PANDIT DEENDAYAL ENERGY UNIVERSITY
Formerly
PANDIT DEENDAYAL PETROLEUM UNIVERSITY
Raisan, Gandhinagar – 382 426, Gujarat, INDIA, Website : www.pdpu.ac.in
NAAC Accredited 'A' Grade (CGPA 3.39 out of 4.00)
NIRF India Rankings 2021: 73rd in University, 68th in Engg., & 66th in Management category.
UGC Recognized
19200

A Board of Studies in Petroleum Engineering meeting was held on **18th August 2022,** where following members along with invited members and students were present.

1) Dr. Bhawanisingh G. Desai – BOS- chairman
2) Dr. Uttam K. Bhui-BOS member
3) Dr. P. Sivakumar-BOS member
4) Prof. M. A Chaudhry-Invited expert
5) Prof. Anirbid Sircar-Invited member
6) Prof. R. K. Vij-Invited member
7) Dr. Hari S. Invited member
8) Dr. Maunish Shah- Invited member
9) Dr. Vivek Ramalingam- Invited member
10) B. Tech Students Ms. Misha Sablok Roll. No. 21BPE068
11) B. Tech Students Mr. Jatin Nakrani Roll. No. 19BPE059
12) M. Tech Student- Mr. Prashant Saini
13) Ph.D student-Mr. Ajendra Singh

Agenda for the Board of Studies in Petroleum Engineering on 18th August 2022

1) Minor Modification in Numerical Methods Practical (20PEB227) –Revision of CO
2) Minor Modification in Engineering Drawing (20PEB106P)- Revision of CO
3) Minor revision in Advance production Engineering and management (20PEB401) - few topic added in Unit-1.
4) Minor revision in Thermodynamics of petroleum reservoir fluids (20PEB203) - few topics added in unit-1 & 2.

The above points were discussed and considered for inclusion in the respective syllabus.

Dr. Bhawanisingh Desai (BOS Chairman)	Dr. Uttam K. Bhui (BOS Member)	Dr. Sivakumar P. (BOS Member)	Prof. M A Choudhry (Invited Expert)
Prof. Anirbid Sircar (Invited Member)	Prof. R K Vij (Invited Member)	Dr. Hari S. (Invited Member)	Dr. Maunish Shah (Invited Member)
Dr. Vivek Ramalingam (Invited Member)	Ms. Misha Sablok (B.Tech Student)	Mr. Jatin Nakrani (B.Tech Student)	Mr. Prashant Saini (M.Tech Student)

20PEB106P					ENGINEERING DRAWING					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	0	0	0	50	50	100

COURSE OBJECTIVES

- Demonstrate various graphical projections.
- Improve analytical skills to understand design blueprints.
- Improve skills to prepare designs blueprints for mechanical parts.
- Develop skills to plan site layout for exploration activities

UNIT 1 12 Hrs.

Introduction to Engineering Graphics. Drawing instruments and accessories, lines and dimensioning. BIS -SP46. Use of plane scales and Representative Fraction. Introduction to Engineering curves and their classification. Introduction to principal planes of projections. Projections of the points. Projections of line and True length of line determination when inclined to two reference planes.

UNIT 2 10 Hrs.

Orthographic Projections: Principle of projection, Principal Planes of projection, Projections from the pictorial view of the object on the principal planes using first angle projection method and third angle projection method. Sectional View: Principle and applications

UNIT 3 10 Hrs.

Isometric Projections and Isometric View or Drawing: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.

UNIT 4 20 Hrs.

Introduction to software such as AutoCAD and ProE/Soildworks. Understanding the fundamentals of 3D printing and application in oil and gas industries

COURSE OUTCOMES (Existing)

On completion of the course, student will be able to

CO1- Draw engineering curves and apply it for designing various equipment components.

CO2- Apply the concept of engineering scale and projection of line for various engineering application and preparation of geological maps.

CO3- Apply the concept for developing product for solids and sheet metal working.

CO4- Comprehend as well as prepare the orthographic drawings of parts and assembly for communication with engineers or workers for designing, analysis, manufacturing and marketing

CO5- Comprehend and develop the assembly drawings in three dimensions.

COURSE OUTCOMES (Revised)

On completion of the course, student will be able to

CO1- Apply the concept of engineering scales and understand the application of various engineering curves.

CO2- Demonstrate the concept of projection of line for various engineering application.

CO3- Prepare an orthographic and sectional orthographic views of any given object and comprehend the drawings to extract complete information of the object.

CO4- Construct an isometric view and isometric projection of any object from provided orthographic views.
CO5- Create 2D and 3D engineering drawings by using AutoCAD software.
CO6- Demonstrate the understanding of 3D CAD software and 3D printing fundamentals and their application in oil and gas industries.

CO-PO Mapping

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	1	2	-	-	-	-	-	-	-	-	2
CO-2	3	2	2	2	-	-	-	-	-	-	-	1
CO-3	3	1	3	2	2	-	-	-	2	3	-	3
CO-4	3	1	3	-	2	-	-	-	1	3	-	2
CO-5	3	2	3	2	3	-	-	-	3	3	-	3
CO-6	3	2	2	2	3	-	-	-	-	-	-	2

20PEB227					Numerical Methods Practical					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

1. To develop the mathematical skills of the students in the areas of numerical methods
2. To teach theory and applications of numerical methods in a large number of engineering subjects which require solutions of linear systems, finding eigen values, eigenvectors, interpolation and applications, solving ODEs, PDEs and dealing with statistical problems like testing of hypotheses.
3. To lay foundation of computational mathematics for post-graduate courses, specialized studies and research

UNIT 1 07 Hrs.

Data representation, error analysis, introduction to MATLAB, Applied MATLAB programming. Numerical Solution of Algebraic & Transcendental equations: Bisection Method, Method of false position, Secant method, Iteration method, Extended method of iteration, Newton-Raphson method, Newton-Raphson method for multiple roots. Comparison of various methods.

UNIT 2 10 Hrs.

Interpolation: Newton Gregory Forward Interpolation Formula, Newton Gregory Backward Interpolation Formula, Gauss's Forward and Backward Interpolation Formula, Stirling's Central Difference Formula, Lagrange's Interpolation Formula for unevenly spaced Formula, Inverse Interpolation, Divided Differences, Newton's Divided Difference Formula.

UNIT 3 08 Hrs.

Numerical Integration: Trapezoidal rule, Simpson's one-third rule, Simpson's Three-Eighth rule, Weddle's rule, Romberg's method, Double Integration.
Solution of Simultaneous Algebraic Equations: Gauss-Jacobi's method, Gauss-Seidal method.
Numerical Solution of Ordinary Differential Equation: Taylor's method, Euler's method, Runge – Kutta method, Modified Euler's method, Predictor Corrector method: Adam's method& Milne's method.

UNIT 4 04 Hrs.

Numerical Solution of Partial Differential Equation: Bender-Schmidt method Crank- Nicholson method.

COURSE OUTCOMES (Existing)

On completion of the course, student will be able to
CO1 - Enable students to understand various concepts of numerical methods
CO2 - Enable students to understand the theoretical concepts of numerical methods
CO3 - Enable students to various applications of numerical methods in petroleum engineering
CO4 - Enable students to solve and applied differential equation by finite elements methods
CO5 - <>

CO6 - <>

COURSE OUTCOMES (Revised)

On completion of the course, student will be able to

CO1 – Utilize MATLAB programming language as tool to solve numerical problems.

CO2 – Apply various bracketing and open root methods for solving non-linear equations.

CO3 – Select an appropriate interpolation technique and apply to solve engineering problems.

CO4 – Perform numerical integration for a given problem.

CO5 – Solve boundary and initial value problems using finite difference technique.

CO6 – Categorize and select the most suitable numerical technique to solve given petroleum engineering problem.

List of Experiments	
1. Introduction to MATLAB programming language.	CO1
2. Structured programming, nesting & indentation in MATLAB programming.	CO1
3. Numerical Solution of Algebraic & Transcendental equations by Direct Methods.	CO1, CO2
4. Numerical Solution of Algebraic & Transcendental equations by Iterative Methods.	CO1, CO2, CO6
5. Interpolation Techniques: Newton Gregory Forward Interpolation, Newton Gregory. Backward. Interpolation, Gauss's Forward and Backward Interpolation, Stirling's Central Difference.	CO1, CO3, CO6
6. Interpolation Techniques: Lagrange's Interpolation, Inverse Interpolation, Divided Differences, Newton's Divided Difference.	CO1, CO3, CO6
7. Numerical Integration: Trapezoidal rule, Simpson's one-third rule, Simpson's Three-Eighth rule, Weddle's rule, Romberg's method, Double Integration.	CO1, CO4
8. Solution of Simultaneous Algebraic Equations: Gauss-Jacobi's method, Gauss-Seidal method.	CO1, CO5, CO6
9. Numerical Solution of Ordinary Differential Equation: Taylor's method, Euler's method, Runge – Kutta method, Modified Euler's method, Predictor Corrector method: Adam's method& Milne's method.	CO1, CO5, CO6
10. Numerical Solution of Partial Differential Equation: Bender-Schmidt method Crank- Nicholson method.	CO1, CO5, CO6

CO-PO Mapping

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	3	1	1	2	3	-	-	-	-	3	-	3
CO-2	3	3	2	2	3	-	-	-	-	2	-	2
CO-3	3	3	2	3	3	-	-	-	-	2	-	2
CO-4	3	3	2	3	3	-	-	-	-	2	-	2
CO-5	3	3	2	3	3	-	-	-	-	2	-	2
CO-6	3	3	3	3	3	-	-	-	-	2	-	3

20PEB401				ADVANCED PRODUCTION ENGINEERING AND MANAGEMENT						
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- Demonstrate the concepts of Production enhancement.
- Develop skills to predict bottlenecks and optimize production system.
- Develop Skills to design Stimulation Jobs
- Develop Skills to analyse reasons for excessive Production of Sands & Water and design remedial measures.

Unit I **Hours: 8**

Production Enhancement: Introduction: An overview of various production enhancement techniques, Well Analysis and Remedial Measures, Low Productivity – Stimulation, Excessive Production of unwanted fluid, Water Control, Sand Control, Production Optimization, CTU:- a new generation work over rig, conventional and advanced applications, for cost effective treatment.

Unit-II **Hours: 14**

Stimulation: Concept of Formation damage, Type & description of stimulation techniques to mitigate formation damage problem and address issues of low productivity, Design of matrix acidization and acid fracturing. Design of hydraulic fracturing, Multistage fracturing.

Unit III **Hours: 12**

Control of Excessive Production of unwanted fluid: Reasons for excessive production of oil & gas, Causes and hazards of excessive sand production. Industry practices to contain their production. Water Control techniques-Reasons, identification and control techniques, Sand Control Techniques Reasons, identification and control techniques

Unit IV **Hours: 5**

Production optimization: Modelling, Monitoring and Control, optimization processes.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Analyse/identify the bottleneck in the production system & suggest remedial measures.

CO2- Analyse the reasons of Formation damage and evaluate it so as to suggest proper preventive measures and design right remedies.

CO3- Design of well stimulation techniques like hydraulic fracturing and matrix acidization.

CO4- Analyse the current IPR and predict the future IPR upon implementation of suggested measures.

CO5- Evaluate the causes of unwanted production fluid such as sand and water and remedial measures to be adopted.

CO6- Evaluate the production system in totality and redesign it for optimizing operations and cost.

TEXT / REFERENCE BOOKS

1. Dr. Guo Boyun, Computer Aided Petroleum Production Engineering
2. H Dale Begg, Production Optimization. OGCIPublication.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

PART A: Part A/Question: <Short Notes, Problems, Numericals> **20 Marks**

PART B:<Justification, Criticism, Long answers, Interpretation > **80 Marks**

20PEB203					Thermodynamics of Petroleum Reservoir Fluids					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	-	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To provide the understanding of fundamentals of thermodynamics of reservoir fluids and their phase behaviour
- To provide the concept and understanding of fluid sampling and PVT study
- To provide the understanding of compositional characterization and application of various correlations in real field and simulation application

Unit-1 Reservoir fluids and Hydrocarbon phase behaviour **10 Hrs.**

Reservoir and reservoir fluids, Hydrocarbon-formation in source rock and crude oil in reservoirs, Thermodynamic behavior – single, two, three and multicomponent system. Physical properties of petroleum reservoir fluids, classification of reservoirs and reservoir fluids

Unit 2 Properties Hydrocarbon components, characterization and correlation **10 Hrs.**

Natural gas properties, behavior of ideal and real gases. Characterizing Hydrocarbon-plus fractions: generalized correlations, PNA determination, splitting and lumping scheme including various correlation methods.

Unit 3 Sampling, PVT properties and laboratory study of PVT **10 Hrs.**

Collection of reservoir fluid samples for PVT study, PVT analysis: Constant composition expansion, flash liberation, differential liberation, separator test for PVT data of hydrocarbon fluids. Evaluation and correlation of physical and chemical properties of reservoir fluids including laboratory and empirical methods. Water from petroleum reservoirs, water production and parameters

Unit-4 Equation of state and application **9 Hrs.**

Vapor-liquid equilibrium calculation, Use of various equations of state for simulation of laboratory PVT data, tuning EOS parameters and original fluid composition calculation.

Total 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the compositional range of hydrocarbon components present in reservoir fluids with crude typing.
CO2- Understand hydrocarbon phase behaviour in dynamic reservoir conditions.
CO3- Understand chemical characterization of hydrocarbon reservoir fluids and available correlations.
CO4- Design sample collection for various purposed and understand PVT study and analysis
CO5- Analyse situation dependent applicability of different correlation and equation of state (EoS).
CO6- Apply the knowledge for petroleum engineers real field activities.

TEXT/REFERENCE BOOKS

1. Equation of state and PVT analysis: Applications for improved Reservoir Modelling, Tarek Ahmed, Gulf Publishing Company 2007
2. Thermodynamics of Hydrocarbon Reservoirs, Abbas Firoozabadi, McGraw-Hill.
3. PVT and Phase behavior of Petroleum Reservoir Fluids, Ali Danesh, Elsevier, 1998.
4. Properties of Petroleum Rocks and Fluids, Abhijeet Dandekar.
5. PVT Property Correlations: Selection and estimation, Ahmed El-Banbvi, Ahmed Alzahabi, Ahmed El-Maraghi, Gulf Publishing Company 2018

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

PART A: <Question: <Short Notes, Problems, Numerical> **20 Marks**

PART B: <Justification, Criticism, Long answers, Interpretation > **80 Marks**