

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology			Branch/Spec.		Petrochemical Engineering		
Semester		III			Version		1.0.0.0		
Effective from Academic Year			2020-21		Effective form the batch Admitted in			July 219	
Subject code		2PCE3101		Subject Name		Numerical Methods And Programming			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	1	0	5	Theory	40	60	100
Hours	3	1	2	0	6	Practical	30	20	50
Pre-requisites:									
<ul style="list-style-type: none"> Basics of Computer Basic Mathematics 									
Course Objective									
After learning this course, student should be able to:									
<ul style="list-style-type: none"> Students need to learn programming languages and algorithm. Understand the concepts of array and matrix operations in C. To learn polynomial equations. To learn Numerical Integral and Differential equations To understand optimization techniques. 									
Theory syllabus									
Unit	Content								Hrs
1	Introduction to programming: programming languages, algorithm, flowcharts, C Language: Features of C, data types, Identifiers, Constants, Variables, expressions, Console I/O statement, Selection statements: if-else, switch, Iteration Statements: For, while, do-while, Jump statements: return, go to, break, and continue, comments, and program using these features.								11
2	Macros Function and Recursion: Structure and Union, Pointers, String, Basics of File handling								6
3	Concept of Array, Matrix operations in C and Searching, Sorting: Linear search, Binary search, Bubble sort, Insertion sort, Selection Sort.								6
4	Program to obtain roots of polynomial Equation: Newton-Rapson method, Regular Falsi Method, Muller method, Bisection method, false position method. Programs for interpolation and extrapolation using numerical methods.								8
5	Numerical Integral and Differential equations using: Initial value problems by Euler's method, modified Euler's, Taylor series, Runge-kutta methods, Regression analysis.								8
6	Optimization techniques: integer programming, Simplex method, dynamic programming, programs for implementation of these method and case study.								6
Practical content									
Practical list shall be based on the above content of subject									
Text Books									
1	Numerical methods for Scientific and Engg. Computations by M.K. Jain, Srk Iyengar, R.K. Jain, Wiley Eastern Ltd.								
2	Numerical methods for Science & Engg. By Stanton R.G., PHI.								
Reference Books									

1	The C Programming Language: Dennis Ritchie & Brain Kernighan [Pearson].
2	ANSI C: By E Balagurusamy
ICT/MOOCs references	
<u>1</u>	https://nptel.ac.in/courses/122106033/
<u>2</u>	https://www.math.unipd.it/~mrrusso/Didattica/NA-Yaounde/Manual.pdf
<u>3</u>	https://www.youtube.com/playlist?list=PLCA944605A8EDE42A
Course Outcomes	
<p>Students will learn programming languages and algorithm.</p> <p>Understand the concepts of array and matrix operations in C.</p> <p>Know about polynomial equations.</p> <p>Students will learn Numerical Integral and Differential equations</p> <p>Students will understand optimization techniques.</p>	

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Semester		III			Version		1.0.0.0		
Effective from Academic Year			2020-21		Effective form the batch Admitted in			July 219	
Subject code		2PCE3102		Subject Name		Fluid Mechanics			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	1	0	5	Theory	40	60	100
Hours	3	1	2	0	6	Practical	30	20	50
Pre-requisites:									
<ul style="list-style-type: none"> • Basic concept of physics • unit system 									
Course Objective									
<ul style="list-style-type: none"> • To Know about fluid statics and dynamics. • Able to calculate Mass and volumetric flow rate for fluid flowing through pipe. • To Know about different pipe fittings and flow pattern • Understand the fundamentals Bernoulli's and continuity equation. • To Know about types of pumps and their principle and working. 									
Theory syllabus									
Unit	Content								Hrs
1	Introduction to Fluid Mechanics: Classification of fluid mechanics, Properties of fluids, Classification of fluids, Shearing and flow, characteristics of Newtonian and Non-Newtonian fluids, Shear stress distribution of fluids, Pressure measurement, U-tube, Inverted U-tube, Differential and Inclined manometers, Reynolds number, Friction facto								8
2	Basic Fluid flow equations: Bernoulli's equation, Frictional loss in pipe, Continuity equation, Velocity distribution for, laminar flow and turbulent flow, Hydraulic mean diameter, losses due to enlargement and contraction of pipe cross - section								7
3	Pipe Fittings: - Equivalent length of pipe, Pipe fittings, Gate , Globe, Check and Butterfly valves, Boundary layer development, Two-phase flow, Flow patterns in two phase flow. The Baker diagram, Erosion in two phase flow.								7
4	Flow Measurement: Flow rate measurement, Working principle and expressions for flow rate through Pitot tube, Orifice meter, Venturimeter, Nozzle, Rotameter, Notch and Weir, Coefficient of discharge, Wet gas flowmeter, Pressure recovery in Orifice meter, Venturimeter and Nozzle..								7
5	Pumps: Pumping of fluids, Classification of pumps, Positive displacement pumps, Reciprocating, Pump, Plunger pump, Diaphragm pump, Metering pump, Rotary gear pump, Rotary lobe Pump, Rotary vane pump, Flexible vane pump, Mono pump, Centrifugal pump, Volute pump, Volute pump with vortex chamber and diffuser vanes, Cavitation, Priming, Net positive suction head								10

	,Multistage centrifugal pumps. Specific speed and operating characteristics of centrifugal pump.	
6	Fluid Flow in Packed Column : Fluid flow in packed column, Classification of packing's, Characteristics of packing material, Loading and flooding in packed column, Specific surface of packed column, Permeability coefficient, Modified Reynolds number, Modified friction factor,	6
Practical content		
The practical work shall be based on experimental work on the topics mentioned above .		
Text Books		
1	R. P. Vyas, Fluid Mechanics, Second edition, Denett & Co. Publication, 2008	
2	W.L. McCabe, J.C. Smith, P. Harriott, Unit Operations of Chemical Engineering, Seventh Edition, McGraw Hill Publication, 2005	
Reference Books		
1	J.M. Coulson, J.F. Richardson with J.R. Backhurst, J.H. Harker, Chemical Engineering Vol. II: Particle Technology and Separation Processes, Fifth Edition, ButterworthHeinemann an imprint of Elsevier	
2	G.G. Brown, Unit Operations, CBS Publishers Pvt. Ltd, 2005.	
ICT/MOOCs references		
1	https://nptel.ac.in/courses/103104043/	
2	https://nptel.ac.in/courses/103104044/	
3	https://www.youtube.com/playlist?list=PLbMVogVj5nJQqyKLjvvgAC38ThsmjCJad	
Course Outcomes		
<p>Know about fluid statics and dynamics.</p> <p>Able to calculate Mass and volumetric flow rate for fluid flowing through pipe.</p> <p>Know about different pipe fittings and flow pattern</p> <p>Understand the fundamentals Bernoulli's and continuity equation.</p> <p>Know about types of pumps and their principle and working.</p>		

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Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 219	
Subject code		2PCE3103		Subject Name		STRENGTH OF MATERIALS			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	0	0	4	Theory	40	60	100
Hours	3	1	0	0	4	Practical	0	0	0
Pre-requisites:									
<ol style="list-style-type: none"> 1. Basic knowledge of mathematics 2. Understanding of Engineering Mechanics 									
Course Objective									
<ul style="list-style-type: none"> • To Calculate and draw bending moments and shear forces diagrams in beam. • To know about simple stresses and strains. • Student will understand concept of shear forces and bending moments. • To know about Stress distribution of the section of an eccentrically loaded rectangular column 									
Theory syllabus									
Unit	Content								Hrs
1	Simple Stresses and Strains: Introduction; Definition of stress and strain; tensile and compressive stresses; shear stress, Elastic limit, Hooke's law, Poisson's ratio, modulus of Elasticity, modulus of Rigidity, Bulk Modulus; stresses in composite sections; Volumetric strain; Temperature stresses. Strain Energy Stresses due to different types of axial loading; Gradually applied loads, Suddenly applied loads, Impact loads								9
2	Shear Forces and Bending moments: Concept of Shear force and Bending moment; Sign conventions; Shear force and Bending moment diagrams for cantilevers, simply supported beams and beams with overhang; point of contra flexure; member subjected to couples. Stresses in Beams Definition; Pure or simple bending, theory of simple bending; Neutral layer, Neutral axis, Moment of resistance, assumptions in the theory of simple bending; Section modulus for rectangular, circular, I section and T section. Flitched Beams Definition; Equivalent section, modular ratio, moment of resistance in flitched beams. Shear stress distribution in Beams sections Shear stress distribution on rectangular, circular, I section and T section..								11
3	Deflection of Beams :Member bending into a circular arc; Slope, deflection and radius of curvature; Cantilevers and simply supported beams. Macaulay's method for slope and deflection in cantilevers, simply supported beams and beams with overhang.								6
4	Direct and Bending Stresses :Stress distribution of the section of an eccentrically loaded rectangular column; Core of Kern of the section, Circular and hollow sections. Columns and Struts Introduction; axially loaded compression members; crushing load; Buckling or critical load, Euler's theory of long columns, assumptions made in Euler's theory; Empirical formulae; Rankine's formula..								8
5	Torsion of Shafts And Pure Torsion: Theory of pure torsion; Torsional moment of resistance; assumptions in the theory of pure torsion; Polar modulus; Power transmitted by circular and hollow shafts; Torsional rigidity. Close coiled helical springs Stiffness, deflection, shear stress and Strain energy								6
6	Thin Cylinders and Sphere: Thin cylinders; Circumferential and Longitudinal stresses; Thin spherical shells. Riveted Connections Types of joints; Lap and Butt joints; Failure of riveted								5

	<p>joints; Tearing strength, shearing strength and bearing strength; Efficiency of a joint.</p>	
Practical content		
Text Books		
1	Strength of Materials by S. Ramamrutham.	
2	R. S. Khurmi, "Strength of materials", S. Chand & Co. New Delhi, 13 th Revised Edition	
Reference Books		
1	Strength of Materials by B. C. Punmia	
2	M. Chakraborti, S. K. "Strength of materials", Kataria & Sons, 2013.	
3	TimoShenko, "Strength of materials", CBS Publisher New Delhi, 5th Edition.	
ICT/MOOCs references		
1	https://nptel.ac.in/courses/112107146/	
2	https://www.youtube.com/watch?v=GkFgysZC4Vc	
3	https://www.mooc-list.com/course/mechanics-materials-i-fundamentals-stress-strain-and-axial-loading-coursera	
4	https://onlinecourses.nptel.ac.in/noc17_ce22/preview	
Course Outcomes		
	<p>Calculate and draw bending moments and shear forces diagrams in beam. To know about simple stresses and strains. Student will understand concept of shear forces and bending moments. To know about Stress distribution of the section of an eccentrically loaded rectangular column</p>	

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Semester	III				Version	1.0.0.0			
Effective from Academic Year		2020-21			Effective for the batch Admitted in			July 2019	
Subject code	2PCE3104		Subject Name		Chemical Process Calculations				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	1	0	0	4	Theory	40	60	100
Hours	3	1	0	0	4	Practical	0	0	0
Pre-requisites:									
<ol style="list-style-type: none"> 1. Basic Principles in Process Calculations . 2. Introductory knowledge of chemistry 									
Course Objective									
<ul style="list-style-type: none"> • To understand basic concept of gram atom ,gram mole and unit system. • to understand the concept of ideal gas law , partial and vapour pressure • to understand material balance reaction with and without chemical reaction. • to know types of fuels and their combustion. 									
Theory syllabus									
Unit	Content								Hrs
1	Basic Principles : Basic principles, the concept of gram atom and gram mole, conversion of units from one system to another, concept of excess reactant, conversion and yield, Selectivity and degree of completion of reaction.								9
2	Ideal Gas Law : Ideal gases, partial pressure, vapor pressure, application of ideal gas laws, volume changes with changes of composition, dissociating gases, humidity and saturation, solubility and crystallization.								9
3	Material Balance Reaction : Material balance without chemical reaction, recycle, purge and bypass calculations, material balance with chemical reaction.								8
4	Energy Balance : Energy balance without chemical reaction, combined material and energy balances..								6
5	Combined Material and Energy Balance: Energy balance with chemical reaction, combined material and energy balances.								6
6	Fuels And Combustion: Fuels and combustion, types of fuels, heating values of fuels, theoretical and excess air, heat and combustion problems								7
Practical content									

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Text Books	
1	Stoichiometry and Process Calculation by Narayana K.V., Laxmikutty B. , Prentice Hall of India 2006.
2	Basic Principles and Calculations in Chemical Engineering by Himmalblau D.M. & Riggs, J.B. Prentice Hall of India 6th Edition (2011)
Reference Books	
1	Stoichiometry by Bhatt B.I. , Vora S.M. Tata-McGraw-Hill 4th Edition 2004
2	Chemical Process Calculation by Hougen A., Watson, M. John Wiley & Sons, Third Edition 2000
ICT/MOOCs references	
1	https://www.youtube.com/watch?v=-Zrvfgfi0Zs
2	https://nptel.ac.in/courses/103105110/
3	http://www.nptelvideos.in/2012/12/materials-and-energy-balance.html
Course Outcomes	
	<p>Student will understand concept of gram atom ,gram mole and unit system.</p> <p>Students will able to understand the concept of ideal gas law , partial and vapour pressure</p> <p>Students will able to understand material balance reaction with and without chemical reaction.</p> <p>Students will able to understand types of fuels and their combustion.</p>

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Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 219	
Subject code		2PCE3105		Subject Name		Plant Utilities			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	0	0	0	4	Theory	40	60	100
Hours	4	0	0	0	4	Practical	0	0	0
Pre-requisites:									
<ol style="list-style-type: none"> 1. Fundamental knowledge of Thermodynamics Laws 2. Basic understanding of systems. 									
Course Objective									
<ul style="list-style-type: none"> • to understand thermodynamics processes, First and Second Law of thermodynamics. • To Know about steam generators and turbines. • To understand internal combustion engine two and four stroke cycle. • to learn refrigeration and its applications. 									
Theory syllabus									
Unit	Content								Hrs
1	Thermodynamics: Laws of perfect gases, thermodynamics processes, First and Second Law of thermodynamics, Entropy, The clausius inequality, Steady Flow Processes, Carnot Cycle. PROPERTIES OF STEAM: Use of steam tables, measurement of dryness fraction, entropy of steam, temperature entropy and mollier charts, clausius clapeyron equation, Rankine Cycle.								8
2	Steam Generators: General Description, Boiler Mounting and Accessories, Natural and Artificial Draught, Equivalent Evaporation and Thermal efficiency. Fuels use in boilers – liquids, gaseous and hydrocarbon								7
3	Turbine: Theory and working of impulse, reaction and gas turbine. Bleeding and reheating.								6
4	Internal Combustion Engine: Cycle of operation, two and four stroke cycle, general description of S.I and C. I. engines, ignition, injection and governing.								7
5	Water Management : Sources, conditioning and management of water for cooling of hot gases, cooling towers, cooling ponds. Design of chimney. Constructional details and design aspects.								6
6	Introduction to refrigeration: , various cycles, coefficient of performance. Applications of refrigeration								6
Practical content									
The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.									
Text Books									
1	Fundamental of Engineering Thermodynamics – John and Howel								
2	THERMODYNAMICS An Engineering Approach – Y.A. Cengel and M.A. Boles								
Reference Books									
1	Applied Thermodynamics – Aestop								
2	Smith, J.M., Van Ness, H.C., Abbott, M.M., "Introduction to Chemical Engineering Thermodynamics", 7 th Edition, McGraw-Hill 2005								

ICT/MOOCs references	
1	https://nptel.ac.in/courses/103106071/
2	https://nptel.ac.in/content/syllabus_pdf/103107156.pdf
	Course Outcomes
	<p>Student will be able to understand thermodynamics processes, First and Second Law of thermodynamics.</p> <p>Know about steam generators and turbines.</p> <p>Student will be able to understand internal combustion engine two and four stroke cycle.</p> <p>Student will be able to understand refrigeration and its applications.</p>

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Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 2019	
Subject code		2PCE3106	Subject Name		Petrochemical Engineering I				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	0	1	0	5	Theory	40	60	100
Hours	4	0	2	0	6	Practical	30	20	50
Pre-requisites:									
1.									
Course Objective									
<ul style="list-style-type: none"> To Know about oil and gas industry with subdivisions. Student will understand history of petroleum types and ages of rocks in geology. To Understand the theories of origin and accumulation of oil and gas. Learn different surface and subsurface methods for exploration of hydrocarbons. To Know about EOR (Enhanced oil recovery) techniques. Know the dehydration and desalting process of crude oil and gas. 									
Theory syllabus									
Unit	Content								Hrs
1	Introduction to the subject: Outline of the gas and oil industry with main sub divisions, comparative study of various conventional and non conventional energy sources. Fuels and sources of synthetic organic chemicals								5
2	Petroleum Geology: History of petroleum, elements of petroleum geology, types and ages of rocks, lithography and classification of rocks, structure and stratigraphy of rock formation, sedimentary rocks, traps for oils and gas and their structural details.								7
3	Origin And Accumulation of Oil And Gas: Theories and origin and accumulation of oil and gas. Kerogen composition, classification, isolation, Properties of petroleum and gas in rocks, porosity, permeability, connate water, electrical resistivity, compressibility of rocks, phase behaviour, shrinkage, viscosity, compressibility, permeability, mobility, interfacial tension, wetting capillary pressure and forces of oil and flows.								10
4	Methods of Surface And Subsurface: Methods of surface and subsurface exploration (geological, geophysical and geochemical) cable tool, rotary and turbo drilling, drilling of wells (vertical, deviated and horizontal). Drilling, fluids, composition and functions, rates, coring, cementing, acidization, fracturing, completion and testing of wells, logging, methods of primary recovery.								10
5	Well Testing And EOR: Well testing and control, free flow and gas lifting, mechanical pumping, work over jobs, treatment of water for injection, enhanced oil recovery, secondary and tertiary.								6
6	Desalting , Transportation and Storage: Separation of Oil and Gas, gathering, stabilization, dehydration, desalting, sorting and mixing, transportation and storage of oil and gas, metering systems, group gathering stations and tank firms.								7
Practical content									

The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.

Text Books

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| 1 | An introduction to Physics and Chemistry of Petroleum : R R F Kinghorn |
| 2 | Composition and properties of Petroleum : H J Neumann, B P Lahme and B Severin |

Reference Books

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| 1 | Fundamental Aspects of Petroleum geochemistry : Negi and Colombo |
| 2 | Modern Petroleum Technology : G D Hobson and W Pohl |
| 3 | |

ICT/MOOCs references

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| 1 | https://nptel.ac.in/courses/103102022/ |
| 2 | https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod2.pdf |

Course Outcomes

Know about oil and gas industry with subdivisions.
Student will understand history of petroleum types and ages of rocks in geology.
Understand the theories of origin and accumulation of oil and gas.
Learn different surface and subsurface methods for exploration of hydrocarbons.
Know about EOR (Enhanced oil recovery) techniques.
Know the dehydration and desalting process of crude oil and gas

