

Scheme & Syllabus of

UNDERGRADUATE DEGREE COURSE

B.Tech. VII & VIII Semester

PETROCHEMICAL ENGINEERING



Rajasthan Technical University, Kota
Effective from session: 2020 – 2021



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Scheme & Syllabus

IV Year- VII & VIII Semester: B. Tech. (Petrochemical Engineering)

Teaching & Examination Scheme B. Tech.: Petrochemical Engineering 4th Year – VII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	7PC4-01	Transport Phenomena	3	0	0	3	30	120	150	3
2	OE		Open Elective I: To be chosen from the bundle of open electives floated by other departments.	3	0	0	3	30	120	150	3
		Sub Total		6	0	0		60	240	300	6
PRACTICAL & SESSIONAL											
3	PCC	7PC4-21	Gas Testing Lab	0	0	2	0	30	20	50	1
4		7PC4-22	Energy and Geopolitics Sessional	0	0	2	0	30	20	50	1
5		7PC4-23	Minor Project	0	0	4	0	60	40	100	2
6	PSIT	7PC7-30	Industrial Training	1	0	0	0			125	2.5
7		7PC7-40	Seminar	2	0	0	0			100	2
8	SODE CA	7PC8-00	Social Outreach, Discipline & Extra Curricular Activities							25	0.5
		Sub- Total		3	0	8		120	80	450	9
		TOTAL OF VII SEMESTER		9	0	8		180	320	750	15

L: Lecture, **T:** Tutorial, **P:** Practical, **Cr:** Credits

ETE: End Term Exam, **IA:** Internal Assessment



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IV Year- VII & VIII Semester: B. Tech. (Petrochemical Engineering)

Teaching & Examination Scheme B. Tech.: Petrochemical Engineering 4th Year – VIII Semester

THEORY											
SN	Categor ory	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	8PC4-01	Refinery Engineering Design	3	0	0	3	30	120	150	3
2	OE		Open Elective II: To be chosen from the bundle of open electives floated by other departments.	3	0	0	3	30	120	150	3
		Sub Total		6	0	0		60	240	300	6
PRACTICAL & SESSIONAL											
3	PCC	8PC4-21	Refinery Engineering Design Sessional	0	0	2	0	30	20	50	1
4		8PC4-22	Comprehensive Study of Petrochemical Engineering	0	0	2	0	30	20	50	1
5	PSIT	8PC7-50	Project	3	0	0	0	210	140	350	7
6	SODE CA	8PC8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0	0	0	0	25	0.5
		Sub- Total		0	0	4	0	270	180	475	9.5
		TOTAL OF VIII SEMESTER		9	0	4		330	420	775	15.5

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List of Open Electives for Petrochemical Engineering			
Subject Code	Title	Subject Code	Title
Open Elective - I		Open Elective - II	
7AG6-60.1	Human Engineering and Safety	8AG6-60.1	Energy Management
7AG6-60.2	Environmental Engineering and Disaster Management	8AG6-60.2	Waste and By-product Utilization
7AN6-60.1	Aircraft Avionic System	8AN6-60.1	Finite Element Methods
7AN6-60.2	Non-Destructive Testing	8AN6-60.2	Factor of Human Interactions
7CH6-60.1	Optimization Techniques	8CH6-60.1	Refinery Engineering Design
7CH6-60.2	Sustainable Engineering	8CH6-60.2	Fertilizer Technology
7CR6-60.1	Introduction to Ceramic Science & Technology	8CR6-60.1	Electrical and Electronic Ceramics
7CR6-60.2	Plant, Equipment and Furnace Design	8CR6-60.2	Biomaterials
7CE6-60.1	Environmental Impact Analysis	8CE6-60.1	Composite Materials
7CE6-60.2	Disaster Management	8CE6-60.2	Fire and Safety Engineering
7CS6-60.1	Quality Management/ISO 9000	8CS6-60.1	Big Data Analytics
7CS6-60.2	Cyber Security	8CS6-60.2	IPR, Copyright and Cyber Law of India
7EE6-60.1	Electrical Machines and Drives	8EE6-60.1	Energy Audit and Demand side Management
7EE6-60.2	Power Generation Sources.	8EE6-60.2	Soft Computing
7EC6-60.1	Principle of Electronic communication	8EC6-60.1	Industrial and Biomedical applications of RF Energy
7EC6-60.2	Micro and Smart System Technology	8EC6-60.2	Robotics and control
7ME6-60.1	Finite Element Analysis	8ME6-60.1	Operations Research
7ME6-60.2	Quality Management	8ME6-60.2	Simulation Modeling and Analysis
7MI6-60.1	Rock Engineering	8MI6-60.1	Experimental Stress Analysis
7MI6-60.2	Mineral Processing	8MI6-60.2	Maintenance Management
7TT6-60.1	Technical Textiles	8TT6-60.1	Material and Human Resource Management
7TT6-60.2	Garment Manufacturing Technology	8TT6-60.2	Disaster Management



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IV Year- VII & VIII Semester: B. Tech. (Petrochemical Engineering)

7PC4-01 Transport Phenomena

Credit: 3

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

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Similarity in momentum, heat and mass-transport - Newton's laws of viscosity. Fourier's laws of conduction and Fick's laws of diffusion, Flux-transport property relationships. Estimation of transport properties measurement and correlations, velocity distribution in Laminar flow of falling film.	9
3	Flow over an inclined plane, a circular tube an annulus and between two parallel plates. Shell balance approach for developing equations of change for momentum, heat and mass transport.	10
4	Transport equations in turbulent flow and equations for turbulent fluxes. Velocity, Temperature and concentration profiles for laminar and turbulent flow conditions. Temperature and concentration profiles for conductive and convective transport in solids and fluids.	10
5	Macroscopic momentum and heat balance equations, Kinetic energy calculations, Constant area and variable area flow problems. Flow through bends, time determination for emptying of vessels.	10
	Total	40

Open Elective I: To be chosen from the bundle of open electives floated by other departments.



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IV Year- VII & VIII Semester: B. Tech. (Petrochemical Engineering)

7PC4-21 Gas Testing Lab

Credit: 1

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

OL+OT+2P

Contents
<ol style="list-style-type: none">1. Determination of compositions of Gas with Gas Chromatography.2. Determination of Reid Vapour Pressure.3. Determination of % reserve of gas.4. Determination of Gas gravity.5. CO₂ detection.

7PC4-22Energy and Geopolitics Sessional

Credit: 1

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

OL+OT+2P

Contents
<ol style="list-style-type: none">1. Basic concepts of demand, supply and pricing; price and output determination under perfect competition, derivation of the supply function, price and output determination under monopoly, oligopoly, and monopolistic competition.2. Energy and society: Social, economic, political and environmental dimensions of energy.3. Major types and sources of energy at the global and at the national level.4. Reserves and resources of petroleum, coal and nuclear minerals: Globally and in India.5. Other resources of energy: Hydroelectric power, solar energy, wind, wave, and biomass based energy.6. Energy sources and power generation: Thermal, nuclear, hydroelectric, solar, wind and wave; relative merits and demerits including conversion efficiency, generation cost and environmental impact, clean coal initiatives.7. Power transmission and distribution.8. Carbon sequestration, coal gasification, CBM, Shale gas, gas hydrates: current status and future prospects.9. Solar energy, hydrogen energy, and fuel cells: current status and future prospects.10. Carbon credits and its impact on hydrocarbon business.11. International oil markets, developments of Indian oil industry.12. NELP (New Exploration Licensing Policy), Mines rules and regulations.13. Pipelines: Current status and future prospects.14. LNG, CNG and other forms of natural gas: global and Indian scenario.15. Global energy politics.



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IV Year- VII & VIII Semester: B. Tech. (Petrochemical Engineering)

7PC4-23 Minor Project

7PC7-30 Industrial Training

7PC7-40 Seminar

7PC8-00 Social Outreach, Discipline & Extra Curricular Activities



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IV Year- VII & VIII Semester: B. Tech. (Petrochemical Engineering)

8PC4-01 Refinery Engineering Design

Credit: 3

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

3L+0T+0P

End Term Exam: 3 Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	01
2	Overview of Refinery: Global and Indian Refining Industry, Refinery configurations, ASTM Distillation TBP Distillation, EFV distillation. Analysis of crude petroleum and its fractions. Different types of Boiling point, VABP, WABP, MABP, MeBP, CABP Computation of the curves, Calculation of ASTM temperature to TBP and EFV temperature, Average boiling points, Separation criteria in crude oil fractionation. Calculation for characterizing crude oil.	12
3	Atmospheric distillation: Atmospheric distillation tower, types of refluxes, pump around reflux pump back reflux top tray reflux, converting crude TBP to product TBP curves, concept of overflash. Energy balance in a topping tower and calculations involve estimation of top, side, bottom draw tray temperatures. Calculation of side steam strippers.	10
4	Vacuum distillation: Vacuum distillation tower, type of operations, Lube type Vacuum tower with pump back and pump around reflux heat removal. Lube or special vacuum distillation operation economic consideration in Vacuum Tower	10
5	Fired Heater: Types of fired heaters, Horizontal Types, Vertical Types, Codes and standards Burner, Gas burner Oil burner combination burners. Preparing refractories for operation stacks emissions, Basic constructional features of furnace, Different furnace types.	7
	Total	40

Open Elective II: To be chosen from the bundle of open electives floated by other departments.



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8PC4-21 Refinery Engineering Design Sessional

Credit: 1

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

OL+OT+2P

Contents
<ol style="list-style-type: none">1. Study of atmospheric and vacuum distillation units in refinery.2. Characterization of crude oil3. Design of atmospheric distillation unit of refinery4. Design of vacuum distillation unit of refinery5. Design of fired heaters.

8PC4-22: Comprehensive Study of Petrochemical Engineering

Credit: 1

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

OL+OT+2P

Contents
Viva voce to assess the knowledge of all the courses of the curriculum

8PC7-50 Project

8PC8-00 Social Outreach, Discipline & Extra Curricular Activities