

Scheme & Syllabus of  
UNDERGRADUATE DEGREE COURSE

**B.Tech. VII & VIII Semester**

**Chemical Engineering**



Rajasthan Technical University, Kota  
Effective from session: 2020-21



# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Scheme & Syllabus

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

Teaching & Examination Scheme

B. Tech.: Chemical Engineering

4<sup>th</sup>Year – VII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	7CH4-01	Transport Phenomena	3	0	0	3	30	70	100	3
2	OE		<b>Open Elective I</b>	3	0	0	3	30	70	100	3
			<b>Sub Total</b>	06	0	0		60	140	200	6
PRACTICAL & SESSIONAL											
3	PCC	7CH4-21	Transport Phenomena	0	0	2		60	40	100	1
4		7CH4-22	Energy Resources Utilisation	0	0	2		60	40	100	1
5		7CH4-23	Process Design and Techno-Feasible Studies	0	0	4		60	40	100	2
6	PSIT	7CH7-30	Industrial Training	1	0	0		60	40	100	2.5
7		7CH7-40	Seminar	2	0	0		60	40	100	2
8	SODE CA	7CH8-00	Social Outreach, Discipline & Extra Curricular Activities						100	100	0.5
			<b>Sub- Total</b>	3		8		300	400	600	9
			<b>TOTAL OF VII SEMEESTER</b>	9	0	8		360	540	800	15

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

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



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B. Tech.: Chemical Engineering

4<sup>th</sup> Year – VIII Semester

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	PCC	8CH4-01	Process Modelling and Simulation	3	0	0	3	30	70	100	3
2	OE		Open Elective II	3	0	0	3	30	70	100	3
<b>Sub Total</b>				6	0	0		60	140	200	6
PRACTICAL & SESSIONAL											
3	PCC	8CH4-21	Process Modelling and Simulation	0	0	2		60	40	100	1
4		8CH4-22	Comprehensive Study of Chemical Engineering	0	0	2		60	40	100	1
5	PSIT	8CH7-50	Project	3	0	0		60	40	100	7
6	SODE CA	8CH8-00	Social Outreach, Discipline & Extra Curricular Activities	0	0	0			100	100	0.5
<b>Sub- Total</b>				3		4		180	220	400	9.5
<b>TOTAL OF VIII SEMEESTER</b>				9	0	4		240	360	600	15.5

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

<b>List of Open Electives for Chemical Engineering</b>			
<b>Subject Code</b>	<b>Title</b>	<b>Subject Code</b>	<b>Title</b>
<b>Open Elective - I</b>		<b>Open Elective - II</b>	
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
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
7PE6-60.1	Pipeline Engineering	8PE6-60.1	Unconventional Hydrocarbon Resources
7PE6-60.2	Water Pollution control Engineering	8PE6-60.2	Energy Management & Policy
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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# RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Scheme & Syllabus

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

## 7CH4-01: Transport Phenomena

**Credit: 3**  
**3L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course.	1
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
	<b>Total</b>	<b>40</b>



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

## 7CH4-21: Transport Phenomena

**Credit: 1**  
**OL+OT+2P**

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

### Contents

1. Study of momentum transport problems with shell balance approach.
2. Study of heat transport problems with shell balance approach.
3. Study of mass transport problems with shell balance approach.
4. Development of equations for turbulent fluxes. Velocity, Temperature and concentration profiles for laminar and turbulent flow conditions.
5. Development of transport equations in turbulent flow.
6. Solution of problems related to constant area and variable area flow problems.



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

## 7CH4-22: Energy Resources Utilisation

**Credit: 1**  
**OL+OT+2P**

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

### Contents

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.

**7CH4-23: Process Design and Techno-Feasible Studies**

**7CH7-30: Industrial Training**

**7CH7-40: Seminar**

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

**7CH8-00: Social Outreach, Discipline & Extra Curricular Activities**

**8CH4-01: Process Modelling and Simulation**

**Credit: 3**  
**3L+0T+0P**

**Max. Marks: 100(IA:30, ETE:70)**  
**End Term Exam: 3 Hours**

SN	Contents	Hours
1	<b>Introduction:</b> Objective, scope and outcome of the course.	1
2	<b>The role of analysis:</b> Chemical engineering problems, basic concepts of analysis; the analysis process, simple example of estimating an order, source of the model equations. Conservation equations, constitutive equations, control volumes, dimensional analysis, system of units, dimensional consistency in mathematical descriptions, dimensional analysis and Constitutive relationships, final observations.	9
3	<b>Non-Reacting Liquid Systems:</b> Introduction, equation of continuity, simple mass balance, application of the model equations, component mass balances. <b>Model behavior:</b> Steady state behavior, un-steady state behavior, density assumption, numerical integration methods of ordinary differential equation.	10
4	<b>Reacting Liquid Systems:</b> Introduction, basic model equations for a tank-type reactor, reaction rate, batch reactor, pseudo first-order reactions, reversible reactions, multiple reactions. Consecutive reactions, parallel reactions, complex reactions, constant density assumption, order and stoichiometry.	10
5	<b>Treatment of experimental data:</b> Introduction, criteria for Best Fit, Best Slope-I, Best straight line. Fitting a quadratic, simulation examples of gravity fluid flow, heat and mass transfer. Dynamic modelling of simple processes, sequential, simultaneous modular and equation oriented approaches. Computer programming of various iterative convergence methods such as Newton- Raphson, false position, Muller methods.	10
	<b>Total</b>	<b>40</b>

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## 8CH6-13: Process Modelling and Simulation

**Credit: 1**  
**OL+OT+2P**

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

### Contents

1. Simulation of gravity flow tank by Euler Method
2. Simulation of gravity flow tank by Range Kutta Method
3. Simulation of three CSTR in series by Range Kutta method
4. Simulation of three CSTR in series by Euler method
5. Simulation of three CSTR in series with feedback -loop by Euler method
6. Modelling a batch reactor-verification of 1st and 2nd order rate kinetics.
7. Counter current double pipe heat exchanger modelling-data analysis by iterative methods
8. Simulation of a distillation column-binary systems, equi-molal overflow, constant relative, volatility.

**8CH4-22: Comprehensive Study of Chemical Engineering**

**8CH7-50: Project**

**8CH8-00: Social Outreach, Discipline & Extra Curricular Activities**