

Syllabus of  
UNDERGRADUATE DEGREE COURSE

Petroleum Engineering



Rajasthan Technical University, Kota  
Effective from session: 2018 – 2019



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE2-01 : Advanced Engineering Mathematics-I

Credit: 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE: 120)  
End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Complex Variables:</b> Analytic functions, Cauchy-Riemann equations, Elementary conformal mapping with simple applications, Line integral in complex domain, Cauchy's theorem, Cauchy's integral formula, Taylor's series, Laurent's series, Poles, Residues, evaluation of simple definite real integrals using the theorem of residues. Simple contour integration.	14
2	<b>Introduction to Statistics:</b> Probability distribution: Bimodal, Poisson, Uniform, Normal, Correlation and Regression, Linear regression, Confidence limits, types of errors, testing of hypothesis based on normal, Chi-square test, F-test, Z-test, Student's T-test. Comparison of means and variances.	12
3	<b>Finite differences-</b> Forward, Backward, and Central differences, Newton's forward and backward difference interpolation formulae, Stirling's formula. Numerical differentiation, Numerical Integration – Trapezoidal rule, Simpson's one-third and three-eighth rule. Introduction to numerical solution of ordinary differential equation	14
<b>Total</b>		<b>40</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE1-02/4PE1-02: Technical Communication

Credit: 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam: 2 Hours

SN	Contents	Hours
1	<b>Introduction to Technical Communication-</b> Definition of technical communication, Aspects of technical communication, forms of technical communication, importance of technical communication, technical communication skills (Listening, speaking, writing, reading writing), linguistic ability, style in technical communication.	4
2	<b>Comprehension of Technical Materials/Texts and Information Design &amp; development-</b> Reading of technical texts, Reading and comprehending instructions and technical manuals, Interpreting and summarizing technical texts, Note-making. Introduction of different kinds of technical documents, Information collection, factors affecting information and document design, Strategies for organization, Information design and writing for print and online media.	6
3	<b>Technical Writing, Grammar and Editing-</b> Technical writing process, forms of technical discourse, Writing, drafts and revising, Basics of grammar, common error in writing and speaking, Study of advanced grammar, Editing strategies to achieve appropriate technical style, Introduction to advanced technical communication. Planning, drafting and writing Official Notes, Letters, E-mail, Resume, Job Application, Minutes of Meetings.	8
4	<b>Advanced Technical Writing-</b> Technical Reports, types of technical reports, Characteristics and formats and structure of technical reports. Technical Project Proposals, types of technical proposals, Characteristics and formats and structure of technical proposals. Technical Articles, types of technical articles, Writing strategies, structure and formats of technical articles.	8
<b>Total</b>		<b>26</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE1-03/4PE1-03 : Managerial Economics and Financial Accounting

Credit: 2  
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)  
End Term Exam: 2 Hours

SN	Contents	Hours
1	<b>Basic economic concepts-</b> Meaning, nature and scope of economics, deductive vs inductive methods, static and dynamics, Economic problems: scarcity and choice, circular flow of economic activity, national income-concepts and measurement.	4
2	<b>Demand and Supply analysis-</b> Demand-types of demand, determinants of demand, demand function, elasticity of demand, demand forecasting –purpose, determinants and methods, Supply-determinants of supply, supply function, elasticity of supply.	5
3	<b>Production and Cost analysis-</b> Theory of production- production function, law of variable proportions, laws of returns to scale, production optimization, least cost combination of inputs, isoquants. Cost concepts-explicit and implicit cost, fixed and variable cost, opportunity cost, sunk costs, cost function, cost curves, cost and output decisions, cost estimation.	5
4	<b>Market structure and pricing theory-</b> Perfect competition, Monopoly, Monopolistic competition, Oligopoly.	4
5	<b>Financial statement analysis-</b> Balance sheet and related concepts, profit and loss statement and related concepts, financial ratio analysis, cash-flow analysis, funds-flow analysis, comparative financial statement, analysis and interpretation of financial statements, capital budgeting techniques.	8
<b>Total</b>		<b>26</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE3-04: Petroleum Geology

Credit: 3

Max. Marks: 150(IA:30, ETE: 120)

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction</b> -Branches of geology useful to petroleum engineering, scope of geological studies in petroleum exploration & production.	4
2	<b>Mineralogy</b> -Minerals: General characteristics, Origin and composition, physical properties, classification, common rock forming minerals and clay minerals, basic of optical mineralogy, SEM, XRD., megascopic identification of common primary & secondary minerals.	6
3	<b>Petrology</b> -Rock forming processes. Rock cycle & Specific gravity of rocks. Igneous petrology- Introduction, structure of earth, Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their chemical and mechanical characteristics. Chemical and mineralogical Composition. Texture and structure. Various forms of rocks. Classification of igneous rock, Field Classification chart. Descriptions of some common volcanic, hypabyssal and plutonic rocks. Sedimentary petrology & petrography: mode of formation of sedimentary rock, Texture and its types, grain size, grain shape, sorting & composition. Mechanically and chemically formed Structures. Classification of sedimentary rocks and their characteristics. Metamorphic petrology- Introduction, Agents and types of metamorphism, composition, and classification. Descriptions of some common metamorphic rock.	10
4	<b>Structural Geology:</b> Introduction of structural geology, Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Brittle and Ductile deformation of rocks. Concepts of plate tectonics and continental drift. Attitude of planar and linear structures. Dip and Strike. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field. Identification of structures from bore-hole data. Joints & Unconformity: Types, Stresses responsible. Salt and mud domes. Effects of folds, faults & salt domes on strata and their importance in petroleum exploration. Tectonics and basin formation, elements of basin analysis.	10
5	<b>Stratigraphy:</b> Earth's history in rock record, introduction of stratigraphic principles – lithostratigraphy, cyclostratigraphy, chronostratigraphy, event stratigraphy. Indian Geological time-scale, Introduction to paleontology, fossils & microfossils and their mode of preservation, significance of microfossils in petroleum exploration, broad stratigraphic subdivisions and associated rock types of important coal basins and oil basins of India	10
<b>Total</b>		<b>40</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-05: Fluid Mechanics

(Common with Petrochemical & Chemical Engineering)

Credit: 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE: 120)  
End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Properties of fluids;</b> Classification; Ideal fluid, Newtonian and Non-Newtonian fluids; Newton's law of viscosity. Pascal's and Hydrostatic law, manometers. Types of manometer.	5
2	<b>Fluid Statics:</b> fluid pressure and its measurement.	3
3	<b>Fluid Kinetics:</b> Continuity equation; types of flow	3
4	<b>Fluid dynamics:</b> One dimensional equation of motion; Bernoulli's equation; application; application of Bernoulli's equation. Friction losses in pipe flow, valves and fittings, k-values, sudden expansion and contraction, pipe flow problems Nozzle. Introduction to laminar & turbulent flow. Velocity Distribution for turbulent flow, concept of Reynolds number & friction factor.	8
5	<b>Flow through Pipes</b> – Darcy – Weisbach's equation. Head loss in pipes. Pipes in series/ Parallel. Classification, basic construction and application of different types of pumps.	6
6	<b>Pump:</b> Centrifugal pump, Principles and application in Bernoulli's theorem Types of Pump:Axial pumps, Gear pump, Plunger Pumps Vane pump, Reciprocation pump and Screw pump. Characteristic Curves of Pumps. Valves, types of valves	5
7	<b>Flow Metering:</b> Metering of fluids; orifice meter, Venturimeter, Pitot tube, Rotameter, Notches, Gas flow meters, coefficient of discharge.	6
	<b>Total</b>	<b>36</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-06 : Drilling Fluids and Cementing

Credit: 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE: 120)  
End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction to Drilling Fluids:</b> Overview of drilling fluids, Basic functions, preparation, properties, maintenance and treatments of drilling fluids, testing of drilling fluid additives	8
2	<b>Classification, types and applications of drilling fluids:</b> Water based, oil based, emulsion based, polymer based, surfactant based, foam based and aerated drilling fluids, Criteria of selection of drilling fluid additives and salinity of drilling fluids. Determination of drilling fluid properties. Drilling fluid calculations.	8
3	<b>Cementing:</b> Purpose. Oil well Cements: Manufacture, composition, API classes of Portland cements and composition, Selection of cement for specific well application	8
4	<b>Cement Slurry:</b> Slurry design, cement and slurry characteristics, cement additives, factors influencing cement slurry design.	8
5	<b>Cementing Methods:</b> Primary cementing, stage cementing, liner cementing, plugging, squeeze cementing techniques in practice. Deep well cementing, squeeze jobs, prevention of gas channeling, HT-HP environments, analysis and techniques of evaluation of cement job. Characteristics of good quality cementation and evaluation. Cementing calculations.	8
<b>Total</b>		<b>40</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-07: Drilling Technology-I

Credit: 3  
3L+0T+0P

Max. Marks: 150(IA:30, ETE: 120)

End Term Exam: 3 Hours

SN	Contents	Hours
1	<b>Introduction to Oil &amp; Gas Well Drilling:</b> Well planning, Drilling techniques, Drilling Rigs in onshore, Offshore and deep sea environments, Types of wells	4
2	<b>Rotary Drilling Technique:</b> Rig components & functions, Lay out of the rig	6
3	<b>Drilling System:</b> Hoisting System, Mud Circulation System, Rotation, Power System, Well Control system, Rig Wireline System handling & storage.	8
4	<b>Casing String &amp; Drill String:</b> Casing types, Functions of different casing, Selection and design of casing, Drill string components & their functions.	4
5	<b>Drill Bits:</b> Drill bit types and function.	2
6	<b>Geological considerations in Drilling:</b> Geo-technical order (GTO), Lithology of well.	2
7	<b>Advanced Techniques in Drilling:</b> Introduction to Directional drilling & other advanced techniques, MWD.	4
8	<b>Drilling Problems and its Prevention:</b> Well kick, blowout: Prevention and safety, Sloughing shale, Formation damage, Environmental issues, Thief zone, Lost circulation, Under balance Drilling	8
9	<b>Other Considerations While Drilling:</b> Dog-legs, Side tracking and coring, Fishing	2
<b>Total</b>		<b>40</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota





# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-21: Fluid Mechanics Lab

Credit: 2  
OL+OT+4P

Max. Marks: 100(IA:60, ETE: 40)

#### List of Experiment

1. Reynolds experiment for Laminar, transitional and turbulent flow identification, through Reynolds apparatus.
2. Verification of Bernoulli's Equation through Bernoulli's Theorem Apparatus.
3. Determination of coefficient of Discharge for Orifice, Venturimeter through Venturimeter and orifice meter test rig.
4. Estimation of losses through pipe fitting, sudden enlargement and contraction frictional Pressure drop in Circular pipes.
5. Verification of Darcy's Law through Darcy apparatus.
6. To Study Construction, Working of Centrifugal, Reciprocating, Gear and Plunger Pumps through test rig.
7. To Study pitot tube apparatus and cavitation apparatus in a pipe flow.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-22 : Drilling Fluids & Cementing Lab

Credit: 1

Max. Marks: 50(IA:30, ETE: 20)

OL+OT+2P

#### List of Experiment

1. Measurement of mud weight
2. Measurement of mud density.
3. Measurement of mud plastic viscosity.
4. Measurement of gel strength.
5. Determination of filtration loss
6. Determination of Sand content
7. Determination of consistency of cement slurry.
8. Determination of the setting points of the cement based slurries.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-23: DBMS Lab

Credit: 2  
OL+OT+4P

Max. Marks: 100(IA:60, ETE: 40)

#### List of Experiment

Objectives: At the end of the semester, the students should have clearly understood and implemented the following:

1. Stating a database design & application problem.
2. Preparing ER diagram
3. Finding the data fields to be used in the database.
4. Selecting fields for keys.
5. Normalizing the database including analysis of functional dependencies.
6. Installing and configuring the database server and the front end tools.
7. Designing database and writing applications for manipulation of data for a standalone and shared data base including concepts like concurrency control, transaction roll back, logging, report generation etc.
8. Get acquainted with SQL.

In order to achieve the above objectives, it is expected that each students will chose one problem. The implementation shall being with the statement of the objectives to be achieved, preparing ER diagram, designing of database, normalization and finally manipulation of the database including generation of reports, views etc. The problem may first be implemented for a standalone system to be used by a single user. All the above steps may then be followed for development of a database application to be used by multiple users in a client server environment with access control. The application shall NOT use web techniques. One exercise may be assigned on creation of table, manipulation of data and report generation using SQL.

Suggested Tools:

For standalone environment, Visual FoxPro or any similar database having both the database and manipulation language may be used.

For multi-user application, MYSql is suggested. However, any other database may also be used. For front end, VB.Net, Java, VB Script or any other convenient but currently used by industry may be chosen. Indicative List of exercises:

1. Student information system for your college.
2. Student grievance registration and redressal system.
3. A video library management system for a shop.
4. Inventory management system for a hardware/ sanitary item shop.
5. Inventory management system for your college.
6. Guarantee management system for the equipments in your college.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

### 3PE4-24: Petroleum Geology Lab

Credit: 1  
OL+OT+2P

Max. Marks: 50(IA:30, ETE: 20)

#### List of Experiment

1. Study of physical properties of the minerals
2. Study of physical properties of the rocks
3. Identification of minerals in hand specimen
4. Identification of rocks (Igneous) in hand specimen.
5. Identification of rocks (Sedimentary) in hand specimen.
6. Identification of rocks (Metamorphic) in hand specimen.
7. Study of thin section of important minerals & rocks.
8. Study of topographical features from Geological maps
9. Interpretation of geological structures from surface geological maps.
10. Interpretation of subsurface geological structures from borehole data
11. Preparation of subsurface structural contours map.
12. Identification of Geological features through wooden Models.  
Field visits for Geological structures & stratigraphy exposures.



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

<b>Industrial Training</b>		
<b>Code: 3PE7-30</b>	<b>Credit: 1</b>	<b>Max. Marks: 50(IA:30, ETE: 20)</b>

Student has to undergo mandatory 15 days In-house/Industry training after II semester. Training Examination will be held in III Semester

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

## SYLLABUS

2<sup>nd</sup> Year - III Semester: B.Tech. (Petroleum Engineering)

<b>Social Outreach, Discipline &amp; Extra Curricular Activities(SODECA)</b>		
<b>Code: 3PE8-00</b>	<b>Credit: 0.5</b>	<b>Max. Marks: 25(IA:0, ETE: 25)</b>

Office of Dean Academic Affairs  
Rajasthan Technical University, Kota