Shri Rawatpura Sarkar University, Raipur

Examination Scheme & Syllabus

for

M.Tech.(Mining Engineering)

Semester-III

(Effective from the session: 2019-20)

Faculty of Engineering,
Shri Rawatpura Sarkar University, Raipur

M.Tech.(Mining Engineering)
Semester-III
Examination Scheme
(Effective from the session: 2022-23)

S.N	Course Code	Th/ Pr	Subject	Type of Course	Teaching hours per week			TC	Examination Scheme				Total Marks
					L	T	P		Theory		Practical		
									EX	IN	EX	IN	
1	MENMN301	Th	Elective –V	Core	4	-	-	4	70	30	-	-	100
2	MENMN302	Th	Open Elective	Core	4	-	-	4	70	30	-	-	100
3	MENMN303	Pr	Technical paper writing and seminar	Core	-	-	4	2	70	30	-	100	100
4	MENMN304	Pr	Dissertation Phase-I / Industrial Project (To be continued and Evaluated next Semester)	Core	-	-	28	14	-	-	140	60	200
	Total Contact hr per week: 40			**Total Credit: 24**					**Grand Total Marks:**				**500**

L: Lecture T: Tutorial P: Practical

Elective-V

S.NO.	Subject Name	Subject Code
1	Introduction to Petroleum Engineering	MENMN301A
2	Finite Element Analysis	MENMN301B

Open Elective

S.NO.	Subject Name	Subject Code
1	Research Methodology	MENMN302A
2	Computational Fluid Dynamics	MENMN302B

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Course Title	**INTRODUCTION TO PETROLEUM ENGINEERING**				
Course Code	**MENMN301A**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**General Science**				
Course objectives	**This course will enable students to:** • Maximize oil and gas production in a cost-effective manner. • Analyze the major exploration techniques, seismic methods, well testing • Distinguish between major enhanced oil and gas recovery techniques.				
Course Contents	**UNIT – I** **Introduction** What is Petroleum Engineering & Significance? Introduction Petroleum Industry- Upstream, Sector – Midstream Processing-Downstream Processing-Indian and World Scenario of Petroleum and Natural Gas- Petroleum Trade-Geopolitics. **UNIT - II** **Upstream Sector-1** Exploration & Ramp; Production – Indian and World Scenario of Petroleum and Natural Gas, Resources-The Reservoir –Reservoir fluids- Hydrocarbon Phase diagrams- Onshore and Offshore, Reservoirs – Reservoir Drives. **UNIT – III** **Upstream Sector-2** Exploration and Drilling Rigs- Rig Components-Drill and drill bits- Drilling Fluids-Well Completions. Production System: Sketches of Well - Well head-Christmas tree and Casing and various other parts. Cementing-Safety Systems- Subsea Wells: Drilling & Completion and Production, Artificial Lift: Principles and operation of Rod Pumps – Downhole Pumps – Gas Lift – Plunger Lift-Electrical submersible pumps. Well Workover and Intervention- Well Stimulation: Matrix Acidizing and Hydro-fracturing. **UNIT - IV** **Gathering of Oil & Ramp; Gas and Storage** Well Tubing- Separation of Reservoir Fluids- Manifolds and Gathering – Production Separators –Gas Treatment and Compression - Oil & Gas Storage, Metering and Export. Midstream processing: Transportation of Crude Oil & its Products and Natural Gas-World and Indian pipeline scenario-Design of Oil and Gas pipelines - Safety aspects of pipelines. Environmental issues.				

	UNIT - V **Downstream Processing** Crude Oil Refining: Classification and Composition – Constituents - Products and their specifications– Pre-treatment of crude oil- Refinery distillation- Safety in refinery operations.
Course Outcomes	**After the completion of course:** • The students will be able to understand the role of petroleum engineers in various facets of petroleum exploration, production, transportation, refining and processing. • Students get motivated to work for the energy security after knowing the present scenario of petroleum and natural gas.
Text Books	1. Havard Devold, Oil and Gas Production Handbook: An Introduction to Oil & Ramp; Gas 2. John R. Fanchi and Christiansen, R.L., Introduction to Petroleum Engineering, John
Reference Books	1. Ericson CA. Fault tree analysis primer. Create Space Independent Publishing Platform. 2011. 2. Wahab KA. New technology in health and safety. SMME. 1992.

Course Title	**FINITE ELEMENT ANALYSIS**				
Course Code	**MENMN301B**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**Mathematics**				
Course objectives	**This course will enable students to:** • The basic concepts of Finite Element methods and its applications to complex engineering problems. • The characteristics and selection of different finite elements used in finite element methods. • The equilibrium equations and stress-strain relations for different boundary conditions encountered in structural and heat transfer continuum problems. • The application of the FEM technique to dynamic problems and validate the solutions through simulation software for real time applications.				
Course Contents	**UNIT – I** **Introduction** Background - General description of the method - Analysis Procedure. Node numbering – Mesh generation - Linear constitutive equations - Plane stress, Plane strain and axisymmetric cases of elasticity - Energy principles Variational methods – Raleigh-Ritz method– Galerkin Method. **UNIT - II** **One Dimensional Problems** Finite element modelling – Coordinates and shape functions –Linear and quadratic elements - Applications to axial loadings of rods – Extension to plane trusses – Bending of beams Element, Finite element formulation of stiffness matrix and load vectors – Assembly for global equations – Boundary conditions. **UNIT – III** **Two Dimensional Problems** Convergence requirements - Constant Strain Triangular (CST), Element – Rectangular Element -Finite element modelling - Element equations, Load vectors and boundary conditions – Assembly - shape functions from Lagrange and serendipity family–Application to heat transfer. **UNIT - IV** **Isoparametric Formulation** Introduction – Coordinate Transformation –Basic theorem of Isoparametric concept – Uniqueness of mapping – Isoparametric, Sub parametric and Super				

	parametric elements – Assembling Stiffness matrix – Numerical Examples. **UNIT - V** **Applications** Application of displacement finite elements to the analysis of simple problems (One and two-dimensional cases) in the area of structural mechanics. Computer Programs: Development of computer programs for an axial and beam bending elements – Programming and use of computer packages for design of underground excavations, mining structures, slope and dump stability, design of supports, etc.
Course Outcomes	**After the completion of course:** • Recall potential energy concepts or vibrational methods for solving complex structural geometries • Illustrate finite element modelling of triangular, axi-symmetric and four noded elements for obtaining shape functions of two-dimensional elements. • Utilize the concepts of shape functions for developing stiffness matrix of triangular, axisymmetric and four noded elements. • Demonstrate the physical models of truss and beam elements by applying finite element method for displacements, stresses and strains.
Text Books	1. Krishnamoorthy, C.S, Finite Element Analysis Theory & Programming, McGraw-Hill, 1995. 2. Desai C.S and Abel,, J.F., Introduction to Finite Element Method, Affiliated East West Press Pvt. Ltd., New Delhi, 2000 3. Chandrupatla T.R., and Belegundu A.D., "Introduction to Finite Elements in Engineering", Pearson Education, 2011, 4th Edition.
Reference Books	1. Bhavikkatti, S.S. Introduction to Finite Element Analysis –Newage International (P) Limited Publishers, New Delhi, 2011. 2. Bathe. K.J., "Finite Element Procedure", Prentice Hall of India, New Delhi, 2006.

Course Title	**COMPUTATIONAL FLUID DYNAMICS**				
Course Code	**MENMN302B**				
Course Credits	**L**	**T**	**P**	**TC**	
	4	**-**	**-**	**4**	
Prerequisites	**Knowledge of a scientific programming language**				
Course objectives	**This course will enable students to:** • Introduce the student to widely used techniques in the numerical solution of fluid equations. • Arise in the solution of such equations, and modern trends in CFD. • Emphasis will be on 'learning by doing', as students will work on programming projects for assignments.				
Course Contents	**UNIT – I** Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions. Derivation of finite difference equations. Solution methods: Solution methods of elliptical equations – finite difference formulations, interactive solution methods, direct method with Gaussian elimination. Parabolic equations-explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tridiagonal matrix algorithm. **UNIT – II** Hyperbolic equations: Explicit schemes and Von Neumann stability analysis, implicit schemes, multi-step methods, nonlinear problems, second order one-dimensional wave equations. Burger's equations: Explicit and implicit schemes, Runge-Kutta method. **UNIT – III** Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods. Treatment of compressible flows: potential equation, Euler equations, Navier-stokes system of equations, Flow field-dependent variation methods, boundary conditions, example problems. **UNIT – IV** Finite volume method: Finite volume method via finite difference method, formulations for two and three-dimensional problems. **UNIT – V** Standard variational methods: Linear fluid flow problems, steady state problems, Transient problems.				

Course Outcomes	**After the completion of course:** 1. This is the foundation of research and development in the computational domain of engineering and technology. 2. As the prerequisite, this will be traced the thought and ideas to design the behavioral tools over the engineering range. 3. Transformation from theory to application through measuring theory of natural problems and its applications.
Text Books	1. Manahan S.E. Environmental Science and Technology. 2. Mackenthun, K.M. Basic Concepts in Environmental Management, Lewis Publications, London, 1998. 3. Noel de Nevers, Air Pollution Control Engg., McGraw Hill, New York, 1995
Reference Books	1. Anjaneyulu, Y. Air Pollution & Control Technologies, Allied Publishers (P) Ltd, India, 2002. 2. Nick Hanley, Jaison F. Shogren and Ben White. Environmental Economics – In Theory and Practice, Macmillan India Ltd, New Delhi, 1999. 3. Roger Perman, Yue Ma and James McGilvray. Natural Resources and Environmental Economics, Second edition, Addision Wesley Longman Ltd, Singapore, 1997.

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Course Title	**TECHNICAL PAPER WRITING AND SEMINAR**				
Course Code	**MENMN303P**				
Course Credits	**L**	**T**	**P**	**TC**	
	-	**-**	**4**	**2**	
Prerequisites	Industrial report writing and paper writing				
Course Objectives	**This course will enable students to:** • Describe the research process. • Outline the elements of a thesis/dissertation. • Select a research topic of importance to the profession. • Effectively work with their academic advisor and graduate committee. • Develop and follow an appropriate timeline for completion of the thesis/dissertation. • Identify an appropriate theory base for their research. • Develop a conceptual model relevant to their research.				
Course Contents	1. Each student will select a topic in the area of power system engineering and related area in the state of art area & technical development. 2. The topic will be decided by the Student, Guide and Departmental research committee. 3. Each student will make seminar presentation with audio/video aids, for the duration of 45 minutes and seminar work shall be in form of report to be submitted by the students at the end of the semester. 4. This report copies must be duly signed by guide and Head of Department. Attendance of all students for all seminars is compulsory. 5. Define the statement of research problem 6. Literature survey, familiarity with research journals 7. Broad knowledge off the available techniques to solve the problems 8. Technical writing skills 9. Presentation skills				
Course Outcomes	After the completion of course: • Acceptable with minor or no revisions (no further approval required) • Acceptable with major revisions in content or format not acceptable				
Reference Books	1. Student will learn to survey the relevant literature such as books, national/international referred journals and contact resource persons for the selected topic of research.				

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<table>
<tr><td>Course Title</td><td colspan="5">PRE-DISSERTATION (LITERATURE REVIEW/ PROBLEM FORMULATION/ SYNOPSIS)</td></tr>
<tr><td>Course Code</td><td colspan="5">MENMN304P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>-</td><td>-</td><td>28</td><td>14</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Paper writing</td></tr>
<tr><td>Course Objectives</td><td colspan="5">This course will enable students to:
• Demonstrate the skills for good presentation and technical report writing skills.
• Apply engineering and management principles while executing the project.</td></tr>
<tr><td>Course Contents</td><td colspan="5">1. Each student will select a topic in the area of power system engineering and related area in the state of art area & technical development.
2. Every student will carry out dissertation under the supervision of a supervisor.
3. The topic shall be approved by a committee constituted by the Head of the concerned department.
4. Every student will be required to present two seminar talks, First at the beginning of the Dissertation (Phase-I)to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester.
5. The committee constituted will screen both the presentations and work.
6. Define the statement of research problem
7. Literature survey, familiarity with research journals
8. Broad knowledge off the available techniques to solve the problems
9. Technical writing skills
10. Presentation skills</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">After the completion of course:
• Student will learn to survey the relevant literature such as books, national/international referred journals and contact resource persons for the selected topic of research.
• Students will be able to use different experimental techniques.
• Students will be able to use different software/computational/analytical tools.
• Students will be able to design and develop an experimental set up/equipment/test rig.
• Students will be able to conduct tests on existing set ups/equipments and</td></tr>
</table>

	draw logical conclusions from the results after analyzing them. • Students will be able to either work in a research environment or in an industrial environment.
Reference Books	1. Student will learn to survey the relevant literature such as books, national/international referred journals and contact resource persons for the selected topic of research. 2. Roberts, C. M. (2010). The dissertation journey. Thousand Oaks, CA: Corwin.