ( $Q_{ij}$ ), typical Commercial material properties, rule of mixtures, generally orthotropic lamina –transformation matrix, transformed stiffness. definition of stress and moment resultants, strain displacement relations, laminate constitutive equations, balanced laminates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties from laminate tests, quasi-isotropic laminates, determination of lamina stresses within laminates, maximum stress and strain criteria, *Von-Misses* Yield criterion for Isotropic materials, meneralized Hill's criterion for anisotropic materials, Tsai-Hill's failure criterion for composites, tensor polynomial (Tsai-Wu) failure criterion, prediction of laminate failure, equilibrium equations of motion, energy formulations, static bending analysis, buckling analysis.

#### Text Books Recommended

1. R. M. Jones, *Mechanics of composite materials*, Second. CRC Press.

#### References

1. O. Ishai, Isaac M. Daniel, *Engineering Mechanics of Composite Materials*, Second. Oxford University Press
2. B. D. Agarwal, L. J. Broutman, and K. Chandrashekhara, *Analysis and performance of fiber composites*. John Wiley, 2006.
3. M. W. Hyer, "Stress Analysis of Fiber-Reinforced Composite Materials," 2009.

Course Code	PEC2D_DE301				<b>Semester - 3 (Three)</b>
Course Category	Professional Elective Courses				
Course Title	Dynamics of Compressible Flow				
Scheme and Credits	L 2	T 1	P 2	Credits 4	

Introduction and review of basic thermodynamics, normal shocks, oblique shocks, expansion waves, area- mach relationship, unsteady shock waves, wave propagation, method of characteristics, application of the method of characteristics, design of a minimum length nozzle, flow through a diverging channel flow over a wavy wall, formulation using perturbation theory, subsonic flow and supersonic flow over a wavy wall, supersonic flow past a  $3d$  cone.

#### Text Books Recommended

1. J. D. Anderson, "Modern compressible flow : with historical perspective," p. 760, 2003.

#### References

1. A. H. Shapiro, "The dynamics and thermodynamics of compressible fluid flow (*Volume 1*)," 1953.
2. A. H. Shapiro, *The Dynamics and Thermodynamics of Compressible Fluid Flow (Volume 2)*. Wiley, NY.
3. A. R. Liepmann, Hans Wolfgang, *Elements of Gasdynamics*.
4. M. A. Saad, *Compressible fluid flow*. Prentice Hall, 1993.

Course Code	PEC3D_DE301				
Course Category	Professional Elective Courses				
Course Title	Mechanical Vibrations of Continuous Systems				
Scheme and Credits	L	T	P	Credits	Semester - <b>3</b> (Three)
	2	1	2	4	

Longitudinal vibration of bars, equation of motion, free vibration solution and natural frequencies, solution using separation of variables, orthogonality of eigenfunctions, free vibration response due to initial excitation, forced vibration, response of a bar subjected to longitudinal support motion, transverse vibration of beams, equation of motion, Euler–Bernoulli, free vibration equations, beam simply supported with different support conditions, orthogonality of normal modes, free vibration response due to initial conditions, forced vibration, response of beams under moving loads, transverse vibration of beams subjected to axial force, beam on an elastic foundation, beam on an elastic foundation, raleigh and Timoshenko's theory, transverse vibration of plates, classical plate theory, equilibrium approach, variational approach, free vibration of rectangular plates, solution for a simply supported plate, solution for plates with other boundary conditions, forced vibration of rectangular plates, free and forced vibration of circular plates, effects of rotary inertia and shear deformation, plate on an elastic foundation, transverse vibration of plates subjected to in-plane loads.

#### Text Books Recommended

1. S. S. Rao, *Mechanical Vibrations of Materials*, Fith. Pearson, Prentice Hall, 2011.

#### References

1. Singiresu S. Rao, *Vibration of Continuous Systems*. John Wiley & Sons, 2019.

Course Code	DSV_DE302				
Course Category	Dissertation, Seminar and Professional Viva				
Course Title	Seminar				
Scheme and Credits	L	T	P	Credits	Semester - <b>3</b> (Three)
	0	0	6	3	
Pre requisites					

#### Course Objectives:

The seminar curriculum pedagogy is designed to focus on approaches for planning, creating, and transmitting technical information within a variety of technical situations found in the global employment and professional marketplace. The seminar curriculum will adhere to the domains of workplace professional/ technical writing, successful and effective presentation design in the emerging technical scenario.

#### Course Plan:

Each student shall identify a topic of current relevance mechanical engineering branch, get approval of faculty concerned, collect sufficient literature on the topic, study it thoroughly, prepare a presentation and report and will be later on assessed before an expert committee constituted by the concerned department on the basis of:

1. Quality of content presented
2. Proper planning for presentation.

3. Effectiveness of presentation.
4. Report writing based on the Literature, fundamentals of the topic, and state of art application

The objectives and learning outcomes of the seminar are:

- To Ensure that students are made **aware** about the basic and core communication frameworks, tools, frameworks and typologies,
- To ensure that students are able to **enhance** their personal, professional communication skills through seminar mode teaching-learning pedagogy,
- To **understand** the individual and team/group level communication styles through experiential understanding, learning and application of emerging communication techniques
- To **develop** problem solving and analytical skills in global-cross cultural business communication and awareness of challenges required for successful communication within and outside multinational organizations
- To **enhance** the communication skills across variety of formal and informal networks,
- To **understand** the ethical approach for roles and responsibilities as business communicators through case discussions of technical/business dilemmas and problems
- To ensure **application** of the modern data analysis and visualisation software's for enhanced presentation/communication modules so that to incorporate the professional use of technology in communications.

Course Code	DSV_DE303			
Course Category	Dissertation, Seminar and Professional Viva			
Course Title	Professional Viva			
Scheme and Credits	L	T	P	Credits
	0	0	0	3

**Semester - 3 (Three)**

#### Course Plan:

Each student will have to appear at a viva voce examination in front of a board of examiners composed of faculty members from all the specializations on all subjects completed during the course of his/her Postgraduate study. Viva-voce is intended to assess the student's understanding of the subjects he/ she studied during the M.Tech. course of study.

**Comprehensive** Viva-Voce enables a successful student to **demonstrate** knowledge in the program domain, **present** his views cogently and precisely, **exhibit** professional etiquette suitable for career progression

Course Code	DSV_DE305				
Category	Dissertation, Seminar and Professional Viva				
Course Title	Dissertation Phase-I				
Scheme and Credits	L	T	P	Credits	Semester- <b>3</b> (Three)
	0	0	16	8	
Pre requisites	-				

**Course Plan:**

The dissertation work will start in semester 3 (Three) and should preferably be a problem with research potential and should involve scientific research, design, generation/ collection and analysis of data, determining solution and must preferably bring out the individual contribution. The examination shall consist of the preparation of a report consisting of a detailed problem statement and a literature review. The preliminary results (if available) of the problem may also be discussed in the report. The candidate has to be in regular contact with his supervisor and the topic of dissertation must be mutually decided by the supervisor and student. The work has to be later on presented/ assessed before an expert committee constituted by the concerned Head / Coordinator of the department and **Project and Training Incharge (PTI)**, on the basis of:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Dissertation writing based on the state of art, fundamentals of the topic and its viability (A dissertation is documentation of a research of a student- a record of the original research done by the student during his M. Tech. program and provides information on the student's research work to future researchers).

