DEPARTMENT OF PETROLEUM ENGINEERING

GRBT-20
4 YEARS B. TECH
COURSE STRUCTURE AND SYLLABUS

GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, Permanently Affiliated to JNTUK, Accredited by NBA, NAAC with A+ Grade,
Recognized by UGC under the sections 2(f) and 12(B) of UGC act 1956,
GIET Campus, NH-16, Rajahmundry - 533296, East Godavari, Andhra Pradesh.
www.giet.ac.in

Structure of B. Tech Program in Petroleum Engineering

I Year I Semester

S. No	Category	Course Code	Subject Title	Hours per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB101	Mathematics-I	3	0	0	3	30	70	100
2	BSC	201HB102	Communicative English	3	0	0	3	30	70	100
3	HSMC	201HB103b	Engineering Chemistry	3	0	0	3	30	70	100
4	ESC	201EE104	Basic Electrical & Electronics Engineering	1	0	4	3	30	70	100
5	ESC	201ME105	Engineering Graphics	3	0	0	3	30	70	100
6	ESC	201HB111b	Engineering Chemistry Laboratory	0	0	3	1.5	50	50	100
7	BSC	201EE112	Basic Electrical & Electronics Engineering Laboratory	0	0	3	1.5	50	50	100
8	ESC	201ME113d	Basic Engineering Workshop	0	0	3	1.5	50	50	100
			Total	**13**	**0**	**13**	**19.5**	**300**	**500**	**800**
BSC = 7.5 ESC=9 HSMC=3										

I Year II Semester

S. No.	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB201	Mathematics-II	3	0	0	3	30	70	100
2	BSC	201HB202b	Engineering Physics	3	0	0	3	30	70	100
3	ESC	201ME203a	Engineering Mechanics	3	0	0	3	30	70	100
4	ESC	201HB204a	Fundamentals of Computer Programming	3	0	0	3	30	70	100
5	ESC	201ME205	Metallurgy and Material Science	3	0	0	3	30	70	100
6	ESC	201CS213a	Fundamentals of Computer Programming Laboratory	0	0	3	1.5	50	50	100
7	BSC	201HB211b	Engineering Physics Laboratory	0	0	3	1.5	50	50	100
8	HSMC	201HB212	Communicative English Laboratory	0	0	3	1.5	50	50	100
9	MC	201HB296	Environmental Studies	2	0	0	0	30	70*	100
			Total	**17**	**0**	**9**	**19.5**	**300**	**500**	**800**
BSC = 7.5 ESC = 10.5 HSMC = 1.5 MC = 0										

II Year I Semester

S. No	Category	Course Code	Subject Title	Hours per Week			Credits	Internal	External	Total
				L	T	P				
1	BSC	201HB301	Mathematics-III	3	0	0	3	30	70	100
2	HSMC	201HB305	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
3	PCC	201HB202	Fluid Mechanics for Petroleum Engineers	3	0	0	3	30	70	100
4	PCC	201HB303	Petroleum Geology	3	0	0	3	30	70	100
5	PCC	201HB304	Process Calculation	3	0	0	3	30	70	100
6	ESC	201PT211	Computational Methods Laboratory	0	0	3	1.5	50	50	100
7	PCC	201PT312	Fluid Mechanics Laboratory	0	0	3	1.5	50	50	100
8	PCC	201PT313	Petroleum Geology Laboratory	0	0	3	1.5	50	50	100
9	SC	201CS381	Programming with Python	0	1	2	2	-	50	50
10	MC	201CS391	Constitution of India	2	0	0	0	30*	70*	100*
			Total	**17**	**1**	**11**	**21.5**	**300**	**550**	**850**
BSC = 3 HSMC = 3 ESC = 1.5 PCC = 12 SC = 2 MC = 0										

II Year II Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	ESC	201PT401	Elements of Mechanical Engineering	3	0	0	3	30	70	100
2	PCC	201PT402	Instrumentation, Process Dynamics & Controls	3	0	0	3	30	70	100
3	PCC	201PT403	Petroleum Exploration	3	0	0	3	30	70	100
4	PCC	201PT404	Process Heat Transfer	3	0	0	3	30	70	100
5	PCC	201PT405	Process Thermodynamics	3	0	0	3	30	70	100
6	PCC	201PT411	Instrumentation, Process Dynamics & Controls Laboratory	0	0	3	1.5	50	50	100
7	PCC	201PT412	Petroleum Analysis Laboratory	0	0	3	1.5	50	50	100
8	PCC	201PT413	Process Heat Transfer Laboratory	0	0	3	1.5	50	50	100
9	SC	201PT414	Engineering Exploration Project	1	0	2	2	-	50	50
Total				**16**	**0**	**11**	**21.5**	**300**	**550**	**850**
ESC =3 PCC=16.5 SC=2										
			Minor course	4	0	0	4			

*At the end of II-Year II semester, students must complete Summer Internship – I.

III Year I Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PCC	201PT501	Drilling & Well Completion	3	0	0	3	30	70	100
2	PCC	201PT502	Petroleum Reservoir Engineering-I	3	0	0	3	30	70	100
3	PCC	201PT503	Well Logging & Formation Evaluation	3	0	0	3	30	70	100
4	PEC		PE-I	3	0	0	3	30	70	100
5	OEC		OE-I	3	0	0	3	30	70	100
6	PCC	201PT511	Drilling Fluids Laboratory	0	0	3	1.5	50	50	100
7	PCC	201PT512	Petroleum Reservoir Engineering Laboratory	0	0	3	1.5	50	50	100
8	SC	201PT581	English for Career	1	0	2	2	-	50	50
9	MC	201PT591	IPR & Patents	2	0	0	0	30*	70*	100*
10	PROJ	201PT531	Industrial Training/Skill development / Research Project in higher learning institutes	0	0	0	1.5	100	-	100
Total				**18**	**0**	**8**	**21.5**	**350**	**500**	**850**
PEC=3 OEC=3 PCC=12 PROJ=1.5 SC=2 MC = 0										
			Minor course	4	0	0	4			

III Year II Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PCC	201PT601	Enhanced Oil Recovery Techniques	3	0	0	3	30	70	100
2	PCC	201PT602	Petroleum Production Engineering	3	0	0	3	30	70	100
3	PCC	201PT603	Petroleum Reservoir Engineering-II	3	0	0	3	30	70	100
4	PEC		PE-II	3	0	0	3	30	70	100
5	OEC		OE-II	3	0	0	3	30	70	100
6	PCC	201PT611	Petroleum Equipment Design Simulation Laboratory	0	0	3	1.5	50	50	100
7	PCC	201PT612	Petroleum Reservoir Simulation Laboratory	0	0	3	1.5	50	50	100
8	PCC	201PT613	Computer Aided Drafting	0	0	3	1.5	50	50	100
9	SC	201PT681	Applications of AI & ML in Petroleum Engineering	1	0	2	2	-	50	50
10	MC	201HB691	Quantitative aptitude and Reasoning	2	0	0	0	30*	70*	100*
			Total	**18**	**0**	**11**	**21.5**	**300**	**550**	**850**
PEC=3 OEC=3 PCC=13.5 SC=2 MC = 0										
			Minor course	4	0	0	4			

**At the end of III Year II Semester, students must complete summer internship-II.

***In case of exigency, students should take Community Service Project in place of summer internship-II.

IV Year I Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PEC		PE-III	3	0	0	3	30	70	100
2	PEC		PE-IV	3	0	0	3	30	70	100
3	PEC		PE-V	3	0	0	3	30	70	100
4	OEC		OE-III	3	0	0	3	30	70	100
5	OEC		OE-IV	3	0	0	3	30	70	100
6	HSMC	201HB781	*Humanities and Social Science Elective	3	0	0	3	50	50	100
7	PROJ	201PT731	Summer Internship-II	0	0	0	3	100	-	100
8	SC	201PT781	Computer Aided Pipe Line Design	1	0	2	2	-	50	50
Total				**19**	**0**	**2**	**23**	**300**	**450**	**750**
PEC=9 OEC=6 HSMC =3 PROJ=3 SC=2										
Minor course				4	0	0	4			

IV Year II Semester

S. No	Category	Course Code	Subject Title	Periods per Week			Credits	Internal	External	Total
				L	T	P				
1	PROJ	201PT841	Project (Project work, Seminar and Internship in industry)	0	0	0	12	60	140	200
Total				**0**	**0**	**0**	**12**	**60**	**140**	**200**
PROJ=12										

PROFESSIONAL ELECTIVE COURSES

S No	Semester	Course code	Courses	L	T	P	C
PE-I	V	201PT564A	Fundamentals of Liquefied Natural Gas	3	0	0	3
		201PT564B	Flow through Porous media				
		201PT564C	Pipeline Engineering				
		201PT564D	Petroleum Refining and Petrochemical Engineering				
PE-II	VI	201PT664A	SurfaceProduction Operations	3	0	0	3
		201PT664B	CarbonDioxide Sequestration				
		201PT664C	Reservoirmodeling and Simulation				
		201PT664D	TransportPhenomena				
PE-III	VII	201PT761A	Subsea Engineering	3	0	0	3
		201PT761B	Advances in Well Control				
		201PT761C	HSE in Petroleum Industry				
		201PT761D	Coal Bed Methane Engineering				
PE-IV	VII	201PT762A	Advanced Well Completion Engineering	3	0	0	3
		201PT762B	Oil and Gas Processing Plant Design				
		201PT762C	Natural Gas Engineering				
		201PT762D	Geothermal Reservoir Engineering				
PE-V	VII	201PT763A	Horizontal Well Technology	3	0	0	3
		201PT763B	Offshore Engineering				
		201PT763C	Shale Gas Reservoir Engineering				
		201PT763D	Advanced Drilling Operations				

OPEN ELECTIVE COURSES

S. No.	Semester	Course Code	Courses	L	T	P	C
OE-I	V	201PT565a	Fundamentals of Petroleum Engineering	3	0	0	3
OE-II	VI	201PT665a	Basic Concepts in Petroleum Drilling Engineering	3	0	0	3
OE-III	VII	201PT763a	Introduction to Petroleum Production Engineering	3	0	0	3
OE-IV	VII	201PT764a	Basic concepts in Petroleum Reservoir Engineering	3	0	0	3

MINORS COURSES

S No.	Semester	Course Codes	Courses	L	T	P	C
1.	IV	201PT406	Petroleum Geology	4	0	0	4
2.	IV	201PT407	Drilling Technology	4	0	0	4
3.	V	201PT504	Well Logging & Formation Evaluation	4	0	0	4
4.	V	201PT505	Well Completion	4	0	0	4
5.	VI	201PT604	Reservoir Engineering	4	0	0	4
6.	VI	201PT605	Production Engineering	4	0	0	4
7.	VII	201PT701	Enhanced Oil Recovery	4	0	0	4
8.	VII	201PT702	Offshore Engineering	4	0	0	4

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code	**Mathematics-I**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Types of matrices, Limits, continuity.	3	0	0	3

Course Objectives

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students understand advanced level mathematics to develop the confidence and ability to handle real world problems and their applications.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Apply mean value Roll's, Lagrange's and Cauchy mean value theorem in engineering applications.
CO3:	Acquire the knowledge maxima and minima of function of several variables
CO4:	Evaluate multiple integrals and their applications
CO5:	Understand Beta and Gamma functions, evaluate improper integrals.

Syllabus

Unit I

Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, solving system of linear homogeneous and non-homogeneous equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

Unit II

Quadratic forms and Mean Value Theorems

Quadratic forms and nature of the Quadratic forms, reduction of Quadratic form to canonical form by diagonalisation and orthogonal transformation. Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof).

Unit III

Partial differentiation and Applications

Partial derivatives, total derivatives, chain rule, Homogeneous functions and Euler's theorem, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit IV

Multiple Integrals and Applications

Evaluation of double integrals (Cartesian and polar coordinates) and triple integrals, change of variables, change of order of integration, Finding areas and volumes.

Unit V

Beta & Gamma Functions and Applications

Error functions, Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation of improper integrals.

Text book(s)

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

Reference(s)

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.

3. T.K.V.Iyenger, et.al., Engineering Mathematics, Volume-III, .Chand Publicatiobns, 2018.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2015.

Web Resource(s)

1. https://nptel.ac.in/courses/111105121/
2. https://nptel.ac.in/courses/111105035/
3. https://www.sanfoundry.com/engineering-mathematics-multiple-choice-questions-answers/
4. https://ocw.mit.edu/courses/mathematics/

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I Sem (1st Semester)			
Course Code	**Engineering Chemistry** (Common to All Branches)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Knowledge of theoretical and experimental concepts from Intermediate level, Application of Chemistry theory and calculations required for the course.	3	0	0	3

Course Objective

To acquaint the students with soft and hard water types and softening methods, to introduce the basic concepts of electrochemical cells and photovoltaic cells and to familiarize the students with engineering materials, their properties and applications.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	Understand the removal techniques of hardness of water
CO2	Distinguish the fuel cells and batteries
CO3	Identify different control techniques of corrosion
CO4	Understand the concepts of plastics and rubbers
CO5	Analyze the importance of nano materials

Syllabus

UNIT –I

Water technology

Hardness of water, Determination of hardness by EDTA Method - Boiler troubles **-** scale and sludge-priming and foaming (reasons and its preventions), specifications for drinking water by World Health Organization (WHO) standards, municipal water treatment or portable water treatment, softening of water - Lime soda process, zeolite and ion-exchange processes, Desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT – II

Energy sources and applications

Electrode potential, determination of single electrode potential –Nernst's equation, reference electrodes, hydrogen and calomel electrodes – electrochemical series and its applications – primary cell, dry or Leclanche cell – secondary cell, lead acid storage cell, nickel-cadmium cell – lithium ion batteries (Lithium-MnO_2) – fuel cell, hydrogen-oxygen fuel cell, Solar cell and its applications.

UNIT – III

Corrosion engineering

Corrosion: Definition – theories of corrosion, chemical and electro chemical corrosion –pitting corrosion, differential aeration corrosion, passivity, factors affecting corrosion – nature of the metal and nature of the environment.

Corrosion Controlling Methods: Sacrificial and Impressed current cathodic protection, Metallic coatings (anodic, cathodic), applying of metallic coatings - galvanizing and tinning, metal cladding, electroplating, organic surface coatings, paints (constituents and their functions).

UNIT – IV

Polymers

Introduction to polymers and monomers,polymerization and its types,mechanism of addition polymerization, compounding and fabrication of plastics, differences between thermoplastic and thermo setting resins, Preparation, properties and uses of Urea-Formaldehye, PVC andpolyethylene, Natural Rubber-vulcanization of rubber, Preparation, properties and uses of BUNA-S and BUNA-N Rubber, conducting polymers and its applications.

UNIT – V

Nano materials

Introduction to Nano materials, Nano structured materials-nano rods, nano sheets, Quantum dots, Methods of preparations by bottom up and top-down approaches -ball milling,sol-gel methods, Characterization of nanoparticles by XRD, SEM and TEM (includes basic principle of TEM), Applications of nano materials.

Text Book(s)

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakasham, (2014).

Reference(s)

1. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2. B.S Murthy and P. Shankar, A Text Book of NanoScience and NanoTechnology, University Press (2013).
3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand& Co, (2010)
4. V. Raghavan, A Material Science and Engineering, Prentice-Hall India Ltd, (2004).
5. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).

Web Resources

1. www.btechguru.com/courses--nptel--chemistry-and-biochemistry-video-lecture--cbc.html
2. www.chem.tufts.edu

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B.Tech. I sem (1st Semester)			
Course Code	**Communicative English-1** (Common to All Branches)				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisites	Learner should be equipped with basic language and communication skills like Reading, Writing, Listening and Speaking.	3	0	0	3

Course Objectives

This course aims to

- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
- Impart effective strategies for good writing, to summarize information and practice writing essays.
- Improve communication in both professional and social life
- Demonstrate Language efficiency in career building
- Provide the knowledge of grammatical structures, vocabulary and encourage their appropriate use in speech and writing.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	Develop effective reading strategies
CO2	Demonstrate writing skills that are required for professional development and use graphic elements for communication
CO3	Apply grammatical skills and vocabulary effectively in speech and writing
CO4	Display language efficacy in tune with subjective knowledge
CO5	Use required language along with contextual vocabulary and grammar structures

Syllabus

UNIT-I

Reading

Detailed Study- Exploration- "A Proposal to Girdle the Earth (Excerpt)" by Nellie Bly, from English All Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan.

Non-Detailed Study- "Deliverance" by Prem chand from Individual Society**,** Pearson Publications

Grammar

Verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural forms. Simple question forms — Wh-questions; Word order in sentences.

Vocabulary

Technical Vocabulary (GRE Model)-20 words**.** Content words and function words; Word forms

Writing skills

Paragraph Writing-Beginnings and endings of paragraphs - introducing a topic- structure and types of paragraph.

UNIT-II

Reading

Detailed Study: On Campus - An excerpt from "The District School as It Was by One Who Went to It" by Warren Burton from English All Round: Communication Skills for Under Graduate Learners-1 by

Orient Black Swan Non-Detailed Study: "Bosom Friend" by Hira Bansode from Individual Society, Pearson Publications

Grammar

Use of articles and zero article; prepositions.

Vocabulary

Technical Vocabulary (GRE Model)-20 words**.** Linkers, sign posts and transition signals.

Writing skills

Punctuation. Summarizing an oral or written text.

UNIT-III

Reading

Detailed Study: Working Together - The Future of Work? (Adopted from web resources) From English All. Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan Non-Detailed Study"Shakespeare's Sister" by Virginia Woolf from Individual Society, Pearson Publications.

Grammar

Tense and aspect; direct and indirect speech, reporting verbs for academic purposes.

Vocabulary

Technical Vocabulary (GRE Model)-20 words. Prefixes and Suffixes.

Writing skills

Rephrasing what is read; avoiding redundancies and repetitions

UNIT—IV

Reading

Detailed Study: Fabric of Change- H. G. Wells and the Uncertainties of Progress by Peter J. Bowler from English All Round: Communication Skills for Under Graduate Learnerslby Orient Black Swan. Non-Detailed:"Telephone Conversation" by Wole Soyinka from Individual Society, Pearson Publications.

Grammar

Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison.

Vocabulary

Technical Vocabulary (GRE Model)-20 words. Use of antonyms and homophones. Cloze encounters

Writing skills

Information transfer; describe, compare, contrast, and identifying significance/trends based on information provided in figures/charts/graphs/tables — Sensible writing, Defining and classifying.

UNIT — V

Reading

Detailed Study: Tools for Life -Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far from English All Round: Communication Skills for Under Graduate Learners-1 by Orient Black Swan.

Non-Detailed: "Still I Rise" by Maya Angelou from Individual Society, Pearson Publications.

Grammar

Reading comprehension- framing right answers and editing the given text.

Vocabulary

Technical Vocabulary (GRE Model)-20 words. Idioms and Phrases.

Writing skills

Writing structured essays on specific topics using suitable claims and evidences.

Text Book(s)

1. Detailed Study: ENGLISH ALL ROUND: Communication Skills for Under Graduate Learners-Published by Orient Black swan Pvt Ltd
2. Non-detailed Study: Individual Society, Pearson Publications

Reference(s)

1. Pathways: Listening, Speaking and Critical Thinking-1 by Rebecca Tarver Chase, Becky Tarver and Henley, ELT; 2nd Edition, 2018.

2. InfoTech English by Maruthi Publications.

Web Resource(s)

1. https://www.englishclub.com/
2. http://www.world-english.org/
3. http://learnenglish.britishcounci I .org/

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code	**Engineering Graphics** (Common to CE, ME, CSE(AI&ML),CSE(Cyber Security), Automobile, Mining and Petroleum Engineering)				
Teaching	Total contact hours - 60	L	T	P	C
Prerequisites	Knowledge of theoretical and experimental concepts from Intermediate level, Application of Chemistry theory and calculations required for the course.	3	0	0	3

Course Objectives

- To highlight the significance of universal language of engineers.
- To impart basic knowledge and skills required to prepare engineering drawings.
- To impart knowledge and skills required to draw projections of solids in different contexts.
- To visualize and represent the pictorial views with proper dimensioning and scaling.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	Apply principles of drawing to represent dimensions of an object.
CO2	Outline the polygons and engineering curves.
CO3	Illustrate projections of points, lines, planes and solids.
CO4	Illustrate the 3D views through isometric views.
CO5	Create the isometric views and orthographic views

Syllabus

UNIT-I

Polygons

Constructing regular polygons by general methods, inscribing and describing polygons oncircles.

Curves

Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes.

UNIT-II

Orthographic projections

Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to oneof the reference planes (HP,VP or PP)

Projections of straight lines

Inclined to both the planes, determination of true lengths,angle of inclination and traces- HT, VT.

UNIT-III

Projections of planes

Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV

Projections of solids

Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT-V

Isometric views

Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer aided design

Drawing practice using Auto CAD, Creating 2D & 3D drawings of objects using Auto CAD
Note: In the End Examination there will be no question from CAD.

Text Book(s)

1. Engineering Drawing by N.D. Butt, Chariot Publications.
2. Engineering Drawing by Agarwal&Agarwal, Tata McGraw Hill Publishers.

Reference (s)

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers.
2. Engineering Graphics for Degree by K.C. John, PHI Publishers.
3. Engineering Graphics by PI Varghese, McGrawHill Publishers.
4. Engineering Drawing + AutoCad – K.Venugopal, V. Prabhu Raja, New Age.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code	**Basic Electrical and Electronics Engineering** (Common for Mech, CE, AME, PET, MM, ECE, EEE)				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisites	Basics of Physics	3	0	0	3

Course Objectives

1. To learn the basic principles of electrical law's and analysis of networks.
2. To understand the principle of operation and construction details of DC machines.
3. To learn the principle of operation and constructional details of transformers, alternator and induction motors.
4. To study the operation of PN junction diode, half wave, full Wave rectifiers and OP-AMPS
5. To study operation of PNP and NPN transistors and various amplifiers.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.

Syllabus

UNIT –I

Introduction to Electrical Circuits

Basic definitions, Electrical circuit elements (R, L and C), Ohm's Law, Series & Parallel circuits, Kirchhoff's Laws, Simple problems.

UNIT- II

DC Generator

Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

UNIT- III

DC Motor

Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

UNIT –IV

Rectifiers & Linear Integrated Circuits

PN junction diodes, diode applications - Half wave and bridge rectifiers. Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non-inverting, integrator and differentiator).

UNIT –V

Transistors

PNP and NPN junction transistor, transistor as an amplifier, single stage CE amplifier, frequency response of CE amplifier, concepts of feedback amplifier.

Text books(s)

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.

2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
3. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.
4. Electrical Technology by Surinder Pal Bali, Pearson Publications.
5. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group

Reference(s)

1. Basic Electrical Engineering by M.S.Naidu and S.Ka1nakshiah, TMH Publications
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2th edition
3. Basic Electrical Engineering by Nagsarlcar, Sukhija, Oxford Publications,2nd edition
4. Industrial Electronics by GK. Mittal, PHI

Web Resource(s)

1. www.electrical4u.com
2. www.nptel.com

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B. Tech. I Sem.(1st Semester)			
Course Code	**Engineering Chemistry Laboratory** (Common to All Branches)				
Teaching	Total contact hours - 45	L	T	P	C
Prerequisites	Basic Knowledge of Engineering Chemistry Applications	0	0	3	1.5

Course Objective

To familiarize the students with the basic concepts of Engineering Chemistry Lab, training the students on how to handle the instruments and to demonstrate the digital and instrumental methods of analysis.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO2	Determine the total hardness of water
CO3	Perform various Redox titrations
CO4	Preparation of polymers
CO5	Compare viscosities of different oils

LIST OF EXPERIMENTS

1. Determination of strength of an acid by pH metric method
2. Determination of Fe (II) in Mohr's salt by potentiometric method
3. Determination of conductance by conductometric method
4. Determination of Hardness of a ground water sample
5. Determination of chromium (VI) in potassium dichromate
6. Determination of strength of KMnO4 using standard Oxalic acid solution
7. Determination of Zinc by EDTA method
8. Preparation of Urea-Formaldehyde resin
9. Estimation of active chlorine content in Bleaching powder
10. Estimation of sodium hydroxide with HC1

DEMONSTRATION EXPERIMENTS

1. Determination of viscosity of a liquid
2. Determination of surface tension of a liquid
3. Estimation of vitamin-C

Text book(s)

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers (2000).
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code	**Basic Electrical and Electronics Engineering Laboratory** (Common for Mech, CE, AME, PET, MM, ECE, EEE)				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisites	Basics of Physics	0	0	3	1.5

Course Objectives

1. To verify the Kirchhoff's laws & Ohm's law
2. To calculate the efficiencies of transformers, DC motors, Three-phase Induction Motor
3. To plot the characteristics of PN junction diode & operational amplifier
4. To plot the characteristics of Transistor

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	Analyze the various electrical networks
CO2	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
CO3	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5	Explain the single stage CE amplifier and concept of feedback amplifier.

List of Experiments

1. Verification of Kirchhoff's laws
2. Verification of Ohm's laws
3. Study of various wiring components (wires, switches, fuses, sockets, plugs, Lamp holders, lamps etc. their uses and ratings)
4. Measurement of current, voltage, power in R-L-C series circuit excited by single phase supply
5. Verification of voltage & current relations in Star & delta connections
6. Swinburne's test on a DC shunt machine.
7. Transistor common base characteristics
8. Speed control of D.C. Shunt motor by Armature Voltage control and Field flux control method
9. Efficiency and regulation of a single phase transformer by direct loading method.
10. Brake test on a three phase induction motor
11. PN junction Diode characteristics a). Forward bias b).Reverse bias. (Cut in voltage & Resistance calculations)
12. Zener diode characteristics
13. Half wave rectifier
14. Full wave Rectifier
15. Transistor common emitter characteristics.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	I B. Tech. I Sem. (1st Semester)			
Course Code	**Basic Engineering Workshop** (Common to CE, ME, Automobile, Mining and Petroleum Engineering)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Aptitude to learn.	3	0	0	3

Course Objectives

- Provide insight into utilization of various tool in carpentry, fitting, tin smithy, black smithy andhouse wiring.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Experiment with various basic house wiring techniques.
CO2:	Develop basic prototype in the trade of tin smithy such as square tray and open scoop.
CO3:	Design v-fitting and square fitting in the trade of fitting
CO4:	Making square rod and L-bend from the round rod in black smithy
CO5:	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.

List of Experiments

Note: At least two exercises should be done from each trade.

1. Carpentry
    1. T-Lap Joint
    2. Cross Lap Joint
    3. Dovetail Joint
    4. Mortise and Tenon Joint
2. Fitting 1.Vee Fit
    2. Square Fit
    3. Half Round Fit
    4. Dovetail Fit
3. Black Smithy
    1. Round rod to Square
    2. S-Hook
    3. Round Rod to Flat Ring
    4. Round Rod to Square headed bolt
4. Tin Smithy
    1. Taper Tray
    2. Square Box without lid
    3. Open Scoop
    4. Funnel
5. House wiring
    1. Ordinary bulb connection
    2. Staire case connection
    3. Parallel connection

4. Series connection

1. Workshop Manual by P.Kannaiah & K.L.Narayana- Scitech Publishers

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Mathematics-II**				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisites	Fundamentals of ODE, PDE and Vectors	3	0	0	3

Course Objectives

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Solve higher order differential equations with constant coefficients, apply method of variation of parameters.
CO2:	Solve Cauchy's and Legendre's linear equations, applications of differential equations
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Apply the Knowledge of different algorithms for approximating the solution of ordinary differential equations in practical Engineering problems.
CO5:	Apply del operator to Scalar and vector point functions, illustrate Gradient, Divergence and Curl operators

Syllabus

UNIT I

Linear Differential Equations of Higher Order

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

UNIT II

Equations Reducible to Linear Differential Equations and Applications

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.

Unit III

Solutions of Algebraic, Transcendental Equations and Interpolation

Introduction, Bisection method, Newton-Raphson method and Regula-Falsi method. Newton's Forward and backward difference formulae. Interpolation with unequal intervals- Lagranges interpolation.

UNIT IV

Numerical Integration and Solution of Ordinary Differential Equations

Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solutions of ordinary differential equations- Taylor's series, Runge-Kutta method of fourth order.

UNIT V

Vector Calculus

Scalar and vector point functions, Curl, Gradient and Divergence, directional derivative, Irrotational and Solenoidal vector fields. Line integral, Work done, Area, Surface and volume integrals. Greens, Stokes and Gauss Divergence theorems (without proof).

Text book(s)

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference (s)

1. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. T.K.V.Iyenger, et.al., Engineering Mathematics, Volume-I, S.ChandPublicatiobns, 2016.

4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.

Web Resources

1. https://nptel.ac.in/courses/111108081/
2. https://nptel.ac.in/courses/111105093/
3. https://nptel.ac.in/courses/111105122/
4. https://nptel.ac.in/courses/111107108/

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Engineering physics** (For All Non-Circuital Branches like Mechanical, CE, AME, PET, Mining etc)				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

Physics Curriculum is re-oriented to the needs of all the branches of graduate engineering courses that serve as a transit to understand specific advanced topics.

Course Outcomes

On Completion of the course, the students will be able	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO2:	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO3:	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
CO4:	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.

Syllabus

UNIT –I

WAVE OPTICS

Interference

Introduction - Principle of Superposition- Interference in thin films (reflected light) - Newton's Rings – Engineering Applications

Diffraction

Introduction – Types of Diffractions – Fraunhofer Single slit Diffraction (Quantitative) – Double Slit - N slits/Grating (Qualitatively) – Grating Formula – Rayleigh's Criterion for resolving power of grating

Polarization

Introduction - Types of Polarization (plane, circular, elliptical) – Production of polarized light by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates

UNIT –II

Laser

Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Pumping schemes – Population inversion – Three level system and meta stable state - Lasing Schemes – Ruby Laser – He-Ne laser - Applications of lasers.

Fiber Optics

Introduction - Principle and structure of Optical Fibers - Acceptance angle - Numerical Aperture - Classification of optical fibers based on Refractive index profile and modes – Applications for the optical fibers

UNIT –III

Acoustics

Introduction – Reverberation – Reverberation time– Sabine's formula (Derivation using growth and decay method) – Basic requirements for the acoustically good halls - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures

Ultrasonics

Introduction - Properties of ultrasonics - Production by magnetostriction and piezoelectric methods – Detection - Acoustic grating - Non-Destructive Testing – pulse echo system through transmission and reflection modes

UNIT –IV

Crystallography

Introduction - Space lattice, Basis, Unit Cell – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Introduction

Bragg's law - X-ray Diffractometer – Miller Indices – Planes - crystal structure determination by rotating crystal (Laue's) and powder methods

UNIT –V

Dielectrics properties

Introduction - Electric polarization - Dielectric polarizability, Susceptibility and Dielectric constant-Types of dielectric polarizations – Electronic, Ionic, Orientational& Space (Qualitatively) – Internal Field (or) Local field in solids - Claussius-Mosotti equation – Ferroelectrics (Qualitatively)

Magnetic properties

Introduction - Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment -Classification of Magnetic materials (Dia, Para, Ferro/Ferri/Antiferro) with regard to temperature and field - Weiss ferromagnetic domain theory (qualitative)-Hysteresis-soft and hard magnetic materials-Ferrites

Text book(s)

1. M. R. Srinivasan, "Engineering Physics", New Age International Publishers, 2011.
2. D. Thirupathi Naidu, M. Veeranjaneyulu, "Engineering Physics", Techno Series, 2019.
3. P. K. Palanisamy, "Applied Physics", Sci-tech Publications.
4. A.J.Decker, "Solid State Physics", Mac Millan.
5. M. N. Avadhanlu, P. G. Kshirasagar "A Text book of Engineering Physics", S. Chand Publications, 2017.

Reference(s)

1. Principles of Physics by Resnick, Halliday, and Walker, Printice Hall Publications
2. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata McGrawHill ,2008
3. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
4. H. K. Malik and A. K. Singh "Engineering Physics", McGraw Hill Publishing Company Ltd, 2018.

Web Link

1. https://www.britannica.com/science/interference-physics
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Fundamentals of Computer Programming** (Common to Mech, MM, Civil, AME, EEE, PET)				
Teaching	Totalcontacthours–48	L	T	P	C
Prerequisites	Basic knowledge of Mathematics, Logical Ability	3	0	0	3

Course Objectives

- Exposure to problem solving through programming
- Basic concepts of C-programming language
- Involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcomes

On Completion of the course, the students will be able	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.

Syllabus

UNIT-1

Introduction to Computers

Generations, CPU, Memory, I/o Devices.

Introduction to Computer Programming

Computer Languages: Machine level, Assembly level and High-level language.

Introduction to Problem Solving

Algorithm, Pseudo code and Flowchart.

UNIT-2

C Fundamentals

Structure of a C-program, C-character set, C Tokens: variables, constants, identifiers, data types and sizes, operators, Preprocessor.

I/O Functions

Header files, Standard 1/0 library functions-formatted I/O functions.

Decision making statements

Simple if, if-else, nested if-else, else-if ladder, switch-case statements and sample programs.

Iterative Statements

for, while, do-while. Jump Statements-break, continue.

UNIT-3

Introduction to Arrays & Strings

Arrays- Declaration, initialization, storing and accessing elements of I-D, 2-D and multi-dimensional arrays.Array Applications: addition, multiplication, transpose, symmetry of a matrix.

Strings: Declaration, initialization, reading and writing characters into strings, string operations, character and string manipulation functions

UNIT-4

Pointers, Functions & Storage Classes

Pointers: Introduction to pointers, defining a pointer variable, Pointer to Pointer, Examples ofpointers, using pointers in expressions, pointers and arrays. Functions: declaration, definition, prototype, function call, return statement, types of functions, parameter passing methods, and function recursion. Storage Classes: Auto, Static, Extern and Register.

UNIT-5

Structure and Union

Declaration, initialization, storing and accessing elements by using structure and union.

Text Book(s)

1. Problem Solving and Programming Concepts, Maureen Sprankle and Jim Hubbard, Pearson, 9th Edition.
2. "Programming in ANSI C" by E.Balagurusamy,McGraw Hill Publications.
3. "Programming in C" by Ashok N. Kamthane, 2/e Pearson, 2013.
4. "The C — Programming language" B.W.Kernighan, Dennis M. Ritchie.PHI.
5. v"Let Us C", 12th Edition by Yashavant P. Kanetkar online in India.

Reference(s)

1. Programming in C by Ajay Mittal, Pearson.
2. Programming with C, Bichkar, Universities press.
3. Programming in C,ReemaThareja, OXFORD.

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Engineering Mechanics** (Common to CE, ME, Automobile, Mining, and Petroleum Engineering)Engineering)				
Teaching	Totalcontacthours-55	L	T	P	C
Prerequisites	Engineering Physics	3	0	0	3

Course Objectives

- Tolearntheresolutionandcompositionofsystemofforces.
- Tounderstandtheanalyticalandgraphicalmethodsforanalysisofstaticequilibriumofrigidbodies.
- Tolearntheconceptofcentroid, centerofgravity,momentofinertia.Tolearnkinematic andkinetic analysisofrigidbodies.
- Tolearnapplicationofworkenergyandimpulsemomentumprinciplestorigidbodymotion.

CourseOutcomes

OnCompletionofthecourse,thestudentswillbeableto-	
CO1:	Carryoutcompositionofsystemofforces.
CO2:	Analyserigidbodiesinstaticequilibriumconditionundersystemofforcesincludingfriction.
CO3:	Determinecentreofgravityand momentofinertiaofsimpleandcompositeplanar,solid sections.
CO4:	Carryout dynamicanalysisofrigidbodiesundertranslation,rotationandplanemotion.
CO5:	Applywork energyandimpulsemomentumprinciplestorigidbody motion.

Syllabus

UNIT–I

Introductiontoengineeringmechanics–basicconcepts,systemsof forces

Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. Introduction**,** limiting friction and impendingmotion,coulomb'slaws of dry friction,coefficient of friction,cone of friction.

UNIT-II

Equilibrium of systems of forces

Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. LamisTheorm, Graphical method for theequilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT–III

Centroid

Centroid of simple figures(from basic principles)–Centroids of CompositeFigures.

Centreofgravity

Centre of gravity of simple body(from basic principles), centre of gravity of composite bodies,pappustheo em.

Area moments of inertia

Definition – Polar Moment of Inertia, Transfer Theorem, Momentsof Inertia of Composite Figures, Products ofInertia, Transfer Formula for Product of Inertia.

Massmoment of inertia Momentof Inertiaof Masses, Transfer Formula for Mass MomentsofInertia,massmomentofinertiaofcompositebodies.

UNIT–IV

Kinematics

Rectilinear and Curvilinear motions–Velocity and Acceleration–Motion of Rigid Body–Types and their Analysis in Planar Motion.

Kinetics

Analysis and Particle and Analysis of Rigid Body inTranslation–Central Force Motion– Equations of Plane Motion–Fixed Axis Rotation–RollingBodies.

UNIT– V

Work–energymethod

EquationsforTranslation,Work-EnergyApplicationstoParticleMotion,ConnectedSystem-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TextBook(s)

1. Engineering Mechanics statics and dynamics:ANelson,McGrawHillpublications.
2. Engineering Mechanics, SSBhavikatti, New Age International Publications.

Reference(s)

1. Engineering. Mechanics -S.Timoshenko & D.H.Young.,4th Edn-,McGrawHill publications.
2. Engineering Mechanics:Basudeb Bhattacharyya,Oxford University Press
3. Engineering Mechanics:staticsanddynamics–I.H.Shames,–Pearson Publ.
4. Engineering Mechanics, TayalA.K.(2010)Umesh Publications
5. Engineering Mechanics,KhurmiR.S.(2010),S.Chand&Co.

Web resources

1. http://nptel.ac.in/courses.php
2. http://mit.espe.edu.ec/courses/mechanical-engineering/

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Material Science and Metallurgy** (Common to ME, Mining, Petroleum Engineering)				
Teaching	Totalcontacthours-55	L	T	P	C
Prerequisites	EngineeringPhysicsandEngineering Chemistry	3	0	0	3

CourseObjectives

To understand the basic fundamentals of Material science and Physical metallurgy. The basicconcepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of the society.

CourseOutcomes

On Completion of thecourse,the students will be able to-	
CO1:	Demonstrate the knowledgeof science and fundamentals ofmaterials.
CO2:	Describe the regions of stability of phases that occur in thealloy systems.
CO3:	Classify steels and castIron swith applications.
CO4:	Select heat treatment methods and non-ferrousmaterials.
CO5:	Explain the concept of ceramics and composites.

Syllabus

UNIT–I

Structureofmetalsand constitutionofalloys

BondsinSolids–Metallic bond-crystallizationofmetals,grain andgrain boundaries,effect of grain boundaries on the properties of metal/alloys–determination of grain size.Necessity of alloying,types of solid solutions,HumeRotherysrules ,intermediate alloy phases,and electron compounds.

UNIT–II

Equilibriumdiagrams

Experimental methods of construction of equilibrium diagrams ,Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps,eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solidstate – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagramsand properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cus-SnandFe-Fe3C.

UNIT–III

Castironandsteels

Classification of CastIron-Structure and properties of WhiteCastiron, Malleable Castiron,greycastiron,Spheriodal graphite castiron,Alloy castirons. Classification of steels-structure and properties of plain carbonsteels, Lowalloysteels, Hadfield manganese steels,tool and diesteels.

UNIT–IV

Heat treatment of alloys

Effect of alloying elements on Fe-Fe3C system, Annealing,normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment,Cryogenic treatment of alloys.

Non-ferrousmetalsandalloys

Structure and properties of copper and its alloys,Aluminium and its alloys,Titanium and its alloys.Magnesium and its alloys.

UNIT– V

Ceramics

Crystallineceramics,glasses,cermets,abrasivematerialsnano-materials.

Composites

Definition, properties and applications of the above.Classification of composites-particle–reinforced materials ,fiberrein forced materials,metal ceramic mixtures,metal–matrix composites andC–C composites various methods of manufacturing of composites.

TextBook(s)

1. IntroductiontoPhysicalMetallurgy-SidneyH.Avener–McGrawHill
2. MaterialscienceandEngineering-V.Rahghavan

Reference(s)

1. Material ScienceandMetallurgy–Dr.V.D.kodgire.
2. Materials Scienceandengineering-Callister&Baalasubrahmanyam
3. Material Sciencefor Engineeringstudents–Fischer–Elsevier Publishers
4. Introduction to Material Science and Engineering–Yip-WahChungCRCPress
5. Material Science and Metallurgy– AVK Suryanarayana– BSPublications
6. Material Science and Metallurgy–U.C.Jindal– PearsonPublication
7. Material Science and Metallurgy for Engineers-Kodgire-Everest Publishing House

Web resources

1. http://nptel.ac.in/courses.php
2. http://mit.espe.edu.ec/courses/mechanical-engineering/

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Engineering Physics Laboratory** (For All Non-Circuital Branches like Mechanical, CE, AME, PET, Mining etc)				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisites		0	0	3	1.5

Course Objectives

On Completion of the course, the students will be able	
CO1:	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colors using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO3:	To evaluate the acceleration due to gravity using compound pendulum
CO4:	To determine the moment of inertia using Fly wheel

List of Physics Experiments

1. Determination of the radius of curvature of the lens by Newton's ring method
2. Determination of wavelength by plane diffraction grating method
3. Resolving power of a grating
4. Magnetic field along the axis of a circular coil carrying current
5. Measurement of resistance with varying temperature
6. To determine the acceleration due to gravity using compound pendulum
7. Rigidity modulus of material of a wire-dynamic method (torsion pendulum)
8. Moment of inertia by Flywheel
9. To determine the V-I characteristics of P-N Junction diode
10. To determine the V-I characteristics Zener diode

Additional Experiments

1. Determine the thickness of the fiber using wedge shape method
2. To verify the laws of vibration using sonometer
3. To determine the resistivity of semiconductor by Four probe method
4. To determine the carrier concentration and Hall coefficient
5. To determine the energy gap of a semiconductor

Reference(s)

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017

Web Resources

http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Fundamentals of Computer Programming Lab** (Common to Mech, Min, Civil, AM E, EEE, PET)				
Teaching	Totalcontacthours-36	L	T	P	C
Prerequisites	Basic knowledge of Mathematics, Logical Ability	0	0	3	1.5

Course Objectives

- To provide exposure to problem solving through programming.
- To train the student to the basic concepts of C-programming language.
- The course involves a lab component which is designed to give the student hands-on experience with the concepts.

Course Outcomes

On Completion of the course, the students will be able	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.

Programs

1. Write a C Program to
   a) Calculate the area of triangle using the formula
      Area = (s (s-a) (s-b) (s-c)) 1/2, where s= (a+b+c)/2
   b) To find the largest of three numbers using ternary operator.
   c) To swap two numbers with and without temporary variable.
2. Write a C program that perform the following operations:
   a) Reading and writing a complex number
   b) Addition of two complex numbers
3. Write a C program to
   a) Find the roots of a quadratic equation.
   b) Take two integer operands and one operator form the user, Performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
4. Write a C Program toprint the following patterns
   a) Floyd's triangle
   b) Pyramid
5. Write a C program to
   a) Check whether the given number is Armstrong number or not.
   b) Check whether the given number is palindrome or not.
   c) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

d) Generate all the prime numbers between 1 and n, where n is a value supplied by the user.

6. Write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.
7. Write a C program to
   a) Examples which explore the use of structures, union and other user defined variables.
   b) Declare a structure for calculating the percentage achieved by 3 students, by considering the structure elements as name, pin no, mark1, mark2, mark3.
8. Write the C programs for the following using arrays
   a) Matrix addition
   b) Matrix Multiplication
9. Write C Program for perfoming the following string operations
   a) length of a string
   b) reverse a string
   c) append a string to another string
   d) compare two strings
10. Write a C Programs for the following string operations with and without using the built in functions
    a) To reverse a string using pointers.
    b) To concatenate two strings by using pointer.
11. Write a C program to find the factorial of a given integer using function recursion.
12. Write C programs to
    a) Find the area of triangle by using call by value and call by reference concepts.
    b) Pointer based function to exchange value of two integers using passing by address.

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Communicative English Lab**				
Teaching	Totalcontacthours-36	L	T	P	C
Prerequisites	Learner should be equipped with Basic Language and Communication Skills like, Listening and Speaking which ensure Good Pronunciation and Ease in Communication	0	0	3	1.5

Course Objectives

- Adopt activity-based teaching-learning methods to ensure effective learning both in the classroom and laboratory sessions.
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Explore the important language needs of the learner
- Build Language efficacy in both speaking and listening context

Course Outcomes

On Completion of the course, the students will be able	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.

Syllabus

UNIT 1

Basic aural and oral skills

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and other. Speaking: Phonetics-Accent and pronunciation

UNIT 2

Conversational skills

Listening: Listening to audio texts, framing question in order to find out the gist of the unknown text. Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks

UNIT 3

Language in use

Listening: Listening for global comprehension and summarizing. Speaking: Asking for Clarifications. Inviting others. Expressing Sympathy, Congratulating, Apologizing, Advising, Suggesting, Agreeing and Disagreeing.

UNIT 4

Language application

Listening: Making predictions while listening to conversations/ transactional dialogues; listening to video and narrating the theme. Speaking: word stress-di-syllabic words, Poly-Syllabic words - Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

UNIT 5

Interpretations

Listening: TED Talks — understanding the summary. Speaking: Formal oral presentations on topics from academic contexts and technical back ground. Giving formal explanations.

Lab Manual: INTERACT by Orient Black Swan

Software: Cambridge —UNLOCK-2, English In Mind, Pronunciation Power, English grammar in Use

Reference (s)

1. English Pronunciation in use- Mark Hancock, Cambridge University Press
2. English Phonetics and Phonology-Peter Roach, Cambridge University Press.

Web Resources

1. littps://www.usingenglish.com/comprehension
2. https://www.englishclub.com/reading/short-stories.httm
3. littps://www.english-online.com

Regulation GRBT-20	GodavariInstituteofEngineering&Technology (Autonomous)	I B. Tech. II Sem.(2nd Semester)			
CourseCode	**Environmental Science** (Common to All Branches)				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisites	KnowledgeofEnvironment Science	0	1	2	2

Course Objective

To bring in the students an awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and study the causes for pollution due to the day-to-day activities of human life, to save earth from the interventions by the engineers.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3:	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5:	Influence their society in proper utilization of goods and services.

Syllabus

UNIT – I

Multidisciplinary nature of environmental studies

Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES **:** Renewable and non-renewable Energy resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

UNIT – II

Ecosystems, biodiversity, and its conservation

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation

Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental pollution and solid waste management

Definition, Cause, effects and control measures of:Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards

Solid waste management

Causes,effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social issues and the environment

Urban problems – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human population and the environment

Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health –Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text book(s)

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

Reference (s)

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

Web Resources

1. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
2. https://www.tutorialspoint.com/environmental_studies/environmental_studies_tutorial.pdf
3. https://play.google.com/store/apps/details?id=com.techzone.higher.enviroment&hl=en_US

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Mathematics-III**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Properties of derivatives and integration, complex numbers	3	0	0	3

Course Objectives

- To familiarize the techniques in partial differential equations and complex variables.
- To equip the students to solve application problems in their disciplines.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the knowledge of continuity, analytic and C-R equations of complex function.
CO2:	Evaluate complex integration, apply Cauchy theorem, integral formula, residue theorem.
CO3:	Understand properties of Laplace and inverse Laplace transformations, apply to solve differential equations
CO4:	Evaluate Fourier series for different functions. Understand properties of Fourier transformation apply for different function
CO5:	Solve first order linear and nonlinear pde's , Solve higher order pdes.

Syllabus

UNIT- I

Complex Variables

Complex function, continuity, Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, conjugate harmonic function, Milne Thomson method.

UNIT-II

Complex Integration

Integration in the complex plane: Cauchy theorem (without proof), Cauchy integral formula (without proof), zeros and singularities of analytic functions, Residue, Cauchy's residue theorem (without proof), Evaluation of integrals of the type (i) $\int_0^{2\pi} f(cos\theta,\ sin\theta)d\theta$ and (ii) $\int_{-\infty}^{\infty} f(x)dx$.

UNIT-III

Laplace Transforms

Definition of Laplace transform, existence conditions, properties of Laplace transforms, inverse Laplace transforms, transforms of derivatives, transforms of integrals, multiplication by t^n, division by t, convolution theorem, periodic functions, unit step function, unit impulse function, (without proofs). Applications to ordinary linear differential equations with constant coefficients.

UNIT-IV

Fourier series and Fourier Transforms

Dirichlet's conditions, Fourier series, functions of any period, odd and even functions - half range series. Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform.

UNIT-V

First and Higher Order Partial Differential Equations

First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous higher order linear partial differential equations.

Text book(s)

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

Reference (s)

1. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
2. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

Web Resource(s)

1. https://nptel.ac.in/courses/111103070/
2. https://nptel.ac.in/courses/111/106/111106084/
3. https://nptel.ac.in/courses/111/106/111106046/
4. https://nptel.ac.in/courses/111105093/

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Managerial Economics and Financial Analysis**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Basic Knowledge of Economics and Accounts	3	0	0	3

Course Objectives

1. To understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.
2. To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.
3. To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organizations and the concept of Business Cycles.
4. To learn different Accounting Systems, preparation of Financial Statements and uses of different tools for performance evaluation.
5. To understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.

Course Outcomes

On Completion of the course, the learner will be able to-	
CO1:	Estimate the Demand and demand elasticity's for a product
CO2:	Understand the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
CO3:	Understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
CO4:	Prepare Financial Statements and the usage of various Accounting tools for Analysis.
CO5:	Evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

Syllabus

UNIT- I

Introduction to Managerial Economics and Demand Analysis

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting.

UNIT- II

Theories of Production and Cost Analysis

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs, Cost –Volume-Profit analysis-Determination of Breakeven point(problems)- Managerial significance and limitations of Breakeven point.

UNIT- III

Introduction to Markets, Theories of the Firm & Pricing Policies

Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination- Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Forms of Business organizations - Sole Trader, Partnership- Joint Stock Company – State/Public Enterprises.

UNIT- IV

Introduction to Accounting & Financial Analysis

Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis.

Unit V

Capital and Capital Budgeting

Meaning of Capital-Capitalization Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (payback period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Book(s)

1. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis',Cengage Publications
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH
3. Prof. J.V.Prabhakararao, Prof. P. Venkatarao. 'Managerial Economics and Financial Analysis

Reference(s)

1. Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,
2. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
3. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
4. MaheswariS.N,AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
5. I.M Pandey, Financial Management ,Vikas Publishing House Pvt Ltd
6. V. Maheswari, Managerial Economics, S. Chand & Company Ltd

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Fluid Mechanics for Petroleum Engineers**				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of this course are to

- Explain the basic concepts associated with fluid flow such as viscosity, shear stress, and hydrostatic equilibrium, Newtonian, non-Newtonian, compressible and incompressible fluids.
- Demonstrate the Continuity and Navier Stokes equations as fundamental equations for the analysis of oil and gas recovery processes.
- Illustrate the concept of Boundary Layer Theory and governing mathematical equations for Newtonian and non-Newtonian fluid flows
- Demonstrate Bernoulli's equation for various simple and complex cases of fluid flow through channels
- Illustrate compressible and incompressible fluid flows and suitably adapt, modify and apply suitable correlations for compressible fluid flows
- Explain various accessories required for fluid flow in pipelines such as fittings and valves and their relevance towards variation in pressure drop correlations in pipes
- Classify the knowledge related to various fluid flow measuring devices

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the fundamentals and basic principles of process fluid mechanics
CO2:	Formulate and solve the fluid flow problems with the application of conservation laws and examine energy losses and evaluate pressure drop in pipes
CO3:	Formulate and solve the fluid flow problems and evaluate pressure drop in porous medium
CO4:	Analyze the functions and performances of various equipment's and flow measuring devices
CO5:	Analyze the functions and performances of various equipment's in compressible fluids

Syllabus

UNIT –I

Introduction

Units and Dimensions, Basic concepts of Dimensional analysis, Nature of fluids, Hydrostatic equilibrium, Applications of fluid statics. Fluid flow Phenomena-Laminar flow, Shear rate, Shear stress, Rheological properties of fluids, Turbulence, Boundary layers.

UNIT –II

Basic equation of fluid flow

Mass balance in a flowing fluid; continuity, differential momentum balance; Equations of motion, Mechanical energy equations. Incompressible Newtonian/Non-Newtonian flow in pipes and channels- shear stress and skin friction in pipes, laminar flow in pipes and channels, turbulent flow in pipes and channels, friction from changes in velocity or direction, Losses in pipes.

UNIT –III

Fluidization

Flow past immersed bodies, Drag and Drag coefficient, flow through beds of solids, motion of particles through fluids. Fluidization, conditions for fluidization, minimum fluidization velocity, types of fluidization, expansion of fluidized bed, applications of fluidization, continuous fluidization, slurry and pneumatic transport.

UNIT –IV

Transportation and Metering of fluids

Pipes, fittings and valves, Pumps: positive displacement and centrifugal pumps. Measurement of flowing fluids: Full bore meters, insertion meters; Venturi meter, Rotameter, Orifice meter, hot wire anemometer, pitot tube, and other flow metering devices.

UNIT –V

Flow of compressible fluids

Definitions and basic equations, Processes of compressible flow, Isentropic flow through nozzles, Adiabatic frictional flow, and Isothermal frictional flow. Compressors, fans, blowers, steam- ejector sand jets.

Text book(s)

1. Unit Operations of Chemical Engineering, McCabe, W.L., J.C.Smith & Peter Harriot, McGrawHill
2. Transport Processes and Unit Operations, Christie J. Geankoplis, PHI

Reference(s)

1. Introduction to Fluid Mechanics, Fox, R.W. and A. T. McDonald, 5th Edition, John Wiley& Sons

2. Chemical Engineering, Vol-1: Fluid flow, Heat Transfer and Mass Transfer, J. M. Coulsonand J. F. Richardson, Pergamon Press
3. Fluid Mechanics for Chemical Engineers, Noel De Nevers, Tata McGraw-Hill
4. Fluid Flow for Chemical and Process Engineers, Bragg R and F. A. Holland, 2nd Edition, Hodder Stoughton Educational
5. Fluid Flow for the Practicing Chemical Engineer, Patrick Abulencia, J and Louis Theodore, John Wiley and Sons

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Petroleum Geology**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of this course are to

- Explain the concepts, principles and theories of the surface geology; geologicalenvironments, which are related to hydrocarbon industry
- Impart the key elements of hydrocarbon system (i.e. source, reservoir, trap and cap rocks; migration)

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the origin of earth and geological structures of petroleum system
CO2:	Demonstrate the origin of petroleum
CO3:	Demonstrate formation and characteristics of reservoir rock
CO4:	Demonstrate the migration of oil from source to reservoir
CO5:	Demonstrate the entrapment and accumulation of hydrocarbons in sedimentary basins in India

Syllabus

UNIT –I

Structural geology of petroleum system

Origin of the Earth-envelops of the Earth-Crust, mantle, core. Internal dynamic process- Plate tectonics- Continental drift, External dynamic process- Weathering, erosion and deposition. Identification of different structural features encountered in oil exploration viz. joints, faults, folds, unconformities. Origin of igneous, sedimentary and metamorphic rocks. Structures and textures, Petrographic character of conglomerate, sandstone, shale, limestone and dolomite.

UNIT- II

Origin of Petroleum

Inorganic and Inorganic Theories. Source rocks: Definition of source rocks. Organic source rocks, nature and types of source rocks. The process of diagenesis, catagenesis and metagenesis in the formation of source rock, kerogentypes, thermal maturation, subsurface pressure temperature conditions for the generation of oil and gas from the source sediments.

UNIT- III

Characteristics of reservoir rocks

Classification and nomenclature, Clastic reservoir rocks, Carbonate reservoir rocks. Unconventional, fractured and miscellaneous reservoir rocks. Marine and non-marine reservoir rocks. Reservoir properties and cap rocks: Reservoir porosity–primary and secondary porosity, effective porosity, permeability, effective and relative permeability, relationship between porosity and permeability, saturation. Cap rocks: Definition and characteristics of cap rocks.

UNIT-IV

Hydrocarbon migration

Geological framework of migration and accumulation. The concept of hydrocarbon migration from source beds to the carrier beds, Carrier beds to the reservoir. Free path ways for migration:Short distance and long distance migration, Evidence for migration, oil and gas seepages**.**

UNIT-V

Entrapment and accumulation of hydrocarbons

Classification and types of traps, Structural, stratigraphic and combination type of traps. Traps associated with salt domes. Sedimentary Basins: Sedimentary basins origin and classification. Types of basins and their relationship to hydrocarbon prospects. Tectonic classification, stratigraphic evolution and hydrocarbon accumulations of the following basins: Krishna- Godavari basin, Cambay basin, Assam Arakan basin and Mumbai off- shore.

Text book(s)

1. Geology of Petroleum, A.I. Levorsen, 2nd Edition. CBS, Publishers
2. Engineering Geology, Bell, F.G., 2nd Edition, Butterworth Heimann
3. Text book of Geology, Mukherjee, P.K., The World Press Pvt. Ltd

Reference(s)

1. Elements of Petroleum Geology, Richard, C. Selley, Elsevier
2. Sedimentary basins of India- ONGC bulletin
3. Unconventional Petroleum Geology, Caineng Zou et al., Elsevier
4. Elements of Mineralogy, Gribble, C. D., Rutley's, CBS Publishers
5. Principles of Physical Geology, David Duff, Homes, Nelson Thornes Ltd
6. Text Book of Physical Geology, Mahapatra, G.B., CBS Publishers
7. Principles of Engineering Geology, Bangar, K.M., 2nd Edition, Standard Publishers
8. Structural Geology, M. P. Billings, Englewood Cliffs, N.J.: Prentice-Hall

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Process Calculation**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The subject of process calculations is intended to make the students understand mainly the calculations involved in material and energy balances across process units. The students will be trained to:

- Understand and correctly implement unit conversions in process calculations.
- Understand and apply theoretical knowledge towards problem solving in processesindustry.
- Analyze and solve elementary material balances in physical and chemical processes.
- Analyze and solve elementary energy balances in reactive and non-reactive processes.
- Formulate and solve combined material and energy balances and realize the relevance of thermodynamics in process calculations.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate Stoichiometric relations, basic process calculations and applications of ideal gas and their mixtures.
CO2:	Solve calculations of vapor pressure correlations, analyze information about charts/ data for process calculations and humidity and saturation calculations
CO3:	Interpret material balance calculations, process involving chemical reactions
CO4:	Estimate energy balance calculations, enthalpy, heat of reaction, combustion, formation and neutralization calculations
CO5:	Evaluate combustion calculations for combined material and energy balance

Syllabus

UNIT –I

Stoichiometric relation

Basis of calculations, Methods of expressing compositions of mixtures and solutions, density and specific gravity, Baume and API gravity scales, Units and inter conversions, Calculations of molarity, normality and molality.

Behavior of Ideal gases

Kinetic theory of gases, Application of ideal gas law, Gaseous mixtures, Gases in chemical reactions.

UNIT-II

VLE

Liquefaction and liquid state, vaporization, boiling point, Effect of temperature on vapour pressure, Antoine equation, Vapor pressure plots (ternary), Estimation of critical properties, Vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non-volatile solutes.

Humidity and Saturation

Relative and percentage saturation or dew point, wet bulb and dry bulb temperature, Use of humidity charts for engineering calculations.

UNIT-III

Material balances

Tie components, Yield, Conversion, Processes involving chemical reactions. Material balance calculations in simple drying, dissolution and crystallization processes. Processes involving recycles, bypass, purge and other complexities.

UNIT-IV

Thermo-physics

Energy, energy balances, Heat capacity of gases, liquid and mixture solutions. Kopp's rule, Latent heats, Heat of fusion and Heat of vaporization, Trouton's rule, Kistyakowsky equation for nonpolar liquids enthalpy and its evaluation.

Thermo-chemistry

Calculation and applications of heat of reaction, combustion, formation and neutralization, Kirchoff's equation, enthalpy concentration change, calculation of theoretical and actual flame temperatures.

UNIT-V

Combustion Calculations

Introduction to fuels, Calorific value of fuels, coal, liquid fuels, Gaseous fuels, air requirement andflue gases, Combustion calculations, Incomplete combustion, Material and energy balances, Thermal efficiency calculations.

Text book(s)

1. Chemical Process Principles, Part -I, Material and Energy Balances, Hougen O A, Watson K. M. and Ragatz R.A., 2nd Edition, CBS Publishers & distributors
2. Basic Principles and Calculations in Chemical Engineering, D.H. Himmelblau

Reference(s)

1. Elementary Principles of Chemical Processes, R. M. Felder and R. W. Rousseau
2. Handbook Chemical Engineering Calculations, N. Chopey, 3rd Edition, Mc-Graw Hill
3. Stoichiometry, Bhatt, B. I., Thakore S. B., 5th Ed., Tata Mc-Graw Hill Education

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Computational Methods Laboratory**				
Teaching	Total contacthours - 36	L	T	P	C
Prerequisites	Mathematics- III	0	0	3	1.5

Course Objectives

The objectives of this course are to

- To train the students in writing MATLAB code, executing and doing.
- The application of MATLAB to solve various rigorous and iterative problems related to various petroleum engineering topics.
- The what-if analysis for the variations in the parameters using mathematical methods.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Adapting MATLAB code and execution.
CO2:	Developing Coding for typical problems encountered in petroleum engineering subjects.
CO3:	Analyze different MATLAB functions for the variations in the parameters using mathematical methods.
CO4:	Creating 2D and 3D graphs using MATLAB for various rigorous and iterative problems related to various petroleum engineering topics.

List of Experiments

1. Calculation of Flow rate in a pipeline
2. Correlation of the Physical properties of Ethane – Heat capacity and vapour pressure
3. Shooting method for solving two-point boundary value problems
4. Determination of Molar volume and Compressibility
5. Compressibility factor variation from Vanderwaal's Equation
6. Isothermal compression of gas using RK/SRK/PR Equation of State.
7. Thermodynamic properties of steam from RK/SRK/PR Equation of State.
8. Solution of Stiff Ordinary Differential Equations
9. Iterative Solution of ODE boundary value problem
10. Expediting the solution of systems of nonlinear algebraic equations

11. Solving differential algebraic equations –DAEs
12. Method of lines for Partial Differential Equations

References (s)

1. Problem solving in Chemical and Biochemical Engineering with POLYMATH, Excel and MATLAB, Michael B. C and Mordechai S, Prentice Hall

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Fluid Mechanics Laboratory**				
Teaching	Total contact hours - 39	L	T	P	C
Prerequisites	Fluid Mechanics for Petroleum Engineers	0	0	3	1.5

Course Objectives

Fundamentals of momentum transfer will be demonstrated in a series of laboratory exercises like determination of discharge coefficient of orifice, venturi, notches, friction factors in pipes, pressure drop in packed and fluidized beds, fluid viscosity, characteristics of centrifugal pump, characterization of fluid flow, verification of Bernoulli's theorem, and measurement of point velocities. Hands-on experience and communication skills will be achieved.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Classify fluid flow equipment and instrumentation
CO2:	Choose and analyze data using momentum transfer principles and experimentation methods
CO3:	Analyze fluid flow characteristics in porous medium and transportation
CO4:	Demonstrate principles discussed in momentum transfer lecture course
CO5:	Demonstrate appropriate work habits consistent with industrial standards

List of Experiments

1. Identification of laminar and turbulent flows
2. Measurement of point velocities
3. Verification of Bernoulli's equation
4. Variation of Orifice coefficient with Reynolds Number
5. Determination of Venturi coefficient
6. Friction losses in Fluid flow in pipes
7. Pressure drop in a packed bed for different fluid velocities
8. Pressure drop and void fraction in a fluidized bed
9. Studying the coefficient of contraction for a given open orifice
10. Studying the coefficient of discharge in notches

11. Studying the Characteristics of a centrifugal pump
12. Viscosity determination using Stokes' law
13. Viscosity determination using Cannon-Fenske Viscometer

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Petroleum Geology Laboratory**				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites	Petroleum Geology	0	0	3	1.5

Course Objectives

The objectives of this course are to

- Impart fundamental understanding on sedimentary environment associated with oil andgas reservoirs
- Impart a sound understanding on distinction between source rocks and the reservoir rocks that includes both conventional and unconventional hydrocarbon reservoirs

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Analyze the sedimentary basins
CO2:	Analyze the topographic profiles
CO3:	Analyze the geological maps
CO4:	Analyze the lithostratigraphic columns
CO5:	Analyze the source rocks

List of Experiments

1. Identification of Sedimentary Rocks in hand specimen.
2. Recognizing various hydrocarbon traps
3. Preparation of contour maps
4. Preparation of topographic profiles from structure contour maps
5. Interpretation of geological Maps – surface geology
6. Interpretation of geological Maps – subsurface geology
7. Interpretation of geological Maps – Isopach maps and oil-water contact
8. Measurement of dip and strike of the beds.
9. Preparation of lithostratigraphic columns
10. Interpretation of lithostratigraphic columns
11. Identification of lithostratigraphic correlation
12. Gamma ray measurement.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Programming with Python**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Knowledge of any programming language	0	1	2	2

Course Objectives

- This course is intended to teach adequate knowledge on different data structures technique.
- To develop solutions for problems demonstrating usage of control structures, modularity, I/O and other standard language constructs.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	To learn and understand Python programming basics and paradigm
CO2:	Handle different data structures.
CO3:	Understand the use of control statements, function overloading, operator overloading in real time application
CO4:	Implement files using various file operations.
CO5:	Apply knowledge to handle exception handling and database connectivity

List of Programs

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.

2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.

3. Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83,86,89.

4. Write a program that asks the user for their name and how many times to print it. The program should print the user's name, the specified number of times.

5. Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
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6. Write a program that asks the user to enter a word and prints out whether that word contains any vowels.

7. Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and ABCDE the program should print out AaBbCcDdEe.

8. Write a program that generates a list of 20 random numbers between 1 and 100 and perform the following.
   (a) Print the list.
   (b) Print the average of the elements in the list.
   (c) Print the largest and smallest values in the list.
   (d) Print the second largest and second smallest entries in the list
   (e) Print how many even numbers are in the list.

9. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

10. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

11. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, itis much shorter with lists and it is also easier to add new conversions if you use lists.

12. Write a function called sum digits that is given an integer num and returns the sum of the digits of num.

13. Write a function called number_of_factors that takes an integer and returns how many factors the number has.

14. Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.

15. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

Text Book(s)

1. Wesley J. Chun "Core Python Programming" Prentice Hall
2. Head First Python, 2nd Edition

Reference (s)

1. Mark Lutz “Programming Python, 4th Edit O'ReillyMedia
2. David Beazley and Brian K. Jones"Python Cokboo'Reilly

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. I Sem. (3rd Semester)			
Course Code	**Constitution of India**				
Teaching	Total contact hours - 26	L	T	P	C
Prerequisites		2	0	0	0

Course Objective

- Impart the role of constitution and human rights
- Aware of the Central administrative system and National policies.
- Aware of the State administrative system and State policies.
- Aware of the Local administrative system and policies.
- Role of Electoral system in India

Course Outcomes

On Completion of the course, the students will be able to-	
CO1	List out the fundamental Rights and Duties
CO2	Explain the Union Government and Administrative system
CO3	Explain the State Government and Administrative system
CO4	Explain the Local Administrative system
CO5	Write the role of Election commission

Syllabus

UNIT –I

Introduction

Constitution' meaning of the term,, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT –II

Union Government and its Administration

Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers,

Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

UNIT –III

State Government and its Administration

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure

and Functions

UNIT –IV

Local Administration: District's Administration head

Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT -V

Election Commission Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Text book(s)

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap

Reference(s)

1. 'Indian Constitution' by D.D. Basu
2. 'Indian Administration' by Avasti and Avasti

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Elements of Mechanical Engineering**				
Teaching	Total contact hours - 50	L	T	P	C
Prerequisites	Engineering Physics, Engineering mechanics	3	0	0	3

Course Objectives

The content of this course is intended to

- Introduce the basics of stresses and strains and their types
- Impart the knowledge constructing Bending moment and shear force diagrams
- Introduce Steam Boilers,
- Impart the knowledge of working and performance of I.C. Engines,
- Impart the basic knowledge of transmission systems.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Explain various types of stresses and strains induced in the materials subjected to loads.
CO2:	Construct shear force and bending moment diagrams for cantilever and simply supported beams carrying loads without overhanging.
CO3:	Determine stresses and strains in thin and thick cylinders.
CO4:	Summarize the boilers, IC engines, accessories and their performance.
CO5:	Interpret power transmission systems, velocity ratio, tensions and power developed.

Syllabus

UNIT –I

Stresses and Strains

Types of stresses and strains, elasticity and plasticity, Hooks law, stress –strain diagrams, modules of elasticity, Poisson's ratio, linear and volumetric strains, relation between E, N, and K,bars of uniform strength, compound bars and temperature stresses.

UNIT –II

Shear Force and Bending Moment Diagrams

Types of supports, loads, Shear force and bending moment for cantilever and simply supported beams without overhanging for all types of loads.

UNIT –III

Thin Cylindrical Shells

Stress in cylindrical shells due to internal pressures, circumferential stress, longitudinal stress, design of thin cylindrical shells, spherical shells, change in dimension of the shell due to internal pressure, change in volume of the shell due to internal pressure.

Thick Cylindrical Shells

Lame's equation- stresses and strains in cylinders subjected to inside and outside pressures.

UNIT –IV

Steam boilers

Classification of boilers, essentialities of boilers, selection of different types of boilers, study of boilers, boiler mountings and accessories.

Internal combustion engines

classification of IC engines, basic engine components and nomenclature, working principle of engines, four strokes and two stroke petrol and diesel engines, comparison of CI and SI engines, comparison of four stroke and two stroke engines, simple problems such as indicated power, brake power, friction power, specific fuel consumption, brake thermal efficiency, indicated thermal efficiency and mechanical efficiency.

UNIT –V

Transmission systems

Belt drives, Types of belt drives, terminology, velocity ratio, slip, length of belt, open belt and cross belt drives, Ratio of Driving Tensions for Flat Belt Drive, Centrifugal tension, Power transmitted by belts, simple problems.

Gear Trains

Introduction, Types of Gear Trains, Simple Gear Train, Compound Gear Train, Velocity ratio, Design of Spur Gears, Reverted Gear Train.

Text book(s)

1. Strength of Materials and Mechanics of Structures, B. C. Punmia, Standard Publications and distributions.
2. Thermal Engineering, P. L. Ballaney, Khanna Publishers.
3. Elements of Mechanical Engineering, A. R. Asrani, S. M. Bhatt and P. K. Shah, B. S. Publishers.
4. Elements of Mechanical Engineering, M. L. Mathur, F. S. Metha & R. P. Tiwari, Jain Brothers Publications

Reference(s)

1. Theory of Machines, S.S. Rattan, Tata McGraw Hill.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Instrumentation, Process Dynamics & Control**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Mathematics-III, Fluid mechanics for petroleum Engineers	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on the basics of an instrument and its characteristics
- Impart knowledge on various types of industrial thermometers and measurement ofpressure and vacuum
- Demonstrate about instrument diagrams, control center, process analysis & digital instruments
- Impart knowledge on types of controllers and closed loop transfer functions
- Explain the controllers tuning and control valves

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Choose and categorize various types of thermometers
CO2:	Choose and categorize various types of pressure gauges and analyze composition through different techniques
CO3:	Choose and categorize various types of flow meters and explain the processes with appropriate block diagrams
CO4:	Interpret the responses of first order systems with examples
CO5:	Explain tuning a control loop and characteristics of control valves

Syllabus

UNIT –I

Fundamentals

Elements of instruments, Functions of instruments and Characteristics of an instruments.

Industrial Thermometers

Expansion thermometers and its types, Static accuracy and response of thermometry. Thermoelectricity-Industrial Thermocouples-Thermocouple wires - Thermocouple wells and response of thermocouples; Thermal coefficient of resistance - Industrial resistance - thermometer bulbs and circuits - Radiation receiving elements - Radiation pyrometers - photoelectric and optical pyrometers.

UNIT-II

Pressure and vacuum

Liquid column manometers -Measuring elements for gauge pressure and vacuum-indicating elements for pressure gauges -Static accuracy and response of pressure gauges.

Composition analysis

Spectroscopic analysis by absorption, emission and mass, Gas analysis by thermal conductivity, Chromatography - HPLC, GLC, analysis of moisture.

UNIT-III

Flow Meters

Head flow meters; area flow meters; viscosity measurements.

Process Instrumentation

Controls center; Instrumentation diagram; Process analysis; Digital instrumentation and SCADA systems.

UNIT-IV

Introduction to process dynamics and control

Response of first order systems – Physical examples of first order systems. Response of first order systems in series, higher order systems: Second order and transportation lag.

UNIT-V:

Control systems

Controllers and final control elements, Block diagram of a Petrochemical rector control system. Closed loop transfer functions, Transient response of simple control systems. Stability Criterion, Routh Test, Frequency control model, Controller tuning and process identification, Control valves.

Text book(s)

1. Industrial Instrumentation, Donald P.Eckman, CBS
2. Process Systems Analysis and Control, D.R. Coughanowr, 2nd Ed. McGraw Hill
3. Chemical Process Control, G. Stephanopolous, Prentice Hall

Reference(s)

1. Process Control and Instrumentation Technology, Curtis D. Johnson, Prentice Hall
2. Principles of Industrial Instrumentation, Patranabis, Tata McGraw-Hill
3. Process Dynamics and Control, Dale Seaborg, Thomas F. Edgar, Duncan Mellichamp, Wiley India Pvt. Ltd

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Petroleum Exploration**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Petroleum Geology	3	0	0	3

Course Objectives

The objectives of this course are to

1. Explain the fundamentals of petroleum exploration, different methods of geological, geochemical and geophysical surveys and instruments used for it
2. Demonstrate the ways to examine the exploration data and helps to understand the position and extent of subsurface prospects in terms of depth and aerial.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the different methods of exploration
CO2:	Define the sedimentological and biostratigraphic methods of hydrocarbon exploration
CO3:	Analyze gravity and magnetic survey methods
CO4:	Apply seismic survey methods and build seismograph of hydrocarbon system
CO5:	Analyze Seismograph of hydrocarbon system

Syllabus

UNIT –I

Introduction

Overview of petroleum exploration. Global petroleum exploration scenario, Exploration policies in India.

Initial Phase of Hydrocarbon Exploration

Remote Sensing and High Resolution Satellite Imagery studies, Geological surveys, Geochemical Surveys. Sedimentlogical and Biostratigraphic approaches in hydrocarbon exploration.

UNIT-II

Gravity Survey

Basic theory, units of gravity, measurement of gravity, gravity survey, gravity anomalies. Gravity reduction - drift, latitude, elevation, tidal, Eotvos and Free-air & Bouguer anomalies.

Magnetic Survey

Basic concepts, rock magnetism, the geomagnetic field. Magnetic survey, survey instruments, magnetic. Magnetic data reduction – diurnal, geomagnetic, elevation and terrain corrections. Concepts of Airborne magnetic survey.

UNIT-III

Basic Concepts of Seismic Survey

Seismic waves, Seismic waves reflection and refraction, Geometry of Seismic waves, wave theory, diffractions and velocities. Seismic data acquisition in land and marine- recording instruments & energy sources.

Seismic Refraction Surveys

Geometry of refracted path, planar interface. Two-layer case with horizontal interface.

Methodology of refraction profiling. Corrections applied to refraction data. Applications of seismic refraction method.

Seismic Reflection Surveys

Geometry of reflected ray path: Single horizontal reflector, the reflection seismograph and seismogram (Seismic traces). Importance of seismic reflection survey over seismic refraction survey technique. Common depth point (CDP) profiling & stacking.2D, 3D, and 4D seismic surveys, field procedures & principles. Time corrections applied to seismic data. Data processing. Interpretation of reflection data. Introduction to 3D data acquisition & interpretation.

UNIT-IV

Processing of 2D & 3D-Seismic Data

Workflow and procedures.

Borehole seismic

Borehole seismic, VSP types, Litho density log. Synthetic seismograms, seismic to well tie. Gassmann fluid substitution and investigation of possible AVO effect.

UNIT-V

Interpretation of Seismic Data

Seismic stratigraphy, Interpretation of 2D Seismic data- workflow and limitations, Interpretation of 3D-Seismic Data- Workflow, Seismic attribute analysis, Structural interpretation, Stratigraphic interpretation, Reservoir Identification, Reservoir Evaluation. Basics of seismic tomography and seismic inversion. Modern Survey Methods: Field operations, limitations and applications of Electrical Surveying, Electromagnetic Surveying, Telluric and Magnetotelluric Surveying and Radiometric Surveying.

Text book(s)

1. Introduction to Geophysical Prospecting, Milton B. Dobrin, and Carl H. Savit, 4thEdition, McGraw Hill
2. Outlines of Geophysical Prospecting: A Manual for Geologists, M.B. Ramachandra Rao, EBD Educational Pvt Ltd
3. Field Geophysics, John Milsom and AsgerEriksen, 4thEdition, John Wiley
4. Elements of Mechanical Engineering, M. L. Mathur, F. S. Metha & R. P. Tiwari, Jain Brothers Publications

Reference(s)

1. Elements of Geology: Oil and Gas Exploration Techniques, J. Guillemot, Technip
2. Hydrocarbon Well Logging Recommended Practice, Society of Professional Well Log Analysts
3. Open – Hole Log Analysis and Formation Evaluation, Richard M. Batemons, International Human Resources Development Corporation, Bostan
4. Well Logging for Earth Scientists, Darwin V. Ellis, Julian M. Singer, Springer
5. Fundamentals of Well Log Interpretation: The Acquisition of Data, Oberto Serra, Elsevier
6. Well Logging Handbook, Oberto Serra, Editions Technip

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Process Heat Transfer**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of this course are to

- Demonstrate the nature of heat flow, heat transfer conduction in steady state and unsteady state for simple geometries
- Explain the heat flow in fluids, boundary layer concept and convective heat transfer forboth steady and unsteady states
- Explain about heat transfers to fluids without phase change and forced convection fordifferent fluids with different flow regimes
- Explain about heat transfers to fluids with phase change and heat transfer through radiation and combined heat transfer concepts
- Familiarize different heat exchanging equipment, their design and performance

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Analyze, develop and obtain solutions for transient heat conduction in simple geometries and heat transfer problems in steady state and unsteady state conduction
CO2:	Apply the fundamentals of convective heat transfer process and evaluate heat transfer coefficients for natural and forced convection with interior and exterior surfaces
CO3:	Analyze heat transfer to fluids without phase change
CO4:	Analyze heat transfer to fluids with phase change and evaluate the radiation heat transfer
CO5:	Analyze heat exchangers and evaporators performance by using the method of effectiveness

Syllabus

UNIT –I

Introduction

Nature of heat flow, conduction, convection, natural and forced convection, and radiation. Steady state: Heat transfer by conduction in Solids, Fourier's law, thermal conductivity, steady state conduction in plane wall & composite walls, compound resistances in series. Heat flow through a cylinder, conduction in spheres, thermal contact resistance, plane wall: variable conductivity. Unsteady state heat conduction, equation for one-dimensional conduction, Semi-infinite solid.

UNIT-II

Principles of heat flow in fluids

Typical heat exchange equipment, countercurrent and parallel current flows, energy balances,

rate of heat transfer, overall heat transfer coefficient, electrical analogy, critical radius of insulation, logarithmic mean temperature difference. Variable overall coefficient, multi-pass in exchangers, individual heat transfer coefficients, resistance form of overall coefficient, fouling factors, classification of individual heat transfer coefficients, magnitudes of heat transfer coefficients, effective coefficients for unsteady-state heat transfer.

UNIT-III

Heat transfer to fluids without phase change

Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar and turbulent flow, the transfer of heat by turbulent eddies. Analogy between the momentum and heat transfer, heat transfer to liquid metals, heating and cooling of fluids in forced convection outside tubes.

UNIT-IV

Heat transfer to fluids with phase change

Heat transfer from condensing vapors; heat transfer to boiling liquids. Radiation: Properties and definitions, black body radiation, real surfaces, and the grey body. Absorption of radiation by opaque solids, radiation between surfaces, radiation and shielding, combined heat transfers by conduction, convection and radiation.

UNIT-V

Heat Exchange Equipment

General design of heat exchange equipment, heat exchangers, condensers, boilers and calendrias, extended surface equipment, heat transfer in agitated vessels, scraped surface heat exchangers, heat transfer in packed beds, heat exchanger effectiveness (NTU method). Evaporators: Types of

Evaporators, performance of tubular evaporator. Capacity and economy, methods of feeding, multiple effect evaporators, vapor recompression.

Text book(s)

1. Unit Operations of Chemical Engineering, McCabe, W.L., J.C.Smith & Peter Harriot, McGrawHill
2. Heat Transfer, Y.V.C. Rao, Universities Press (India) Pvt. Ltd

Reference(s)

1. Process Heat Transfer, D.Q. Kern, Tata- McGraw-Hill
2. Heat Transfer, Holman, J.P., 9th Edition, Tata McGraw-Hill
3. Schaum's Outline of Heat Transfer, Donald Pitts and L. E. Sisson, 2nd Edition, McGraw-Hill
4. A Text Book on Heat Transfer, Sukhatme, P., 5th Edition, Universities Press (India) Pvt. Ltd
5. Heat Transfer: Principles and Applications, Binay Dutta, K., PHI Learning
6. Chemical Engineering: Fluid Flow, Heat Transfer and Mass Transfer, Coulson, J.M.; Richardson, J.F.; Backhurst, J.R.; Harker, J.H., Vol.1, 6th Edition, Reed Elsevier India

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Process Thermodynamics**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of this course are to

- Explain the laws of thermodynamics and their properties
- Illustrate the PVT behaviour of various pure substances and correlations of differentequations
- Explain the application of various thermodynamic laws for the analysis of Petroleum processes and temperature scales of various thermodynamic laws
- Demonstrate the thermodynamic fluid properties and flow processes
- Demonstrate the solution thermodynamics concepts

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Summarize the basic concepts of thermodynamics and gain working knowledge in first law of thermodynamics.
CO2:	Analyze the PVT behaviour of various fluids
CO3:	Analyze the second law of thermodynamics and inspect the behaviour of petroleum reservoirs
CO4:	Develop the thermodynamic fluid properties, analyze flow processes
CO5:	Analyze the petroleum fluid phase equilibrium concepts

Introduction

The scope of thermodynamics, defined quantities; temperature, volume, pressure, work, energy, heat, The Zeroth Law and Joules Experiments, SI units. The first law and other basic concepts: The first law of thermodynamics, thermodynamic state and state functions, enthalpy, The steady-state steady flow process, Equilibrium, The reversible process, Constant-V and constant- P processes, heat capacity.

UNIT-II

Volumetric properties of pure fluids

The PVT behaviour of pure substances, virial equations, the ideal gas, the applications of the virial equations, Cubic equations of state, generalized correlations for gases.

UNIT-III

The second law of thermodynamics

Statements of the second law, heat engines, thermodynamic temperature scales, thermodynamic temperature and the ideal-gas scale. Entropy, Entropy changes of an ideal gas, mathematical statement of the second law, the third law of thermodynamics. Calculation of ideal work and lost work, Examples on thermodynamic behaviour of Oil and Natural Gas under Reservoir conditions.

UNIT-IV

Thermodynamic properties of fluids

Property relations for homogeneous phases, Residual properties, two phase systems, thermodynamic diagrams, tables of thermodynamic properties, generalized propertycorrelations for gases. Thermodynamics of flow processes; Principles of conservation of mass and energy for flow systems, Analysis of expansion processes; turbines, throttling; compression processes – compressors and pumps.

UNIT-V

Solution thermodynamics

Basic concepts of chemical potential, Phase equilibria, partial properties, fugacity coefficient, residual and excess Gibbs free energy, Correlations for the estimation of fugacity coefficient, Residual and excess Gibbs energy in vapor liquid equilibria. Phase Equilibria: Gamma/Phi formulation of VLE, VLE from Virial Equations of State and cubic equations of state, Introduction to Vapor-Liquid–Liquid Equilibrium (VLLE), Solid-Liquid Equilibrium (SLE) and Solid-Vapor Equilibrium (SVE), Equilibrium adsorption of gases on solids.

Text book(s)

1. Introduction to Chemical Engineering Thermodynamics, Smith, J. M., H. C. Van Ness and M.M. Abbott, 6th Edition
2. Characterization and Properties of Petroleum Fractions, M. R. Riaze, ASTM International
3. Thermodynamics: Applications in Chemical Engineering and the Petroleum Industry, Vidal, J., Edition Technip

Reference(s)

1. Equation of State and PVT analysis, Tarek Ahmed, Gulf publishing company
2. Engineering and Chemical Thermodynamics, Koretsky, M. D., John Wiley & Sons
3. Introductory Chemical Engineering Thermodynamics, Richard Elliott, J. and Carl T. Lira, 2nd Edition, Prentice Hall
4. Chemical, Biochemical and Engineering Thermodynamics, Stanley Sandler, 4th Edition, Wiley India Pvt. Ltd
5. Chemical and Process Thermodynamics, Kyle, B.G., 3rd Edition, PHI Learning
6. Chemical Engineering Thermodynamics, Thomas E. Dauber, McGraw Hill

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Instrumentation, Process Dynamics & Controls Laboratory**				
Teaching	Total contact hours - 30	L	T	P	C
Prerequisites	Mathematics-III, Engineering Chemistry, Fluid Mechanics for Petroleum Engineers	0	0	3	1.5

Course Objectives

The objectives of this course are to

1. Explain the time lag of various first and second order instruments
2. Demonstrate the response in single and two capacity systems with and with-out interaction
3. Illustrate the advanced control methods used for complex processes in the industries
4. Explain the open loop (Manual control) and the on/off controller, Proportional controller, PI controller, PD controller, PID controller, Tuning of controller (Open loop and close loop methods)
5. Impart the knowledge on control valve operation and its flow characteristics
6. Explain the damping coefficient and response of U-tube manometer

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the hysteresis of pressure gauge tester and control valves
CO2:	Classify the characteristics of different types of temperature sensors
CO3:	Estimate the dynamic characteristics of first and second order systems
CO4:	Identify the stability of the first and second order system
CO5:	Experiment with controllers like On/Off, P, PI, PD and PID for process systems

List of Experiments

1. Calibration and determination of time lag of various first and second order instruments.
   Major equipment - First order instrument like Mercury-in-Glass thermometer and overall second order instrument like Mercury-in-Glass thermometer in a thermal well.
2. Experiments with single and two capacity systems with and without interaction.process
   Major equipment- Single tank system, Two-tank systems (Interacting and Non-Interacting).
3. Level control trainer
   Major equipment - Level control trainer set up with computer.
4. Temperature control trainer
   Major equipment -Temperature control trainer with computer.
5. Cascade control
   Major equipment -Cascade control apparatus with computer.
6. Experiments on proportional, reset, rate mode of control etc.

Major equipment – PID control apparatus

7. Control valve characteristics
   Major equipment – Control valve set up.
8. Estimation of damping coefficient for U-tube manometer
   Major equipment - U-tube manometer.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Petroleum Analysis Laboratory**				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

The objective of the petroleum analysis lab is to determine the physical and transport properties like Reid vapor pressure, Viscosity, Smoke point, Flash point & Fire point, Aniline point, Cloud & Pour point, Softening point, Calorific value, Water content of different petroleum products by conducting laboratory experiments using different apparatus and to determine the distillation characteristics of petroleum products.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Handle various equipment in determining the physical properties
CO2:	Handle various equipment in determining the transport properties of different petroleum products
CO3:	Analyze the various products of petroleum components

List of Experiments

1. Determination of Distillation characteristics of Crude Oil, Gasoline, Diesel and Kerosene.
2. Determination of Reid Vapor Pressure of Crude oil & Gasoline.
3. Determination of Viscosity of Diesel and Transformer oils.
4. Determination of Smoke Point of Kerosene.
5. Determination of Carbon Residue of petroleum oils.
6. Determination of Flash & Fire points of gasoline, kerosene and other products.
7. Estimation of Water content in petroleum products.
8. Estimation of Calorific value of solid, liquid and gaseous fuels.
9. Determination of Aniline point of Gasoline and Diesel oil.
10. Determination of Softening point of bitumen.
11. Determination of Cloud & Pour Points of petroleum products.
12. Detection of Corrosiveness of petroleum products

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Process Heat Transfer Laboratory**				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites	Engineering Chemistry, Engineering Physics	0	0	3	1.5

Course Objectives

Fundamentals of process heat transfer will be demonstrated in a series of laboratory exercises like determination of thermal conductivities of composite wall and metal rod, natural convective and forced convective heat transfer coefficients, both film and overall coefficients, Stefen- Boltzman's constant, emissivity of a metal plate

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand the basics of experimental techniques for heat transfer measurements
CO2:	Process experimental data and obtain correlations to predict heat transfer coefficients for design of heat transfer systems.
CO3:	Analyze the stefan-Boltzmann constant by radiation
CO4:	Analyze the convective heat transfer rates for extended surfaces
CO5:	Understand the concepts of conductivity through composite structures

List of Experiments

1. Determination of total thermal resistance and thermal conductivity of composite wall.
2. Determination of thermal conductivity of a metal rod.
3. Determination of natural convective heat transfer coefficient for a vertical rod.
4. Determination of critical heat flux point for pool boiling of water.
5. Determination of forced convective heat transfer coefficient for air flowing through a pipe.
6. Determination of overall heat transfer coefficient in double pipe heat exchanger.
7. Study of the temperature distribution along the length of a pin-fin under natural and forced convection conditions
8. Estimation of un-steady state film heat transfer coefficient between the medium in whichthe body is cooled.
9. Determination of Stefan – Boltzmann constant.
10. Determination of emissivity of a given plate at various temperatures.
11. Studies on single effect evaporator

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Engineering Exploration Project**				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites	Nil	1	0	2	2

Course Objectives

The objectives of this course are to

- Build mind-sets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-worldapplications
- Use Design Thinking for problem solving methodology for investigating ill-definedproblems.
- Undergo several design challenges and work towards the final design challenge

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Analyze the real world applications based on human centric design methodology
CO2:	Demonstrate the problem solving skills using design thinking
CO3:	Plan in-detail the different stages of design challenges from ideating, prototyping and to testing
CO4:	Develop empathy in the design thinking process
CO5:	Develop tangible models

Apply Design Thinking on the following Streams to

1. Project Stream 1: Mechanical tools and Drilling tools
2. Project Stream 2: Drilling Fluid applications and production
3. Project Stream 3: Reservoir Engineering properties
4. Project Stream 4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

How to Pursue the Project Work?

1. The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
2. The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human- centered design.
3. The class will then divide into teams and they will be working with one another for about2-3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
4. The teams start with Design Challenge and go through all the phases more in depth from coming up with

the right question to empathizing to ideating to prototyping and to testing. Outside of class, students will also be gathering the requirements, identifying thechallenges, usability, importance etc.

5. At the end, Students are required to submit the final reports, and will be evaluated by thefaculty.

Tasks to be Done:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify adesign challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems
- Foster team collaboration, find inspiration from the environment and learn how toidentify problems

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity

CardTask 8: Final

- Report Submission and Presentation

Reference(s)

1. Tom Kelly, The Art of Innovation: Lessons in Creativity from IDEO, America's LeadingDesign Firm

2. Tim Brown, Change by Design: How Design Thinking Transforms Organizations andInspires Innovation
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, Design Thinking for the Greater Good:Innovation in the Social Sector

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	II B. Tech. II Sem. (4th Semester)			
Course Code	**Summer Internship-I**				
Teaching		L	T	P	C
Prerequisites	Nil	0	0	0	1.5

Course Objectives

The main objective of the internship is to gain up-to-date, practical experience in the real-working situation, in contrast to information gained during studies concerning mainly theoretical background of petroleum engineering.

The student is guided (through the Industry representative) to learn the following aspects:

- Application of the engineering skills, learned in class room, in real world
- Working as a team to deliver the results along with senior engineering professionals,technicians, managers
- Work safely in industrial environment
- Result oriented approach in plant operation, troubleshooting and engineering work
- Present and / or report the work / project outcomes to various disciplines, departments& interest groups with confidence

Students shall undergo summer training in a petroleum oil & gas producing industry/ petroleum machinery manufacturing industry for 4-6 weeks and submit a report.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Work safely in Industrial environment.
CO2:	Work with various interest groups, disciplines, professionals, managers, technicians
CO3:	Polish the engineering skills by applying the knowledge in day-to-day operation, troubleshooting and minor-modifications.
CO4:	Building relations with University and Industry that will help mutual cooperation over long-term

Syllabus for Minor Course

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	Minors			
Course Code	**Fundamentals of Petroleum Geology**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Nil	4	0	0	4

Course Objectives

The objectives of this course are to

- Explain the concepts, principles and theories of the surface geology; geologicalenvironments, which are related to hydrocarbon industry
- Impart the key elements of hydrocarbon system (i.e. source, reservoir, trap and cap rocks; migration)

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Demonstrate the origin of earth and geological structures of petroleum system
CO2:	Demonstrate the origin of petroleum
CO3:	Demonstrate formation and characteristics of reservoir rock
CO4:	Demonstrate the migration of oil from source to reservoir
CO5:	Demonstrate the entrapment and accumulation of hydrocarbons in sedimentary basins in India

Syllabus

UNIT –I

Structural geology of petroleum system

Origin of the Earth-envelops of the Earth-Crust, mantle, core. Internal dynamic process- Plate tectonics-Continental drift, External dynamic process- Weathering, erosion and deposition.Identification of different structural features encountered in oil exploration viz. joints, faults, folds, unconformities. Origin of igneous, sedimentary and metamorphic rocks. Structures and textures, Petrographic character of conglomerate, sandstone, shale, limestone and dolomite.

UNIT- II

Origin of Petroleum

Inorganic and Inorganic Theories. Source rocks: Definition of source rocks. Organic source rocks, nature and types of source rocks. The process of diagenesis, catagenesis and metagenesis in the formation of source rock, kerogen types, thermal maturation, subsurface pressure temperature conditions for the generation of oil and

gas from the source sediments.

UNIT- III

Characteristics of reservoir rocks

Classification and nomenclature, Clastic reservoir rocks, Carbonate reservoir rocks. Unconventional, fractured and miscellaneous reservoir rocks. Marine and non-marine reservoir rocks. Reservoir properties and cap rocks: Reservoir porosity–primary and secondary porosity, effective porosity, permeability, effective and relative permeability, relationship between porosity and permeability, saturation. Cap rocks: Definition and characteristics of cap rocks.

UNIT-IV

Hydrocarbon migration

Geological framework of migration and accumulation. The concept of hydrocarbon migration from source beds to the carrier beds, Carrier beds to the reservoir. Free path ways for migration:Short distance and long distance migration, Evidence for migration, oil and gas seepages**.**

UNIT-V

Entrapment and accumulation of hydrocarbons

Classification and types of traps, Structural, stratigraphic and combination type of traps. Traps associated with salt domes. Sedimentary Basins: Sedimentary basins origin and classification. Types of basins and their relationship to hydrocarbon prospects. Tectonic classification, stratigraphic evolution and hydrocarbon accumulations of the following basins: Krishna- Godavari basin, Cambay basin, Assam Arakan basin and Mumbai off- shore.

Text book(s)

1. Geology of Petroleum, A.I. Levorsen, 2nd Edition. CBS, Publishers
2. Engineering Geology, Bell, F.G., 2nd Edition, Butterworth Heimann
3. Text book of Geology, Mukherjee, P.K., The World Press Pvt. Ltd

Reference(s)

1. Elements of Petroleum Geology, Richard, C. Selley, Elsevier
2. Sedimentary basins of India- ONGC bulletin
3. Unconventional Petroleum Geology, Caineng Zou et al., Elsevier
4. Elements of Mineralogy, Gribble, C. D., Rutley's, CBS Publishers
5. Principles of Physical Geology, David Duff, Homes, Nelson Thornes Ltd
6. Text Book of Physical Geology, Mahapatra, G.B., CBS Publishers
7. Principles of Engineering Geology, Bangar, K.M., 2nd Edition, Standard Publishers
8. Structural Geology, M. P. Billings, Englewood Cliffs, N.J.: Prentice-Hall

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	Minors			
Course Code	**Drilling Technology**				
Teaching	Total contact hours - 54	L	T	P	C
Prerequisites	Nil	4	0	0	4

Course Objectives

The objectives of this course are to

- Explain various aspects involved in drilling a well including completion
- Illustrate the plan of drilling a well, the process of drilling and various equipment used fordrilling and design of the drill string
- Demonstrate the drilling fluid importance and its properties and hydraulics
- Illustrate different types of casings lowered in a well, the requirement of cementation ina well and cement slurry design
- Demonstrate different tools used for directional drilling and various techniques, fishing,stuck pipe and well control concepts

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Apply drilling concepts of a well from planning to rig mobilization to the location
CO2:	Apply the concept of a drill string design for drilling and select the suitable drilling fluids during drilling
CO3:	Develop casing and cementation design
CO4:	Plan out directional drilling
CO5:	Interpret well control, stuck pipe and fishing problems

Syllabus

UNIT –I

Overview of drilling

Drilling plan- GTO -Types of drilling, Rotary bit technology- Drilling string basics. Drilling fluid properties- Drilling fluid hydraulics calculations- Bit Hydraulics Optimization- Swab & Surge- pressures- Mud hydraulics analysis report- Lost circulation. Disposing of the drilling fluids waste and drill cuttings waste.

UNIT-II

MWD/ LWD

Hydrostatic pressure, Pore pressure, causes of abnormal pore pressure, abnormal pore pressureevaluation- Mud logging methods - Measurement while drilling & logging while drilling data Direct measurements of pore pressure -Formation integrity tests – Fracture gradient determination – Theory of wellbore – FIT procedural Guidelines – Predicting fracture gradient HPHT well design.

UNIT-III

Casing

Functions of casing – Types of casing – Casing properties Casing specifications – Casing connections -Factors influencing casing design – Collapse criterion – Burst criterion – Combination strings – Tension criterion Compression loads – Biaxial effects – Triaxial analysis – Triaxial load capacity diagram, Casing seat selection method. Cementation: Introduction cement Slurries-Typical field calculations- Cementing Nomenclature Cement additives – Cementation of liners.

UNIT-IV

Directional drilling

Applications- Well planning- Down-hole motors- Deflection tools and techniques- Face orientation- Direction control with rotary assemblies- Navigation drilling systems; Horizontal wells–Well profile design considerations – Torque and drag – Horizontal borehole stability – Extended reach well design -Multilateral wells.

UNIT-V

Stuck pipe, well control

Kicks- Kick control- Pressure control theory- BOP-Special kick problems and procedures to free the pipes and Fishing operations. Types of fishing tools, Case studies of blow out control.

Text book(s)

1. Petroleum Engineering: Drilling and Well Completion, Carl Gatlin, Prentice-Hall, Inc
2. Drilling Engineering, J.J. Azar and G. Robello Samuel, Pennwell Books
3. Working Guide to Drilling Equipment and Operations, William Lyons, Gulf Publishing

Reference(s)

1. Oil Well Drilling Engineering: Principles and Practice, H. Rabia, Graham & Trotman
2. Drilling Engineering: A Complete Well Planning Approach, Neal Adams, Tommie CharrierPennwell
3. Practical Well Planning and Drilling Manual, Steve Devereux, Pennwell
4. Primer of Oil Well Service, Workover and Completion, Petroleum Extension Service,University of Texas at Austin
5. Formulas and Calculation for Drilling, Production and Workover, Norton J. Lapeyrouse,Gulf Publishing
6. Applied Drilling Engineering, Adam T. Bourgoyne Jr., Keith K. Millheim, Martine E.Chenevert and F. S. Young Jr., Society of Petroleum Engineers
7. Well Engineering and Construction, HussainRabia, Entrac Consulting
8. Drilling Fluids Processing Handbook, ASME Shale Shaker Committee, Gulf ProfessionalPublishing
9. Fundamentals of Drilling Engineering, Robert F. Mitchell, Stefan Z. Miska, Society ofPetroleum Engineers.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT501	**Drilling & Well Completions**				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisites	Petroleum Geology, Fluid Mechanics for Petroleum Engineers	3	0	0	3

Course Objectives

The objectives of this course are to

- Understand the planning of drilling a well, the process of drilling and various equipment used for drilling and design of the drill string.
- Impart knowledge on drilling fluid importance and its properties and hydraulics.
- Understand different types of casings lowered in a well, the requirement of cementation in a well and cement slurry design.
- Understand different tools used for directional drilling and various techniques, fishing, stuck pipe and well control concepts.
- Learn fundamentals of well testing. Knowledge of surface and subsurface equipment. Planning and designing of well completion after testing of the hydrocarbon zones available.
- Illustrate subsurface circulating equipment, packers, testing of multi zones in a well with DST/RFT with logging tools as well as surface testing equipment.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Learn preparation of GTO, implementation of drilling operations and design of the drill string and understand drilling hydraulics.
CO2:	Analyze Well stability and ready to choose the type of casings with cementation process.
CO3:	Analyze directional drilling and various techniques, fishing, stuck pipe and well control Concepts, Identify different types of wells and their testing methods.
CO4:	Prepare Planning and designing of well completion, select the suitable surface and subsurface equipment, different type of perforation techniques for well construction.
CO5:	Analyze multizone testing, Impart knowledge on usage of logging tools as well as surface testing equipment for DST/RFT.

Syllabus

UNIT-I

Overview of Drilling

Drilling plan - GTO -types of drilling, hydrostatic pressure, pore pressure, causes of abnormal pore pressure, abnormal pore pressure evaluation - measurement while drilling & logging while drilling data -direct measurements of pore pressure – drilling fluid properties - drilling fluid hydraulics

calculations - bit hydraulics formation integrity tests – fracture gradient determination – theory of wellbore – FIT procedural Guidelines – predicting fracture gradient.

UNIT-II

Wellbore Stability

In-situ stress - determination of rock properties, failure criteria – stress distribution around a wellbore - safe mud weights to prevent hole collapse, kick tolerance use of kick tolerance to calculate wellbore pressures.

Casing

Functions of casing – types of casing – casing properties and specifications – casing connections – factors influencing casing design – combination strings – tension criterion - compression loads – biaxial effects – triaxial analysis.

Cementation

Introduction to cement slurries - Cementing nomenclature - Cement additives.

UNIT III

Directional Drilling

Well planning - deflection tools and techniques - face orientation - direction control with rotary assemblies - navigation drilling systems; horizontal wells – well profile design considerations – torque and drag –extended reach well design – multilateral wells.

Well Control

Kicks – BOP - special kick problems and procedures to free the pipes and fishing operations

UNIT IV

Well Completions

Types of wells- Types of completion. Perforation methods. Packers: Function – Application.

Completion Equipment (SSD, SSSV, mandrels, locks etc.)

Subsea well completions, permanent gauges - memory gauges -intelligent completion equipment. Tubing string design.

UNIT-V

Drill Stem Testing

General Procedure and considerations - Test tool components and arrangement - Analysis of Test data. HPHT and horizontal well completions, work over operations, CTU & Slick line operations.

Text Book(s)

1. Petroleum Engineering: Drilling and Well Completion, Carl Gatlin, Prentice-Hall, Inc.
2. Working Guide to Drilling Equipment and Operations, William Lyons, Gulf Publishing.
3. Well Completion and Servicing, D. Perrin, Micheal Caron, Georges Gaillot, Editions Technip,.
4. Primer of Well Service, Workover and Completion, Petroleum Extension Service (PETEX), University of Texas at Austin.

Reference(s)

1. Drilling Engineering, J.J. Azar and G. Robello Samuel, Pennwell Books.
2. Oil Well Drilling Engineering: Principles and Practice, H. Rabia, Graham &Trotman.

3. Drilling Engineering: A Complete Well Planning Approach, Neal Adams, Tommie Charrier Pennwell.
4. Practical Well Planning and Drilling Manual, Steve Devereux, Pennwell.
5. Formulas and Calculation for Drilling, Production and Workover, Norton J. Lapeyrouse, 2ndEdition, Gulf Publishing.
6. Applied Drilling Engineering, Adam T. Bourgoyne Jr., Keith K. Millheim, Martine E. Chenevert and F. S. Young Jr., Society of Petroleum Engineers.
7. Well Engineering and Construction, Hussain Rabia, Entrac Consulting.
8. Fundamentals of Drilling Engineering, Robert F. Mitchell, Stefan Z. Miska, Society of Petroleum Engineers.
9. Well Completion Design, Jonathan Bellarby, Elsevier.
10. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman, Inc.
11. Advanced Well Completion Engineering, Wan Renpu, Gulf Professional Publishing.
12. Well Testing, John Lee, Society of Petroleum Engineers.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT502	**Petroleum Reservoir Engineering-I**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Petroleum Geology, Fluid Mechanics for Petroleum Engineers, Process Thermodynamics	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on basic concepts in reservoir engineering
- Analyze PVT behavior of oil & gas reservoirs
- Apply material balance concepts to oil & gas reservoirs.
- Utilize Darcy's law in oil and gas reservoirs.
- Estimate well inflow for stabilized conditions.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand basics of reservoir engineering and perform reservoir volume calculations.
CO2:	Perform basic PVT analysis of the specific reservoir of various sands.
CO3:	Carry out the calculations in material balance and estimate the reserves of various
CO4:	Test the Darcy's law in single or multiple reservoir.
CO5:	Calculate the formation damage and can recommend suitable stimulation operations

Syllabus

UNIT –I
Basic Concepts in Reservoir Engineering
Calculation of hydrocarbon volumes- Fluid pressure regimes- Oil recovery and recovery factor - Volumetric gas reservoir engineering – Application of the real gas equation of state - Gas material balance and recovery factor and its conceptual coherence with drive mechanisms - Hydrocarbon phase behavior.

UNIT- II
PVT Analysis for Oil
Definition of the basic PVT parameters – Collection of fluid samples - Determination of the basic parameters in the laboratory and conversion for field operating conditions - Alternative manner of expressing PVT lab analysis results - Complete PVT analysis.

UNIT-III
Material Balance Applied to Oil Reservoirs

General form -The material balance expressed as a linear equation - Reservoir drive mechanisms - Solution gas drive- Gas cap drive- Natural water drive- compaction drive and related pore compressibility phenomena.

UNIT-IV

Darcy's Law and Applications

Darcy's law and field potential- Sign convention- Units and unit conversion- Real gas potential – Datum pressures Different flow regimes- Linear &Radial steady state flow - Pseudo-steady flow Unsteady state flow- Derivation of deliverability equations – estimation of reservoir permeability - Two phase flow- Effective and relative permeabilities.

UNIT-V

Radial Diffusivity Equation

The basic differential equation for radial flow in a porous medium- Derivation of the basic radial differential equation – Conditions of solution – The linearization of the equation for slightly compressible and highly compressible fluids -Application of dimensionless diffusivity equation – Numerical solutions using Excel Macros and MAT lab.

Well Inflow Estimation for Stabilized Flow Conditions

Semi steady state solution – Steady state solution – Example of the application of the stabilized inflow equations – Generalized form of inflow equation under semi steady state conditions.

Text Book(s)

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science
2. Applied Petroleum Reservoir Engineering, B. C. Craft – M. Hawkins, Third Edition, Revised by Ronald E. Terry & J. Brandon Rogers, Prentice Hall, New York.

Reference(s)

1. Reservoir Engineering Handbook, Tarek Ahmed, 3rd Edition, Gulf Professional Publishing,.
2. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman Inc..
3. Basic Reservoir Engineering, Rene Cosse, Editions Technip.
4. Petroleum Reservoir Engineering, James W. Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill.
5. Practical Reservoir Engineering and Characterization, Baker, R – Harvey W. Y and Jensen, J. L. Elsevier, GPP.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT503	**Well Logging & Formation Evaluation**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Petroleum geology	3	0	0	3

Course Objectives

The objectives of this course are to

- Learn the logging terminology.
- Impart knowledge on delineate hydrocarbons through direct and indirect means/methods.
- Determine formation lithology through logs like S.P, G.R etc. and also depositional environment with the help of Gamma rays spectroscopy and Dip-meter tools.
- Determine physical properties of the subsurface, strata like resistivity, porosity, thickness etc. through tools like latero, induction, density, neutron, etc.
- Estimate hydrocarbon saturation using the data acquired by the logging tools.
- Estimate hydrocarbons reserves in a particular block.
- Refine the log interpretation data with the help of advanced technology tools namely, Scanner, NMR, Modular formation tester etc.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand different types of coring and well logging methods.
CO2:	Identify type of formation and calculate formation properties.
CO3:	Calculate the porosity of formation by using porosity logs.
CO4:	Interpret the formation behaviour and well condition by using cased hole logs
CO5:	Interpret the multiple well logs and identify the zone of interest for oil production.

Syllabus

UNIT-I

Concepts of Well Logging

Definition of well logging - logging terminology - borehole environment - borehole temperature and pressure - log header and depth scale major components of well logging unit and logging setup-classification of well logging methods-log presentation- log quality control. Direct Methods-
Mud logging- preparation of litho logs - coring – conventional and sidewall coring - core analysis.

UNIT-II

Open hole Logging

SP Logging- Origin of SP, uses of SP log-Calculation of salinity of formation water- Shaliness - Factors influence SP log. Resistivity Log-Single point resistance log (SPR)- Conventional resistivity logs-Response of potential and gradient logs over thin and thick conductive and resistive formations -

Limitations of conventional resistivity tools. Focused resistivity log- Advantages of focused resistivity tools over conventional resistivity tools. Micro resistivity Log-Conventional and focused micro resistivity logs and their application. Induction Log-Principle of induction tool and the advantages, Criteria for selection of induction and lateral logging tool, Determination of true resistivity (Rt) of the formation - Resistivity index - Archie's equation.

UNIT-III

Gamma ray Log-Principle of radioactivity - Uses of gamma ray log- Determination of Shaliness of formation-API counts- Calibration of Gamma ray tool - Statistical fluctuation- Time constant.
Natural Spectral Gamma ray log-Principle and application. Caliper log- Principle and application of caliper tool.

Density Log

Principle of density tool- Environmental corrections - Porosity determination - Tool calibration, Litho density log. Neutron log: Principle and application of neutron tool, Porosity determination.

Sonic Log

Principle and application of sonic log - Bore hole compensation - Determination of primary and secondary porosity, determination of mechanical properties of rock, elastic constants, fractures etc.,

UNIT-IV

Cased hole Logging

Gamma ray spectral log - Neutron decay time log - Determination of fluid saturation behind casing - Cement bond log - Casing collar log - Depth control - Free point locater –Casing inspection logs.

Production Logging

Solving production problems with the help of Fluid Density log - Temperature log and Flow meter logs.

UNIT-V

Advances in Well Logging

Dip meter log - Formation tester - Cased hole resistivity logs -Nuclear magnetic resonance log & Scanner logs (Sonic scanner, MR scanner Rt scanner).Calculating the dip of the formations, collection of fluid samples from wells for confirmation of log interpretation, and also recording resistivity in cased holes.

Interpretation

Quick look interpretation - Cross plots. Neutron - Density, Sonic - Density, Sonic - Neutron cross plots - Hingle plot - Mid plot – Correlation - Hydrocarbon reserve estimate.

Text Book(s)

1. Formation Evaluation, Edward J. Lynch, Harper & Row.
2. Well Logging and Formation Evaluation, Toby Darling, Elsevier, New York.
3. Well Logging & Reservoir Evaluation, Oberto Serra, Editions Technip.

Reference(s)

1. Basic Well Logging and Formation Evaluation, Prof. Dr. Jurgen Schon, FirstEdition, Book boon publishers.
2. Hydrocarbon well logging recommended practice, Society of professional well log analysts.

3. Open – Hole log analysis and formation evaluation, Richard M. Batemons, International
4. Human Resources Development Corporation, Bostan.
5. Well Logging for Earth Scientists, Darwin V. Ellis, Julian M. Singer, Springer.
6. Fundamentals of Well Log Interpretation: The Acquisition of Data, ObertoSerra, Elsevier,.
7. Well Logging Handbook, Oberto Serra, Editions Technip.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT561	**Fundamentals of Liquefied Natural Gas** (Professional Elective-I)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Fluid Mechanics for Petroleum Engineers, Process heat transfer, Process thermodynamics.	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart basic knowledge of LNG and it's prospective.
- Learn different liquefaction technologies of LNG.
- Impart knowledge on different functional units on receiving terminals
- Analyze transportation of LNG and regasification.
- Understand HSE of LNG industry.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand the overview of LNG industry.
CO2:	Understand the principle and process of functional units used in LNG plants.
CO3:	Classify different liquefaction techniques.
CO4:	Understand different units used in LNG processing and transportation.
CO5:	Learn safety and risk assessment of LNG processing facilities.

Syllabus

UNIT-I

Introduction

Overview of LNG industry- History of LNG industry – Base load LNG – Developing an LNG Project – World and Indian Scenario – Properties of LNG.

Supporting Functional Units in LNG Plants

Gas pre-treatment: Slug catcher – NGL stabilization column – Acid gas removal unit – Molecular sieve dehydrating unit – Mercury and sulphur removal unit – NGL recovery – Nitrogen rejection – Helium recovery.

UNIT-II

Liquefaction Technologies

Propane precooled mixed refrigerant process – Description of Air Products: C3MR LNG process – Liquefaction – LNG flash and storage. Cascade process-Description of Conoco Phillips Optimized Cascade (CPOC) process – Liquefaction – LNG flash and storage.

Other Liquefaction Processes

Description of Linde MFC LNG process - Precooling and Liquefied Petroleum Gas (LPG) recovery – Liquefaction and Sub cooling - Trends in LNG train capacity –Strategy for grassroots plant - Offshore LNG production.

UNIT-III

Receiving Terminals

Receiving terminals in India – Main components and description of marine facilities – design of storage tanks – Process descriptions. Integration with adjacent facilities – Gas inter changeability – Nitrogen injection – Extraction of C2+ components.

UNIT-IV

LNG Shipping Industry & Major Equipment in LNG Industry

LNG Shipping Industry: LNG fleet – Types of LNG ships – Moss – Membrane – prismatic; Cargo measurement and calculations. Major equipment in LNG industry – Cryogenic heat exchangers: Spiral – Wound heat exchangers – Plate & fin heat exchangers – Cold boxes; Centrifugal compressors – Axial compressors – Reciprocating compressors. LNG pumps and liquid expanders – Loading Arms and gas turbines.

UNIT-V

Vaporizers

Submerged combustion vaporizers- Open rack vaporizers-Shell and tube vaporizers: Direct heating with seawater, and indirect heating with seawater. Ambient air vaporizers: Direct heating with ambient air – Indirect heating with ambient air- LNG tanks.

Safety, Security and Environmental Issues

Safety design of LNG facilities –Security issues for the LNG industry – Environmental issues – Risk based analysis of an LNG plant.

Text Book(s)

1. LNG: Basics of Liquefied Natural Gas, 1stEdition, Stanley Huang, Hwa Chiu and Doug Elliot, PETEX.

Reference (s)

1. Marine Transportation of LNG (Liquefied) and Related Products, Richard G. Wooler, Gornell Marine Press.
2. Natural Gas by Sea: The Development of a New Technology, Roger Rooks, Wither By.
3. LNG: A Nontechnical Guide, Michael D' Tusiani, Gordon Shearer Penn Well Books.
4. Natural Gas Transportation, Storage and Use, Mark Fennell Amazon Digital Services, Inc.
5. Liquefied Natural Gas, Walter Lowenstein Lom, Wiley.
6. Liquefied Natural Gas, C. H. Gatton, Noyes,.
7. Liquefied Gas Handling Principles on Ships and in Terminals, 3rd Edition, McGuire and White, Wither by Publishers.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. I Sem (5th Semester)			
Course Code 201PT562	**Flow through Porous Medium** (Professional Elective-I)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering-I	3	0	0	3

Course Objectives

The objectives of this course are to

- Learn the basic structure of porous structure
- Identify the physical properties of porous medium.
- Impart knowledge on mathematical models used in miscible and immiscible fluid flow through porous medium.
- Analyze single and multiphase flow through porous medium.
- Analyze surface properties and fluid displacement phenomenon in porous medium.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand physical properties of porous structure.
CO2:	Analyze mathematical models of porous media
CO3:	Apply mathematical models for single phase flow through porous media
CO4:	Apply mathematical models for multi-phase flow through porous media
CO5:	Apply mathematical models for surface phenomena, miscible displacements and dispersion in porous media.

Syllabus

UNIT-I
The Porous Medium
The Physical Medium, Relevant Physical Phenomena, Pore Scale vs. Continuum Scale, Fluid and Porous Matrix Properties

UNIT-II
Mathematical Models of Porous Medium
Network Models, Statistical Descriptors, Fractal Models, Effective Medium, Mixture Theories, Double Porosity Model

UNIT-III
Single Phase Flow in a Porous Medium
Darcy's law. Balance Principles- Mass, Momentum and Energy Conservation, Equations of Motion,

Constitutive Theory- Constitutive equations for mass and heat transfer and Mechanical response for solid phase. Boundary Value Problems-Well-Posed Problems, Common Boundary Conditions, Common Solution Procedures.

UNIT-IV

Immiscible Multiphase Flow

Surface Chemistry, Thermodynamics of Interface, Interfacial Tension, Capillary Pressure, Simultaneous Flow of Two Fluids

UNIT-V

Surface Phenomena

Adsorption, Wetting, Thin Films, Transport through Membranes

Miscible Displacements and Dispersion

Text Book(s)

1. Muhammad Sahimi "Flow and Transport in Porous Media and Fractured Rock: From Classical Methods to Modern Approaches." Wiley VCH Publishers.

Reference(s)

1. M. Crolet, M. El Hatri (Eds.). "Recent Advances in Problems of Flow and Transport in Porous Media Series: Theory and Applications of Transport in Porous Media." Springer Series.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT563	**Pipeline Engineering** (Professional Elective-I)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Fluid Mechanics for Petroleum Engineers	3	0	0	3

Course Objectives

The objectives of this course are to

- Understand Operations and maintenance of flow lines or trunk pipe lines.
- Understand of well fluids for proper designing of flow lines/trunk pipe lines.
- Impart knowledge on obtaining the permissions to laying of pipe line as per the State/DGMS regulations.
- Illustrate Operation and maintenance of gas compressors.
- Understand handling of flammable fluids like gas, oil condensate to check the accident free operation.
- Understand protection from internal/external corrosion of pipe lines by suitable methods.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand pipeline materials, route selection, survey and construction.
CO2:	Understand the design procedures of natural gas transmission lines.
CO3:	Understand the different types of gas compressors and function of cooler in natural
CO4:	Understand gas transmission lines operations.
CO5:	Understand fluid flows in pipelines and maintenance of pipeline.

Syllabus

UNIT-I

Elements of pipeline design

Fluid properties – Environment - Effects of pressure and temperature - Supply/Demand scenario - Route selection - Codes and standards - Environmental and hydrological considerations – Economics - Materials/Construction – Operation - Pipeline protection – Pipeline integrity monitoring.

Pipeline route selection, survey and geotechnical guidelines

Introduction - Preliminary route selection - Key factors for route selection - Engineering survey - Legal survey – Construction As built survey - Geotechnical design. Pipeline construction: Construction – Commissioning.

UNIT-II

Natural gas transmission

General flow equation – Steady state - Impact of gas molecular weight and compressibility factor on flow capacity - Flow regimes – Widely used steady-state flow equations– Summary of the impact of

different gas and pipeline parameters on the gas flow efficiency, Pressure drop calculation for pipeline in series and parallel – Pipeline gas velocity – Erosional velocity – Optimum pressure drop for design purposes – Pipeline packing – Determining gas leakage using pressure drop method – Wall thickness/pipe grade – Temperature profile – Optimization process – Gas transmission solved problems.

UNIT-III

Gas compression

Types of compressors – Compressor drivers – Compressor station configuration – Thermodynamics of isothermal and adiabatic gas compression – Temperature change in adiabatic gas compression – Thermodynamics of polytropic gas compression – Gas compressors in series – Centrifugal compressor horsepower – Enthalpy / Entropy charts (Mollier diagram) – Centrifugal compressor performance curve- Reciprocation compressors.

Coolers

Gas coolers – Air-cooled heat exchangers –Heat transfer equations for coolers – Fan air mass flow rate – Required fan power – Gas pressure drop in coolers – Iterative procedure for calculations based on unknown T2.

UNIT-IV

Liquid flow and pumps

Fully developed laminar flow in a pipe – Turbulent flow –multiphase flow- Centrifugal pumps – Retrofitting for centrifugal pumps (Radial-flow) –Pump station control – Pump station piping design. Pipeline protection, Instrumentation and Pigging: Pipeline coating – Cathodic protection – Cathodic protection calculations for land pipelines – Internal corrosion – Flow meters and their calibration. Sensors – Pigs.

UNIT-V

Pipeline mechanical design

Codes and standards – Location classification – Pipeline design formula – Expansion and flexibility – Joint design for pipes of unequal wall thickness – Valve assemblies – Scraper traps – Buoyancy control – Crossings – Depth of cover – Aerial markings – Warning signs. Materials selection-
Elements of design – Materials designation standards.

Text Book(s)

1 Pipeline Design and Construction: A Practical Approach, M. Mohitpour, H. Golshan and M.A. Murray, 2ndEdition, ASME Press.
2 Pipeline Engineering, Henry Liu , Lewis Publishers (CRC Press).

Reference(s)

1 Piping Calculation Manual, E. Shashi Menon, McGraw-Hill.
2 Piping and Pipeline Engineering: Design, Construction, Maintenance Integrity and Repair, George A. Antaki, CRC Press.
3 Pipeline Planning and Construction Field Manual, E. Shashi Menon, Gulf Professional Publishing.
4 Pipeline Rules of Thumb Handbook, E. W. McAllister.

5 Liquid Pipeline Hydraulics, E. Shashi Menon, Mareel Dekker.
6 Gas Pipeline Hydraulics, E. Shashi Menon, Taylor & Francis.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. IISem (6th Semester)			
Course Code 201PT564	**Petroleum Refining& Petrochemical Engineering** (Professional elective-I)				
Teaching	Total contact hours – 48	L	T	P	C
Prerequisites	Process Heat Transfer	4	0	0	4

Course Objectives

The objectives of this course are to

- Learn the properties and their significance of crude oils and petroleum fractions.
- Impart Knowledge on details of the various petroleum refinery processes including primary, secondary and supporting processes.
- Illustrate various aspects of environmental pollution, its control and waste disposal methods.
- Understand various feed-stocks for the production of petrochemicals.
- Learn the process technologies for the various petrochemical products.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Assess the scenario of world and Indian petroleum refining.
CO2:	Estimate the quantities of various petroleum products obtained from various types of crude oil processing.
CO3:	Analyze and design the various petroleum refinery processes including primary, secondary, treatment and supporting processes.
CO4:	Assess the various aspects of environmental pollution to design the control and waste disposal methods. Assess various petroleum feed stocks for the production of ethylene, propylene, butylene and butadiene etc.
CO5:	Design the processes and equipment for various petrochemical products.

Syllabus

UNIT-I

Introduction

Overall refinery operations –Structure of a Refinery – World and Indian scenario in refining.

Refinery Feed Stocks-Crude oil classification – composition and properties – evaluation of crude oils.

Petroleum Products and Their Specifications-LPG – gasoline – diesel fuels – jet and turbine fuels – lube oils – heating oils – residual fuel oils – wax and asphalt- petroleum coke – all product specifications – product blending.

UNIT-II

Crude Distillation

Atmospheric and vacuum distillation units, auxiliary equipment such as desalters, pipe-still heaters and heat exchanger trains etc.

Catalytic Reforming and Isomerization

Catalytic reforming processes (for petroleum and petrochemical feed stocks) – isomerization processes – feed stocks – feed preparation – process variables – yields.

UNIT-III

Thermal, Catalytic cracking, Hydro Cracking Processes

Visbreaking- delayed coking – fluid catalytic cracking – feed stocks –catalysts – process description and effect of process variables – Hydrocracking: feed stocks process description and effect of process variables.

Hydro Treating & Hydro Processing

Naphtha, kerosene, diesel, VGO & resid, hydro treating / hydro processing–catalysts – process description and effect of process variables.

UNIT-IV

Environmental Issues in Petroleum Refining- Pollution in petroleum processes and operations-control, and disposal methods. Petrochemical Industry: Indian petrochemical industry- feed stocks – process description and process variables – naphtha cracking-gas cracking and gas reforming.

UNIT-V

Chemicals from Gas Reforming-Methanol- acetic acid- ammonia and urea. Chemicals from ethylene: Ethylene oxide**-**monoethylene glycol – ethyl benzene-styrene. **Polymers:**
LDPE, HDPE & LLDPE and polypropylene – PVC – polystyrene.

Text Book(s)

1. Petroleum Refining: Technology and Economics, J.H. Gary and G. E. Handwerk, 4thEdition, Marcel Dekkar, Inc.
2. Elements of Petroleum Processing, D S Jones, Wiley.
3. Petrochemical Process Technology, ID Mall, Macmillan India Ltd.

Reference(s)

1. Petroleum Refining Engineering, WL Nelson, 4thEdition, McGraw Hill Company.
2. Chemical Technology of Petroleum, W. S. Gruese and D.R. Stevens, McGraw Hill.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT565	**Fundamentals of Petroleum Engineering** (Open Elective-I)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on transition from petroleum science to petroleum engineering.
- Explain the role of petroleum engineers in upstream, midstream and downstream sectors.
- Learn the fundamental concepts of upstream, midstream and downstream sectors.
- Impart Knowledge on the transportation of crude oil & its products and natural gas.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand overview of petroleum industry.
CO2:	Understand Exploration and Production of petroleum industry
CO3:	Understand Gathering of Oil & Gas and Storage
CO4:	Understand Midstream of petroleum industry
CO5:	Understand Downstream of petroleum industry

Syllabus

UNIT-I
Introduction
Introduction Petroleum Industry- Upstream Sector – Midstream Processing-Downstream Processing- Indian and World Scenario of Petroleum and Natural Gas- Petroleum Trade- Geopolitics.

UNIT II
Upstream Sector-1
Exploration & Production – Indian and World Scenario of Petroleum and Natural Gas Resources. The Reservoir –Reservoir fluids- Hydrocarbon Phase diagrams- Onshore and Offshore Reservoirs – Reservoir Drives.

UNIT III
Upstream Sector-2
Drilling Rigs- Rig Components-Drill and drill bits- Drilling fluids-Well Completions. Production System: Sketches of Well - Well head- Christmas tree and Casing and various other parts- Cementing-

Safety Systems. Subsea Wells: Drilling & Completion and Production. Artificial Lift: Principles and operation of Rod Pumps –Gas Lift –Electrical submersible pumps. Well Workover and Intervention-Well Stimulation. Basic concepts in Matrix Acidizing and Hydro-fracturing.

UNIT-IV

Gathering of Oil & Gas and Storage

Well tubing-Separation of Reservoir Fluids- Manifolds and Gathering – Production Separators – Gas Treatment and Compression - Oil & Gas Storage, Metering and Export.

Midstream Processing

Transportation of Crude Oil & its Products and Natural Gas- - World and Indian pipeline scenario-Safety aspects of pipelines- Environmental issues.

UNIT V

Downstream Processing

Crude Oil Refining: Classification and Composition – Constituents - Products and their specifications– Pre- treatment of crude oil- Refinery distillation- Safety in refinery operations.

Text Book(s)

1. Oil and Gas Production Handbook: An Introduction to Oil & Gas Production, Havard Devold, ABB ATPA Oil and Gas, 2006.
2. Introduction to Petroleum Engineering, John R. Fanchi and Christiansen, R.L., John Wiley & Sons, 2017.

Reference(s)

1. Petroleum engineering handbook: Howard.B. Bradley,SPE,1987
2. Petroleum engineering hand book: Larry .W.lake, SPE, volume II, 2006.
3. Petroleum engineering handbook: Production operations engineering, volume IV, Joe Dunn Clegg, 2009.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT511	**Drilling Fluids Laboratory**				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites	petroleum geology, Drilling, Petroleum analysis lab	0	0	3	1.5

Course Objectives

The objectives of this course are to

- Impart knowledge on preparation of different types of drilling fluid.
- Illustrate rheological behavior of drilling fluids.
- Estimate different properties of drilling fluids.
- Estimate the strength of cement for well cementation.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Handling various equipment for measuring the drilling fluid properties.
CO2:	Analyze rheological behaviour of drilling fluid.
CO3:	Analyze the effect of drilling additives and fluid loss control agents on drilling fluid.
CO4:	Estimate the drilling fluid contamination and emulsion characteristics of drilling fluid.
CO5:	Analyze the strength of cement for well construction.

List of Experiments

1. Measurement of drilling fluid weight.
2. Measurement of mud viscosity.
3. Measurement of pH of mud.
4. Determination of mud rheology (Viscosity, Gel strength, and Yield point).
5. Determination of the loss of liquid from a mud.
6. Measurement of a drilling mud cake and evaluate resistivity.
7. Measurement of the effect of adding bentonite on mud properties.
8. Drilling fluid contamination test (Salt, Gypsum & Cement contamination) and their effect on the drilling fluid properties.
9. Measurement of solid and liquid content and emulsification characteristics of drilling fluid.
10. Measurement of Oil, water, solid and clay content.
11. Measurement of water ratios for Portland cement slurry. (Effect of water ratio on free water separation normal and minimum water content and thickening time)
12. Measurement of compressive strength of cement test moulds and effect of temperature and pressure on setting of the slurry.
13. Measurement of compressive strength of cement test moulds and effect of chemicals on flash setting and retardation

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT512	**Petroleum Reservoir Engineering Laboratory**				
Teaching	Total contact hours - 36	L	T	P	C
Prerequisites	petroleum Geology, Drilling, Petroleum analysis lab	0	0	3	1.5

Course Objectives

The objectives of this course are to

- Impart knowledge on properties of reservoir rock.
- Impart knowledge on properties of reservoir properties.
- Understand nature of reservoir for selection of oil and gas production from the reservoir.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Handle the equipment for measurement of reservoir rock properties.
CO2:	Handle the equipment for measurement of reservoir fluid properties.
CO3:	Analyze porosity distribution in reservoir.
CO4:	Analyze permeability of reservoir under unsteady state condition.
CO5:	Handle the equipment for measuring of reservoir capillary pressures.

List of Experiments

1. Determination of effective porosity by gas expansion method.
2. Determination of porosity and pore size distribution by mercury injection.
3. Measurement of surface tension & interfacial tension with the ring tensiometer.
4. Determination of fluid density using Pycnometer and hydrometer methods.
5. Liquid viscosity measurement using capillary tube viscometer (Ostwald type).
6. Determination of capillary pressure of reservoir rock (core) using porous plate method.
7. Measurement of contact angle (between oil, water and solid surface) using imaging method.
8. Measurement of air permeability.
9. Absolute permeability measurement of water.
10. Determination of relative permeability of oil-water using unsteady state method.
11. Determination of relative permeability of gas-oil using unsteady state method.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code	**English for Career**				
Teaching	Total contact hours -36	L	T	P	C
Prerequisites	Learner should be equipped with Functional Grammatical skills and interactive ability	1	0	2	2

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code	**IPR & Patents**				
Teaching	Total contact hours -	L	T	P	C
Prerequisites		2	0	0	0

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT531	**Summer Internship-I**				
Teaching	Total contact hours -	L	T	P	C
Prerequisites	Basic knowledge of petroleum engineering	0	0	0	1.5

Course Objectives

The main objective of the summer internship-I is to gain up-to-date practical experience in the real-working situation/ obtain skilling certification from oil and gas industry/undergone research projects from IITs, Research labs etc, in contrast to information gained during studies concerning mainly theoretical background of petroleum engineering.

The students are guided (through the Industry representative) to learn the following aspects:

- Application of the engineering skills, learned in class room, in real world.
- Working as a team to deliver the results along with senior engineering professionals, technicians, managers etc.
- Working safely in industrial environment.
- Result oriented approach in field operation, troubleshooting and engineering work.
- Present and / or report the work / project outcomes to various disciplines, departments & interest groups with confidence.
- To give a clear, organized and accurate oral presentation of Industrial Training/Internship Report.
- To provide verbally/ through power point presentation of condensed large amounts of technical information into concise, condensed analysis.
- Sharing the practical knowledge obtained during training with fellow students.

Course Outcomes

The students are able to:

- Work safely in industrial environment.
- Work with various interest groups, disciplines, professionals, managers and technicians etc.
- Polish the engineering skills by applying the practical knowledge in dayto-day operations, trouble-shooting and minor-modifications.
- Build relations between university and industry that helps mutual collaboration and cooperation over long-term.
- Develop/strengthen the basic skills of interviewing, analysis, report writing, communication, decision-making, and problem solving.
- Assess the good practices of petroleum operations.
- Acquire good clarity in the technical topics being presented.
- Develop good communication skills.
- Practice the behaviors of effective speakers.
- Assess strengths in speaking and set goals for future growth

Evaluation

- Every Student should undergo summer internship-I in a petroleum industry (like ONGC)/service providing industry (like Halliburton)/IITs, research labs for 6-8 weeks and submit a report.
- The final report is a documentation of a student's work—a record of the original work done by the student in the Industrial Training/Skill development / Research Project of 6-8 week duration at the end of the IV semester.
- The report of the students shall be evaluated for 50 marks (1.5- credits) for weightage of 50% - Report and 50% - oral presentation by a committee constituted by the Head of the Department along with an industry expert or a faculty from other departments.

Syllabus for Minor course

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT504	**Basic Concepts in Well Logging and Formation Evaluation**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Petroleum geology	4	0	0	4

Course Objectives

The objectives of this course are to

- Learn the logging terminology.
- Impart knowledge on delineate hydrocarbons through direct and indirect means/methods.
- Determine formation lithology through logs like S.P, G.R etc. and also depositional environment with the help of Gamma rays spectroscopy and Dip-meter tools.
- Determine physical properties of the subsurface, strata like resistivity, porosity, thickness etc. through tools like latero, induction, density, neutron, etc.
- Estimate hydrocarbon saturation using the data acquired by the logging tools.
- Estimate hydrocarbons reserves in a particular block.
- Refine the log interpretation data with the help of advanced technology tools namely, Scanner, NMR, Modular formation tester etc.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand different types of coring and well logging methods.
CO2:	Identify type of formation and calculate formation properties.
CO3:	Calculate the porosity of formation by using porosity logs.
CO4:	Interpret the formation behaviour and well condition by using cased hole logs
CO5:	Interpret the multiple well logs and identify the zone of interest for oil production.

Syllabus

UNIT-I

Concepts of Well Logging

Definition of well logging - logging terminology - borehole environment - borehole temperature and pressure - log header and depth scale major components of well logging unit and logging setup-classification of well logging methods-log presentation- log quality control. Direct Methods-
Mud logging- preparation of litho logs - coring – conventional and sidewall coring - core analysis.

UNIT-II

Open hole Logging

SP Logging- Origin of SP, uses of SP log-Calculation of salinity of formation water- Shaliness - Factors influence SP log. Resistivity Log-Single point resistance log (SPR)- Conventional resistivity logs-Response of potential and gradient logs over thin and thick conductive and resistive formations - Limitations of conventional resistivity tools. Focused resistivity log- Advantages of focused resistivity tools over conventional resistivity tools. Micro resistivity Log-Conventional and focused micro resistivity logs and their application. Induction Log-Principle of induction tool and the advantages, Criteria for selection of induction and lateral logging tool, Determination of true resistivity (Rt) of the formation - Resistivity index - Archie's equation.

UNIT-III

Gamma ray Log-Principle of radioactivity - Uses of gamma ray log- Determination of Shaliness of formation-API counts- Calibration of Gamma ray tool - Statistical fluctuation- Time constant.
Natural Spectral Gamma ray log-Principle and application. Caliper log- Principle and application of caliper tool.

Density Log

Principle of density tool- Environmental corrections - Porosity determination - Tool calibration, Litho density log. Neutron log: Principle and application of neutron tool, Porosity determination.

Sonic Log

Principle and application of sonic log - Bore hole compensation - Determination of primary and secondary porosity, determination of mechanical properties of rock, elastic constants, fractures etc.,

UNIT-IV

Cased hole Logging

Gamma ray spectral log - Neutron decay time log - Determination of fluid saturation behind casing - Cement bond log - Casing collar log - Depth control - Free point locater –Casing inspection logs.

Production Logging

Solving production problems with the help of Fluid Density log - Temperature log and Flow meter logs.

UNIT-V

Advances in Well Logging

Dip meter log - Formation tester - Cased hole resistivity logs -Nuclear magnetic resonance log & Scanner logs (Sonic scanner, MR scanner Rt scanner).Calculating the dip of the formations, collection of fluid samples from wells for confirmation of log interpretation, and also recording resistivity in cased holes.

Interpretation

Quick look interpretation - Cross plots. Neutron - Density, Sonic - Density, Sonic - Neutron cross plots - Hingle plot - Mid plot – Correlation - Hydrocarbon reserve estimate.

Text Book(s)

1. Formation Evaluation, Edward J. Lynch, Harper & Row.
2. Well Logging and Formation Evaluation, Toby Darling, Elsevier, New York.
3. Well Logging & Reservoir Evaluation, Oberto Serra, Editions Technip.

Reference(s)

1. Basic Well Logging and Formation Evaluation, Prof. Dr. Jurgen Schon, FirstEdition, Book boon publishers.
2. Hydrocarbon well logging recommended practice, Society of professional well log analysts.
3. Open – Hole log analysis and formation evaluation, Richard M. Batemons, International
4. Human Resources Development Corporation, Bostan.
5. Well Logging for Earth Scientists, Darwin V. Ellis, Julian M. Singer, Springer.
6. Fundamentals of Well Log Interpretation: The Acquisition of Data, ObertoSerra, Elsevier,.
7. Well Logging Handbook, Oberto Serra, Editions Technip.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT505	**Basic Concepts in Well Completions**				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Drilling technology	4	0	0	4

Course Objectives

The objectives of this course are to

- Impart knowledge on basics of reservoir engineering and well completion operations.
- Understand concept of sand controls preventions and techniques.
- Understand factors affecting well completion and design selection.
- Impart knowledge on the well completion equipment.
- Learn fundamental of well completion techniques and installation system.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand the basic idea about reservoir engineering and well completion.
CO2:	Identify Different types of well completion.
CO3:	Understand material selection for design of tubing sting.
CO4:	Apply completion equipment in well completion.
CO5:	Types of installation in onshore and offshore areas.

Syllabus

UNIT-I
Basics of well reservoir engineering in well completion
IPR, perforation, well stimulation techniques including fracturing. Sand controls- introduction- rock strength analysis- sand control prediction and mitigation techniques including installation of screens, gavel pack job-sand consolidation methods

UNIT-II
Well completion life
Introduction- types of well completion- factors affecting well completion, TPR- flow through tubing, well completion fluid properties and production and injection tubing sizing analysis.

UNIT-III
Material selection and stress analysis

Selection of control lines for Injection of corrosion inhibitors, scale inhibitors and use of other seals. Load and stress analysis of tubing including burst pressure, collapse, axial load calculation and some design factors.

UNIT-IV

Well completion equipment

Introduction- types of completion equipment- surface and subsurface equipment. Rating of SSSV, packer, landing nipple locks and sling sleeve and side pocket mandrel selection. Selection of control lines and subsea isolation valve.

UNIT-V

Well completion installation system

Introduction-onshore and subsea well completion installation system. Well bore cleanup operations-well fluid displacement. Filtration prior to well flow.

Text Book(s)

1. Advanced Well Completion Engineering, Wan Renpu, Gulf Professional Publishing.
2. Well Completion Design, Jonathan Bellarby, Elsevier.

Reference(s)

1. Well Completion and Servicing, D. Perrin, Micheal Caron, Georges Gaillot, Editions Technip. Primer of Well Service, Workover and Completion, Petroleum Extension Service (PETEX), University of Texas at Austin.
2. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman, Inc.

Regulation GRBT-20	Godavari Institute of Engineering &Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT601	**Enhanced Oil Recovery Techniques**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering	3	0	0	3

Course Objectives

The objectives of this course are to

- Understand secondary / tertiary recovery of crude oils of specific reservoirs.
- Learn selection criteria to which reservoir suits for specific EOR techniques.
- Illustrate post project monitoring.
- Impart Knowledge on maintenance of injection wells / Production wells.
- Impart Knowledge on ignition of injection wells in case of thermal EORs.
- Impart Knowledge on handling of chemicals like CO2, Surfactants, and Polymers etc.
- Impart Knowledge on injection wells in case of any leakage or blowout situations.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand secondary and tertiary oil recovery methods.
CO2:	Apply gas flooding methods
CO3:	Apply polymer flooding method
CO4:	Apply chemical flooding methods
CO5:	Apply thermal and microbial flooding methods

Syllabus

UNIT-I

Introduction

Different Secondary and tertiary oil recovery techniques. Methods to improve the recovery factor at pore scale and macro scale, Displacement and sweep efficiency.

UNIT-II

Gas Injection

Introduction, Predictive performance, Gas injection in carbonate reservoirs, Inert gas injection, Candidates for gas injection.

Miscible Flooding

Introduction, Sweep efficiency - High pressure gas injection, Enriched gas drive, LPG slug drive; Predictive technique, Field applications.

Carbon Dioxide Flooding

Process description, Field projects, CO2 sources- problem areas, designing a CO2 flood, Guidelines for selection of miscible CO2 projects, Immiscible CO2 flooding conclusions.

UNIT-III

Polymer Flooding

Introduction, Polymer products and theory of use, Planning polymer flood projects.

Polyacrylamides

Introduction, Polyacrylamides chemistry, Application of PAM/AA in enhanced oil recovery, Factors affecting flow in porous media, Field considerations- Site factors, Field operation.

UNIT-IV

Alkaline Flooding

Introduction, Types of caustic used, Entrapment of residue oil, Displacement mechanisms in alkaline flooding, Crude oil properties, Alkali consumption, pH of injected caustic, Effect of sodium ions and sodium chloride, Effect of divalent ions.

Surfactants Flooding

Introduction, Classification of EOR surfactants, Mechanism of oil displacement by surfactant flooding, Ultra low interfacial tension in relation to oil displacement by surfactant flooding, Factors influencing oil recovery, Surfactant gas flooding for oil recovery, Present status of the use of surfactants in oil recovery.

UNIT-V

Steam Flooding for Enhanced Oil Recovery

Introduction, Theory- Screening criteria for steam flood prospects, Reservoir rock and fluid properties, heat losses and formation heating, An overview of steam flood modelling, Parametric studies in steam flooding, Economics of the steam flooding process. Cyclic steam injection - CCS and Steam assisted gravity drainage.

In-situ Combustion Technology

Introduction, Reservoir characteristics, Ignition-Ignition methods, Process In-situ Combustion, Use of In-situ Combustion, Conclusions, Current status of In-situ Combustion.

Microbial Enhanced Oil Recovery

Introduction, screening criteria for potential microbes, production characteristics and economics.

Text Book(s)

1. Applied Enhanced Oil Recovery, Aurel Carcoana, Prentice Hall.
2. Enhanced Oil Recovery, Larry W. Lake, Prentice Hall.

Reference(s)

1. Enhanced Oil Recovery Processes and Operations, E.C. Donaldson, G. V. Chillingarian, T.F. Yew, Elsevier.
2. Basic Concepts in Enhanced Oil Recovery Processes, Marc Baviere, SCI.
3. Enhanced Oil Recovery: Proceedings of the Third European Symposium on Enhanced Oil Recovery, F. John Fayers, Elsevier.
4. Fundamentals of Enhanced Oil Recovery, H. R. Van Pollew and Associates, Penn Well.
5. Enhanced Recovery of Residual and Heavy Oil, M. M. Schumacher, Noyes Data Corp.
6. Recent Advances in Enhanced Oil and Gas Recovery, Istvan Laktos, Academy Kiado.
7. Enhanced Oil Recovery, Don W. Greew, G. Paul Willfite, Society of Petroleum Engineers.
8. Enhanced Oil Recovery: Field Planning and Development Strategies, Vladmir Alvarado, Eduardo Marriglee, Gulf Professional Publishing.

Regulation GRBT-20	Godavari Institute of Engineering &Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT602	**Petroleum Production Engineering**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering-I	3	0	0	3

Course Objectives

The objectives of this course are to

- Learn fundamental concepts in petroleum production engineering.
- Analyze reservoir fluids, efficient flow to the surface without damaging the reservoir dynamics/drive mechanisms.
- Illustrate various surface equipment's for process oil and gas after flow from wells.
- Impart knowledge on sick well identification and remedial stimulation operations.
- Impart knowledge on application of suitable artificial lifts on reservoir energy depletion.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand overview of petroleum production system and properties of oil and natural gas.
CO2:	Determine the well head pressure, down-hole pressure and operating oil/ gas flow rates of the reservoir
CO3:	Analyze well production performance
CO4:	Understand different screens and artificial lifts utilized in reservoir pressure depletions.
CO5:	Identify formation damage and find remedial methods to bring the well back into production.

Syllabus

UNIT-I

Petroleum Production System

Over view of petroleum production system, Production from various types of reservoir based on drive mechanisms, field development method, Safety control system.

Properties of Oil and Natural Gas

Solution Gas-oil ratio, density of oil and gas, viscosity of oil and gas, formation volume factor of oil and gas, oil and gas compressibility, specific gravity of gas and gas pseudo critical pressure and temperature.

UNIT-II

Reservoir Deliverability-Flow regimes - transient, steady state, pseudo steady state IPR for various types of wells. Well bore performance**-**single & multiphase liquid flow in oil wells, single phase & mist flow in gas wells. Choke performance-Sonic & subsonic flow, single & multiphase flow in oil & gas wells; Well deliverability - nodal analysis, Well decline analysis.

UNIT-III

Well Deliverability-Nodal analysis with bottom-hole node, well head node and choke node for oil and gas wells. Forecast of Well Production-Oil and gas production during transient flow period and pseudo transient period. Production Decline Analysis-Exponential, harmonic and hyperbolic decline methods-model identification-determination of model parameters. Safety Protocols and risk analysis-Principles and methods.

UNIT-IV

Artificial Lift Methods

Sucker rod pumping system- Selection of unit and types of unit, Load & power requirements, Performance analysis; electrical submersible pumps: principle, design & operation; Gas lift system: types, evaluation of potential compression requirements, study of flow characteristics, principles of compression, types of compressors, selection of gas lift valves, types of valves, principles of valve operation, setting & testing.

UNIT-V

Production Stimulation

Well problem identification; Matrix acidizing- Design for sandstone & carbonate reservoirs, Hydraulic fracturing – formation fracture pressure, geometry, productivity of fractured wells, hydro-fracture design, selection of fracturing fluid, propant, post frac evaluation.

Text Book(s)

1. Petroleum Production Engineering: A Computer Assisted Approach, BoyunGuo, William C. Lyons, Ali Ghalambor, Elsevier Science & Technology Books.

2. Petroleum Production Systems, M. J. Economides, A. Daniel Hill & C. E. Economides, Prentice Hall.

Reference(s)

1. Production Technology I-II, Institute of Petroleum Engineering, Herriot Watt University.
2. The Technology of Artificial Lift Method, Vol. 1, Brown E., Penn well Books.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT603	**Petroleum Reservoir Engineering-II**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum reservoir engineering-I	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart the knowledge on basics of reservoir engineering and well test.
- Analyze the tests for gas well.
- Analyze the tests for oil well.
- Illustrate the future predictions of reservoir performance.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Carry out the interpretation of Well Test Data.
CO2:	Estimate the reserves of various sands of the reservoir along with water production.
CO3:	Calculate the formation damage and water in flux, accordingly proper stimulation jobs can be recommended.
CO4:	Learn how to acquire the data through well testing in dynamic and closed conditions.
CO5:	Estimate the long term profiles of the reservoirs.

Syllabus

UNIT – I

Oil well testing

The constant terminal rate solution – Transient, semi steady state and steady state flow conditions – Dimensionless variables – General theory of well testing – The Mathews, Brons, Hazebroek pressure build up theory - Pressure build up analysis techniques – Multi Rate Drawdown testing – The effects of partial well completion – After flow analysis.

UNIT– II

Gas Well Testing

Linearization and solution of the basic differential equation for the radial flow of a real gas – The Russel, Goodrich et. al. Solution technique – The Al Hussainy, Ramey Craw-ford solution techniques – Non-Darcy flow – Determination of the non- Darcy coefficient F - The constant terminal rate solution for the flow of a real gas – General theory of gas well testing – Multi rate testing of gas wells.

UNIT– III

Pressure Build up Testing of Gas Wells

Pressure build up analysis in solution gas drive reservoirs Analysis of well tests using type curves- Interference and Pulse Tests - Flow after flow tests in gas wells- Isochronal & modified isochronal tests- Use of pseudo pressure in gas well test analysis Injection Well Testing.

UNIT– IV

Gas and Water Coning

Basic Concepts in Coning, Coning in vertical and Horizontal wells, Critical rate and Breakthrough time calculations from various correlations-After breakthrough time calculations. Natural water influx: The unsteady state water influx theory of Hurst and Van Everdingen and its application in history matching – The approximate water influx theory of Fetkovich for finite aquifers predicting the amount of water influx – Application of influx calculation techniques to steam soaking.

UNIT– V

Immiscible Displacement

Physical assumptions and their implication – The fractional flow equation – Buckley-Leverette one dimensional displacement – Oil recovery calculation – Displacement under segregated flow conditions – Allowance for the effect of finite capillary transition zone in displacement calculations – Displacement in stratified reservoir.

Text Book(s)

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science.
2. Reservoir Engineering Handbook, Tarek Ahmed, Gulf Professional Publishing.
3. B. C. Craft – M. Hawkins, Ronald E. Terry & J. Brandon Rogers, Prentice Hall, New York.

Reference(s)

1. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman Inc.
2. Basic Reservoir Engineering, Rene Cosse, Editions Technip.

3. Petroleum Reservoir Engineering, James W Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill.

Regulation GRBT-20	Godavari Institute of Engineering &Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 20PT661	**Surface Production Operations** (Professional elective-II)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Fluid Mechanics for Petroleum Engineers, drilling and well completion	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on operate and maintain the surface equipment installed in GGS/GCS.
- Impart knowledge on smooth operation of equipment with minimum manpower and handling more crude oil/gas.
- Understand priority to safety operations so that free of even minor accidents.
- Impart knowledge on various Acts of safety and environmental protection.
- Understand modes of transportation types of storage, distribution & Custody transfer.
- Understand pressure maintenance & Reservoir performance monitoring

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Work on the various control systems fitted on the separators/heater-treaters, so that smooth operation of GGS/GCS can be maintained.
CO2:	Do the efficient separation of oil and gas.
CO3:	Figure out the crude oil emulsions produced from various wells and he can treat such crudes to the required oil quality.
CO4:	Maintain the quality of oil, required by the refineries.
CO5:	Perceive the treatment of produced water and disposal of the same as per the norms laidby regulatory authorities

Syllabus

UNIT-I

Production Facilities

Various types of facilities Controlling the process-Basic system configuration design & selection of facilities: Wellhead and manifold- Separation-Initial separation pressure- Stage Separation, Selection of Stages, Process flow sheets, P&IDs, monitoring well performance testing & optimization of flow.

UNIT-II

Two Phase Liquid and Gas Separation

Functional sections of a gas-liquid separator- Inlet diverter section- Liquid collection section- Gravity settling section- Mist extractor section equipment, description of different separators- Scrubbers- Slug catchers- Selection considerations- Vessel internals- Mist extractors- Potential operating problems. Three phase oil, gas and water separation: Equipment description- Horizontal separators. Derivation of equation- Free-water knockout- Flow splitter- Horizontal three-phase separator with a liquid "Boot"-Vertical separator- Selection considerations- Vessel internals- Coalescing plates- Turbulent flow coalesces and potential operating problems.

UNIT-III

Crude Oil Treating

Equipment description of various treaters and heaters- Indirect and fired heaters- Heater sizing- Vertical heater-treaters- Coalescing media- Horizontal heater treaters, Electrostatic heater-treaters- Oil dehydrators-Emulsion treating theory Agitation- Emulsifying agents- Demulsifies- Field optimization- Emulsion treating methods- General considerations Chemical addition- Amount of chemical- Bottle test considerations-hemical selection.

Oil Desalting Systems

Oil desalting systems-Equipment description of desalters- Mixing equipment- Process description- Single stage desalting- Two stage desalting; Monitoring of oil quality.

UNIT-IV

Storage and Transportation Facilities

Storage facilities, measurements custody transfer marketing- transportation modes & dispatch. Gas dehydration compression measurements custody transfer marketing- transportation dispatch. Fire protection systems for tank farm pumping /compressor stations.

UNIT-V

Produced Water Treating Systems

Characteristics of produced water-Sand and other suspended solids- Dissolved gases- Oil in water emulsions- Dissolved oil concentrations- Dispersed oil, Toxicants- Gravity separation- Coalescence- Dispersion- Flotation- Filtration- Equipment description-Retention time and performance

considerations-Design of produced water treating systems. Disposal standards-Disposal methods-Offshore & Onshore operations.

Text Book(s)

1. Surface Production Operations, Ken Arnold & Maurice Stewart, Vol. 1 & 2, 3, Edition, Gulf Professional Publishing.

Reference(s)

1. Petroleum and Gas Field Processing, H.K.Abdel-Aal and Mohamed Aggour and M.A. Fahim, Marcel Dekkar Inc.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 20PT662	**Carbon Dioxide Sequestration** (Professional Elective-II)				
Teaching	Total contact hours - 48	L	T	P	C
Prerequisites	Process thermodynamics	3	0	0	3

Course Objectives

The objectives of this course are to

- Understand importance of Carbon Dioxide Sequestration
- Impart knowledge on technologies for separation of Carbon Dioxide Sequestration from flue gases.
- Identify the suitable reservoirs for Carbon Dioxide Sequestration storage and sequestration
- Modelled the geological storage of Carbon Dioxide Sequestration
- Analyze economic prospects of Carbon Dioxide Sequestration storage from internal/external corrosion of pipe lines by suitable methods.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Analyze need for Carbon Dioxide Sequestration.
CO2:	Analyze Separation Aspects, Design Calculations, and Efficiencies.
CO3:	Apply Geological Screening, Reservoir Characterization.
CO4:	Analyze Production and Injection Aspects, Transportation, Compression, Well design.
CO5:	Analyze the economics of Carbon Dioxide Sequestration operations.

Syllabus

UNIT-I

Carbon Dioxide Sequestration
Background Introduction – Market for the Knowledge in this Course (Global Warming, Improved Oil Recovery, Economics).

Physical and Chemical Properties of Fluids: pure Carbon Dioxide and mixtures Fundamentals of Phase Separation Processes Thermodynamic and Transport Properties.

UNIT-II
Separation Aspects, Design Calculations, Efficiencies
Overview of Power Plants, Gasification and IGCC. Post combustion flue gas separation, Physical Absorption of Carbon Dioxide, Chemical absorption, Membrane Separation.

UNIT-III
Geological Screening, Reservoir Characterization
Storage Options for Carbon Dioxide: Types of geological storage projects. Screening reservoirs for suitability of Carbon Dioxide storage. Potential of CO2 sequestration and storage Geological basins

UNIT-IV
Production and Injection Aspects, Transportation, Compression, Well design
Carbon Dioxide compression and transportation to storage reservoir. Compressor Design and Efficiency. Pipeline Needs, Costs. Production issues. Transportation/Recycling. Well Integrity. Corrosion. Remediation. Scaling Issues.

UNIT-V
Geologic Storage Modelling -Tools and Techniques
Carbon Dioxide Storage Mechanisms and Modelling. Analytical and Numerical Models for Carbon Dioxide Storage Performance Prediction and Uncertainties. EOR Uses, Material Balance Approaches. Performance assessment. Volumes Injected/Recovered – Stored

UNIT-VI
Economics, Regulations
Economic considerations of Carbon Dioxide storage. Regulatory/legal aspects and public policy associated with Carbon Dioxide storage. Summary of key steps involved in developing and implementing a Carbon Dioxide capture and storage project: Carbon Credits/Trading. Health, safety and environmental issues associated with Carbon Dioxide storage

Text Book(s)

1. "Carbon Dioxide Capture and Storage", Intergovernmental Panel on Climate Change, Cambridge University Press.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. ISem (7th Semester)			
Course Code 201PT663	**Reservoir Modeling and Simulation** (Professional Elective-II)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering-I, Petroleum Reservoir Engineering-II	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on build different reservoir simulation models.
- Apply multiphase fluid flow equations in reservoir simulation model.
- Analyze the flow pattern in one, two and three dimensions inside the reservoir.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Learn the basic concepts of reservoir simulation.
CO2:	Understand the integrating of different oil filed data for reservoir simulation.
CO3:	Apply multiphase fluid flow equations to reservoir grid construction.
CO4:	Analyse one, two and three dimensions of multiphase flow in reservoir.
CO5:	Check developed simulation models with history matching technique.

Syllabus

UNIT-I

Introduction to Reservoir Simulation

Introduction, Historical development, Uses and misuses of reservoir simulators, Prerequisites for a simulation study, Major elements of a reservoir simulation study.

UNIT-II

Introduction to Integrated Reservoir Modeling

Use of geophysical, geological, petro physical and engineering data with geostatistical methods to create reservoir description.

UNIT-III

Multiphase Fluid Flow Equations

Parabolic and hyperbolic form; Non-Darcy effects in flow equations; Heat flow equations. Finite difference based discretization in single phase one dimensional Cartesian and radial flow; Grid construction; Irregular grids and variable coefficients; Treatment of non-linearities.Introduction to Black Oil and Compositional Model.

UNIT-IV

Multiphase Flow in One Dimension

Simultaneous Solution method, Implicit Pressure Explicit Saturation method, Sequential Solution method. Solution of tridiagonal, block-tridiagonal and pentadiagonal form of linear equations. Flow of single phase in two dimensions; alternating direction explicit and implicit methods; Method of grid construction. Multiphase flow in two and three dimensions**.** Stream tube and related models; Automatic time step control; Simulation of naturally fractured reservoirs

UNIT-V

History Matching

Inverse modeling, parameterization, objective function formation, calibration and tuning algorithm, Bayesian formulation and uncertainty quantification, optimization algorithms. Introduction to field-scale model, and proprietary simulators.

Text Book(s)

1. K. Aziz, A. Settari, Petroleum Reservoir Simulation. Applied Science Publisher.
2. Shahab D. Mohaghegh, Data-Driven Reservoir Modeling. Society of Petroleum Engineers.
3. James R. Gilman and Chet Ozgen, Reservoir Simulation: History Matching and Forecasting. Society of Petroleum Engineers.

Reference(s)

1. Ertekin, Turgay, Jamal H. Abou-Kassen, and Gregory R. King. Basic AppliedReservoir Simulations. Society of Petroleum Engineers.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT664	**Transport Phenomena** (Professional Elective-II)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Fluid Mechanics for Petroleum Engineers, Process Heat Transfer, Process Thermodynamics	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on physical properties of a fluid and their consequences on fluid flow and heat transfer, expressed in terms of the Reynolds number, Nusselt number, and other dimensionless quantities.
- Understand conservation principles of mass, momentum, and energy
- Develop models of fluid flow and heat transfer systems
- Predict the reservoir behavior in oil field systems.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Analyze flow and transport of fluids
CO2:	Analyze momentum transport of fluids
CO3:	Analyze energy transport
CO4:	Analyze heat transport
CO5:	Analyze mass transport operations

Syllabus

UNIT-I

Laminar Flow

Velocity distribution in Laminar flow - Shell momentum balances - Flow through tubes, surfaces. Flow of non - Newtonian fluids.

UNIT-II

Equation of Motion

Equation of change for isothermal process - One dimensional equation of motion and continuity - Euler and Navier - Stokes equation. Dimensional analysis of equation of change.

UNIT-III

Turbulent Flow

Velocity distribution in turbulent flow - Semi empirical expressions for Reynolds stress. Interphase transport in isothermal system - Ergun's equation.

UNIT-IV

Heat Transfer Analysis

Temperature distribution in solids and fluids in laminar flow - Equations of change for multi component systems.

UNIT-V

Mass Transfer Analysis

Concentration distribution in solids and in fluids laminar flow - Equations of change for multi component systems.

Text Books

1. J.L. Stuart etal., “Transport Phenomena”, John Wiley, New York.
2. B. R. Bird, W. Stewart and E. N. Lightfoot, "Transport Phenomena", Wiley, New York.

Reference(s)

1. C. J. Geankopolis, "Transport Processes in Chemical Operations", Prentice Hall of India, New Delhi.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT665	**Basic Concepts in Petroleum Drilling Engineering** (Open Elective-II)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to
- Understand the different types of drilling.
- Impart knowledge on drilling rig components.
- Illustrate mud circulating system.
- Identify well borehole problems

Course Out comes

On Completion of the course, the students shall be able to-	
CO1:	Understand overview of drilling and rig components
CO2:	Understand selection of drill string and drill bit
CO3:	Understand mud circulation system
CO4:	Understand basics of casing and cementing
CO5:	Understand borehole problems

Syllabus

UNIT-I

Overview of Drilling

Drilling planning approaches, drilling team, types of drilling, power systems.

Hoisting System

Derrick & substructure, steel derricks, making a connection, tripping operation, draw-works.

Travelling Assembly

Crown block, travelling block & hook, drilling line, static crown load.

UNIT-II

Drill String

Drill string, drill string components, and design, stretch of drilling pipe, drill pipe maintenance

Drill Bits

Types of bits, standard classification of bits, failure mechanism of bits, bit selection and evaluation

UNIT-III

Drilling Mud Engineering

Introduction, functions, types of mud, fundamental properties of mud, mud circulation, mud conditioning system

Unit-VI

Casing & Cementing

Casing, functions, types, casing policy, casing design basics, cementing, functions of cement, cement classes, casing accessories, setting casing, single stage and two stage cementing.

Unit-V

Borehole Problems

Introduction, pipe sticking, differential sticking, mechanical sticking, and key seating; sloughing shale, lost circulation zones.

Text Book(s)

1. Neal Adams and Tommie Charrier, "Drilling Engineering: A Complete Well Planning Approach" PennWell Pub. Co., (1985).
2. Formulas and Calculation for Drilling, Production and workover, Norton J. Lapeyrouse, 2nd Edition, Gulf Publishing, (2002).

Reference(s)

1. Heriot Watt, "Drilling Engineering Handbook".
2. Economides, M. J., "Petroleum Well Construction" John Wiley & Sons, (1998).
3. Drilling Engineering- A complete Well Planning Approach, Neal J. Adams
4. Drilling Operation Practices Manual, IDT, ONGC

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. IISem (6th Semester)			
Course Code 201PT611	**Petroleum Equipment Design Simulation Laboratory**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Computational Methods Laboratory	0	0	3	1.5

Course Objectives

The objectives of this course are to

- Impart basics for design and simulation of various equipment used in petroleum industry.
- Design of different type of separators.
- Design of petroleum process facilities.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Design and simulation of the two-phase and three phase separators
CO2:	Design and simulation of compressors.
CO3:	Design and simulation of flash vaporization units
CO4:	Size /rate the pipeline & pumping systems for liquid pumping & simulate water hammer conditions
CO5:	Generate sized equipment data sheets as per the industry standards with required information for detailed design / manufacture

List of Experiments

The following numerical experiments have to be simulated using C/C++/Simulink using MATLAB/UNISIM for design and simulation:

1. Oil- Water separator.
2. Gas- Oil-Water separator.
3. Lean / rich amine heat exchanger.
4. Air cooled heat exchanger.
5. CO2 and H2S absorber unit using, MEA/DEA amine solution.
6. Stripping unit.
7. Single stage flash vaporization unit.
8. Three stage flash vaporization unit.
9. Liquid pumping system & simulation of water-hammer phenomena.
10. Gas Compressor unit.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. IISem (6th Semester)			
Course Code 201PT612	**Petroleum Reservoir Simulation Laboratory**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Computational Methods Laboratory	0	0	3	1.5

Course Objectives

The objectives of this course are to

- Simulate the exploitation of a real reservoir without the costs of real life trial and error, e.g. to test different production scenarios to find an optimal one before the reservoir is actually put on production.
- Develop reservoir simulation models for new reservoirs to maximize recovery of oil and gas and to make investment decisions.
- Develop reservoir simulation models for existing reservoirs to study production decline and production forecasts.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Explain reservoir simulation fundamentals- the underlying equations and the numerical techniques used to solve them.
CO2:	Design a reservoir simulation model, construct the data set, execute the simulator, and view simulation results visually using post-processing software.
CO3:	Plan and conduct the calibration of a reservoir simulation model.
CO4:	Apply reservoir simulation technology to solve production and reservoir engineering problems in individual wells or patterns.
CO5:	Apply reservoir simulation technology to solve production and reservoir engineering problems in entire fields or reservoirs.

Reservoir Simulation Experiments

The students will be trained in the software Package ECLIPSE, or any other equivalent software to model and solve reservoir engineering problems.

1. File organization and structure
2. Selection of suitable by grid sensitivity studies.
3. Screening Criteria
   i. Fluid properties
   ii. Rock properties
4. Well Pattern and Boundary Conditions
5. Aquifer modeling (single and multiphase fluid flow: Oil-Water/Oil-Water-Gas)
6. History matching consisting of adjusting the parameters of the model such as permeability and porosity until the computed results for the historical period are close to historical data
7. Prediction of properties permeability, relative permeability, saturation etc.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. IISem (6th Semester)			
Course Code 201PT613	**Computer Aided Drafting**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Computational Methods Laboratory	0	0	3	1.5

Course Objectives

The objectives of this course are to

- Design and create accurate digital prototypes for a wide variety of oil and gas equipment
- Create blueprints, equipment layouts, section planes, model documentation.
- Create 2D (two-dimensional) and 3D (three- dimensional) technical drawings for visualization and technical documentation in petroleum industry.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Explain computer aided drafting, its practice and standards in drawing.
CO2:	Summarize draw and modify tools used in drafting software like AutoCAD.
CO3:	Construct 2D drawings in AutoCAD and add dimension.
CO4:	Construct 2D drawings using Parametric constraints and plot.
CO5:	Demonstrate the use of layers in AutoCAD in 2D drawings.
CO6:	Develop views like isometric views used in engineering documentation.
CO7:	Construct the drilling rig, group gathering station layouts.
CO8:	Construct schematics of equipment like oil and gas separator.

Syllabus

1. **Computer aided drafting:** Introduction to computer aided drafting, Benefits of computer aided drafting, Standards in drawing, Drawing sheets.
2. **Introduction to AutoCAD software:** Units, draw tools, modify tools, snap tools.
3. **Dimensioning and text:** Adding dimensions and text, managing dimensioning styles, text styles, adding leaders, creating tables and bill of materials.
4. **Parametric constraints and plotting**: Adding parametric constraints and plotting.
5. **Layers:** Benefits, Layer properties.
6. **Block and Groups:** Inserting blocks and creating groups
7. **Layouts:** Layouts creation, Viewports and advanced tools.

8. **Isometric drawings**: Snap settings, Drawing isometric views and Isometric dimensioning.
9. **Drilling rig**: Introduction, facilities, layout.
10. **Surface production facilities at group gathering station:** Introduction, facilities, Layout of group gathering station.
11. **Oil and gas separator**: Introduction, applications, schematic of gas and oil separator.

Reference(s)

1. Introduction to AutoCAD 2020: A Modern Perspective, Paul Richard, Pearson Higher Education & Professional Group.
2. AutoCAD 2011 Tutor for Engineering Graphics by Alan Kalameja – DELMAR Cengage Learning.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B.Tech. IISem (6th Semester)			
Course Code 201PT681	**Applications of ML in Petroleum Engineering**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Programming with Python	1	0	2	0

Course objectives

The objectives of this course are to

- Impart knowledge on overview of the principles and practices of AI to address such complex real-world problems.
- Understand basic understanding of problem solving, knowledge representation, reasoning and learning methods of AI
- Understand AI through machine learning for petroleum industry applications such as exploration, drilling, production and reservoir engineering.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand AI and Problem Solving by Search.
CO2:	Understand Knowledge Representation and Reasoning.
CO3:	Understand Planning and Decision Making.
CO4:	Understand Machine Learning methods.
CO5:	Able to apply AI and ML methods in Petroleum industry.

Syllabus

UNIT-I

AI and Problem Solving by Search

Introduction to Artificial Intelligence, Problem Solving as State Space Search, Uninformed Search.

Problem Solving by search

Heuristic Search, Informed Search, Constraint Satisfaction, Searching AND/OR Graphs, Game Playing, Minimax + Alpha-Beta Problems

UNIT-II

Knowledge Representation and Reasoning

Introduction to Knowledge Representation, Propositional Logic, First Order Logic –I, First Order Logic –II, Inference in First Order Logic –I, Inference in FOL – II, Answer Extraction, Procedural Control of Reasoning

Reasoning under uncertainty

Reasoning under Uncertainty, Bayesian Network, and Decision Network.

UNIT-III

Planning

Introduction to Planning, Plan Space Planning, Planning Graph and GraphPlan, Practical Planning and Acting, Sequential Decision Problems, Making Complex Decisions

Decision Making

Practical Planning and Acting, Sequential Decision Problems, Making Complex Decisions.

UNIT-IV

Machine Learning

Introduction to Machine Learning, Learning Decision Trees,Linear Regression, Support Vector Machines, Unsupervised Learning, Reinforcement Learning, Learning in Neural Networks

Deep Learning: A Brief Overview.

UNIT-V

Applications of oil and gas

Rate of penetration in directional well drilling, estimate the rock uniaxial strength properties, interpretation of real well logging data, forecast of oil production and production optimization.

Text Book (s)

1. Hoss Belyadi , Alireza Haghighat, Machine Learning Guide for Oil and Gas using Python, A Step-by-Step Breakdown with Data, Algorithms, Codes, and Applications, Gulf Professional Publishing is an imprint of Elsevier.
2. Patrick Henry Winston, Artificial Intelligence, Third Edition, Addison-Wesley Publishing Company.
3. Nils J Nilsson, Principles of Artificial Intelligence, Illustrated Reprint Edition, Springer Heidelberg.

Reference(s)

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition, PHI.
2. Nils J. Nilsson, Quest for Artificial Intelligence, First Edition, Cambridge University Press.

ulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code	**Quantitative Aptitude and Reasoning**				
Teaching	Total contact hours-	L	T	P	C
Prerequisites		2	0	0	0

Syllabus for Minor courses

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. I Sem. (5th Semester)			
Course Code 201PT604	**Principles of Petroleum Reservoir Engineering**				
Teaching	Total contact hours- 48	L	T	P	C
Prerequisites	Petroleum geology, Fluid Mechanics for Petroleum Engineers, Process Thermodynamics	4	0	0	4

Course Objectives

The objectives of this course are to

- Impart knowledge on basic concepts in reservoir engineering
- Analyze PVT behavior of oil & gas reservoirs
- Apply material balance concepts to oil & gas reservoirs.
- Utilize Darcy's law in oil and gas reservoirs.
- Estimate well inflow for stabilized conditions.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand basics of reservoir engineering and perform reservoir volume calculations.
CO2:	Perform basic PVT analysis of the specific reservoir of various sands.
CO3:	Carry out the calculations in material balance and estimate the reserves of various
CO4:	Test the Darcy's law in single or multiple reservoir.
CO5:	Calculate the formation damage and can recommend suitable stimulation operations

Syllabus

UNIT –I

Basic Concepts in Reservoir Engineering

Calculation of hydrocarbon volumes- Fluid pressure regimes- Oil recovery and recovery factor- Volumetric gas reservoir engineering – Application of the real gas equation of state - Gas material balance and recovery factor- Hydrocarbon phase behavior.

UNIT- II

PVT Analysis for Oil

Definition of the basic PVT parameters – Collection of fluid samples - Determination of the basic parameters in the laboratory and conversion for field operating conditions - Alternative manner of expressing PVT lab analysis results - Complete PVT analysis.

UNIT-III

Material Balance Applied to Oil Reservoirs

General form -The material balance expressed as a linear equation- Reservoir drive mechanism- Solution gas drive- Gas cap drive- Natural water drive compaction drive under related pore compressibility phenomena.

UNIT-IV

Darcy's Law and Applications

Darcy's law and field potential- Sign convention- Units and units conversion- Real gas potential – Datum pressures- Radial steady state flow and well stimulation- Two phase flow- Effective and relative permeabilities.

UNIT-V

Radial Diffusivity Equation

The basic differential equation for radial flow in a porous medium Derivation of the basic radial differential equation – Conditions of solution – The linearization of the equation for slightly compressible fluids.

Well Inflow Estimation for Stabilized Flow Conditions

Semi steady state solution – Steady state solution – Example of the application of the stabilized inflow equations – Generalized form of inflow equation under semi steady state conditions.

Text Book(s)

1. Fundamentals of Reservoir Engineering, L.P. Dake, Elsevier Science

2. Applied Petroleum Reservoir Engineering, B. C. Craft – M. Hawkins, Third Edition, Revised by Ronald E. Terry & J. Brandon Rogers, Prentice Hall, New York.

Reference(s)

1. Reservoir Engineering Handbook, Tarek Ahmed, 3rd Edition, Gulf Professional Publishing,.
2. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman Inc.
3. Basic Reservoir Engineering, Rene Cosse, Editions Technip.
4. Petroleum Reservoir Engineering, James W. Amyx, Daniel M. Bass Jr., Robert L. Whiting, McGraw Hill.
5. Practical Reservoir Engineering and Characterization, Baker, R – Harvey W. Y and Jensen, J. L. Elsevier, GPP.

Regulation GRBT-20	Godavari Institute of Engineering &Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT605	**Principles of Petroleum Production Engineering**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum reservoir engineering	4	0	0	4

Course Objectives

The objectives of this course are to

- Learn fundamental concepts in petroleum production engineering.
- Analyze reservoir fluids, efficient flow to the surface without damaging the reservoir dynamics/drive mechanisms.
- Illustrate various surface equipment's for process oil and gas after flow from wells.
- Impart knowledge on sick well identification and remedial stimulation operations.
- Impart knowledge on application of suitable artificial lifts on reservoir energy depletion.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand overview of petroleum production system and properties of oil and natural gas.
CO2:	Determine the well head pressure, down-hole pressure and operating oil/ gas flow rates of the reservoir
CO3:	Analyze well production performance
CO4:	Understand different screens and artificial lifts utilized in reservoir pressure depletions.
CO5:	Identify formation damage and find remedial methods to bring the well back into production.

Syllabus

UNIT-I

Petroleum Production System

Over view of petroleum production system, Production from various types of reservoir based on drive mechanisms, field development method, Safety control system.

Properties of Oil and Natural Gas

Solution Gas-oil ratio, density of oil and gas, viscosity of oil and gas, formation volume factor of oil and gas, oil and gas compressibility, specific gravity of gas and gas pseudo critical pressure and temperature.

UNIT-II

Reservoir Deliverability

Flow regimes - transient, steady state, pseudo steady state IPR for various types of wells.
Well bore performance – single & multiphase liquid flow in oil wells, single phase & mist flow in gas wells.

UNIT-III

Choke Performance

Sonic & subsonic flow, single & multiphase flow in oil & gas wells; Well deliverability - nodal analysis, Well decline analysis.

UNIT-IV

Artificial Lift Methods

Sucker rod pumping system-Selection of unit and types of unit, Load & power requirements, Performance analysis; electrical submersible pumps: principle, design & operation;
Gas lift system-Types, evaluation of potential compression requirements, study of flow characteristics, principles of compression, types of compressors, selection of gas lift valves, types of valves, principles of valve operation, setting & testing.

UNIT-V

Production Stimulation

Well problem identification; Matrix acidizing- Design for sandstone & carbonate reservoirs, Hydraulic fracturing – formation fracture pressure, geometry, productivity of fractured wells, hydro-fracture design, selection of fracturing fluid, propant, post frac evaluation.

Text Book(s)

1. Petroleum Production Engineering: A Computer Assisted Approach, BoyunGuo, William C. Lyons, Ali Ghalambor, Elsevier Science & Technology Books.
2. Petroleum Production Systems, M. J. Economides, A. Daniel Hill & C. E. Economides, Prentice Hall.

Reference(s)

1. Production Technology I-II, Institute of Petroleum Engineering, Herriot Watt University.
2. The Technology of Artificial Lift Method, Vol. 1, Brown E., Penn well Books.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. ISem (7th Semester)			
Course Code 201PT761	**Subsea Engineering** (Professional Elective-III)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Drilling & Well completion	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on flow assurance calculations and size the piping & distribution system.
- Understand deliver the equipment & system design required for a given subsea project requirement.
- Understand reliability issues such as hydrate, wax formation, corrosion etc. during design.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand the subsea development operations.
CO2:	Learn the process control and power supply consideration to subsea system.
CO3:	Learn the hydraulic / equipment / system design considerations.
CO4:	Understand the reliability issues involving subsea flow line system.
CO5:	Understand design challenges involving subsea systems.

Syllabus

UNIT-I

Overall View of Subsea Engineering

Introduction – Subsea production systems – Flow Assurance& System engineering – Subsea structures & Equipment – Subsea pipelines.

Subsea Field Development

Subsea field development overview – Deep water or Shallow-Water development – Wet Tree & Drain tree systems – Subsea Tie-back development – Stand-Alone development – Artificial lift methods and Constraints – Subsea processing – Template, Clustered Well Systems & Daisy chain – Subsea field development assessment.

UNIT-II

Subsea Distribution System-Introduction – Design Parameters – SDS component design requirements. Subsea Control: Introduction – Types of control systems – Topside equipment – SCMMB – SCM –Subsea transducers & Sensors – HIPPS – SPCS – IWOCS. Subsea Power Supply-Introduction – Electrical power system – Hydraulic power system.

UNIT-III

Installation & Vessels- Introduction – Typical installation vessels – Vessel requirements &selection– Installation – positioning & Analysis. Subsea System Engineering: Introduction – Typical flow assurance process – System design &Operability.

Hydraulics

Introduction – Composition & Properties of hydrocarbon – Emulsion – Phasebehaviour– Hydrocarbon flow – Slugging & Liquid handling – Slug catcher design – Pressure surge – Linesizing.

UNIT-IV

Wax & Asphaltenes

Introduction – Wax – Wax management – Wax remediation – Asphaltenes –Asphaltenes control design philosophies.

Hydrates

Introduction – Physics & Phase behaviour – Hydrate prevention – Hydrate remediation –Hydrate control design philosophies – Recovery of thermodynamic hydrate inhibitors.

UNIT-V

Heat Transfer & Thermal Insulation

Introduction – Heat transfer fundamentals – U value –Steady state heat transfer – Transient heat transfer – Thermal management strategy & Insulation.

Subsea Corrosion & Scale

Introduction – Pipeline internal corrosion – Pipeline external corrosion– Scales – Overview of Erosion & Sand management.

Text Book(s)

1. Subsea Engineering Handbook, Yong Bai&QiangBai, Gulf Professional Publishing, New York.
2. Offshore Drilling and Completions Training Manual, Drill – Quip, Inc.

Reference(s)

1. Manual on Subsea Technology, IOGPT, ONGC.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. Isem (7th Semester)			
Course Code 201PT762	**Advances in Well Control** (Professional Elective-III)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Drilling & well completion	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on basics of Well control and Pressure Control theory.
- Understand concept of Kick and Well Control techniques.
- Illustrate detailed description of Well Control Equipment.
- Understand Well Control during Work over operations.
- Illustrate detailed Description on Subsea Well control and Intervention Operations.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand the basic well Control concept during drilling.
CO2:	Understand different methods of well control.
CO3:	Understand importance of Well Control equipment and maintenance.
CO4:	Understand barriers and Use of Well Control Equipment during Workover Operations
CO5:	Understand the Subsea Control system and Subsea Intervention.

Syllabus

UNIT-I

Basics of Well control

Pore pressure – Overburden and Effective Stress Concepts- Conventional Pressure-Prediction Concepts-Pressure Control theory - Swab and Surge Pressure, Abnormal Pressure-Formation Integrity tests – Fracture gradient determination -ECD -MAASP

UNIT-II

Kick Detection and Well Control Methods

Causes of Kick- Detection and Containment-Shut inpressure analysis –Increasing mud Density, Primary, Secondary and tertiary well control - Barriers,Well killing procedures - Drillers method – Wait and weight method – Volumetric method – Bullheading – Kill sheet calculations.

UNIT-III

Well Control Equipment

Safety valves –SSSV - FOSV-IBOP, Surface BOPEquipment- LowPressure and High pressure equipment, Special kick problems.

Fishing Operations

Requirement for fishing and procedures for various fishing problems,Proceduresto free the pipes.

UNIT-IV

Well Control during Completion and Work over Operations

Completion and work over Fluids characteristics –Well control Surface Equipment – Well Control barriers and Integrity Envelopes, Well control during Work over - Coil Tubing – Slick-line / wire line - Stimulation Operations.

UNIT-V

Subsea Well Control System

Subsea BOP – LMRP, Risers, Well Control in deep water drilling and Completion, Subsea test tree, Subsea Tree, Subsea Intervention – Riserless Operations.

Text Book(s)

1. Well Engineering and construction, Hussain Rabia, Entrac Petroleum.
2. Advanced Well control , David Watson, Terry Brittenham and Preston L Mooore, SPE Text Book Series.
3. Well Control for completions and Interventions, Howard Crompton, Gulf Professional Publishing, First Edition.

Reference(s)

1. Drilling Enginering, Heriott –Watt University.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	III B. Tech. II Sem.(6th Semester)			
Course Code 201PT763	**HSE in petroleum industry** (Professional Elective-III)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Knowledge of well operations	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on environment issues and all related Acts.
- Impart knowledge on drilling fluids and its toxic effects with environment.
- Understand proper disposal of drilling cutting after appropriate treatment.
- Understand treatment of produced water and makeup water and its disposal as per state pollution control board norms.
- Impart knowledge on oil mines regulations and proper implementation in drilling & production mines as per Act.
- Impart knowledge on HAZOP in drilling rigs & production installations.
- Impart knowledge on disaster management to fight any fire accident at drilling rig/ production installation/production platform.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand acts related to safety, Health and environment in petroleum industry.
CO2:	Understand safe handling of drilling fluids and its disposal such toxic products.
CO3:	Understand oil mines regulations and safety of well operations.
CO4:	Understand mitigation of occupational health hazards in the industry.
CO5:	Apply HAZOP to petroleum equipment operation and assess risk involved.

Syllabus

UNIT-I

Environmental Control

Introduction to environmental control in the petroleum industry, Overview of environmental issues- A new attitude- Air emissions.

Drilling and production operations

Drilling- production.

UNIT-II

The Impact of Drilling And Production Operations

Measuring toxicity- Hydrocarbons- Salt- Heavy metals- Production chemicals- Drilling fluids- Produced water- Nuclear radiation- Air pollution-Acoustic impacts- Effects of offshore platforms- Risk assessment.

Environmental Transport of Petroleum Wastes

Surface paths- subsurface paths- atmospheric paths, planning for environmental protection.

Waste Treatment Methods

Treatment of water- treatment of solids- treatment of air emissions-waste water disposal: surface disposal.

UNIT-III

Oil Mines Regulations

Introduction-Returns, Notices and plans- Inspector, management and duties, Drilling and workover- Production- Transport by pipelines- protection against gases and fires- machinery, plants and equipment- general safety provisions- miscellaneous-remediation of contaminated sites-site assessment-remediation process.

UNIT-IV

Toxicology and Skin Effects

Toxicity, physiological, asphyxiation, respiratory, skin effect of petroleum hydrocarbons and their mixtures - Sour gases with their threshold limits- toxicity of additives for acidizing and hydro fracturing.

UNIT-V

Risk Assessment in Petroleum Industry

Hazard identification- Hazard evaluation- HAZOP and what if reviews- Developing a safe process and safety management- Personal protection systems and measures.

Classification of fires- The fire triangle- Distinction between fires and explosions- Flammability characteristics of liquids and vapors- Well blowout fires and their control- Fire fight equipment.

Text Book(s)

1. Environmental Control in Petroleum Engineering, John C. Reis, Gulf Publishing Company.
2. Application of HAZOP and What if Reviews to the Petroleum, Petrochemical and Chemical Process Industries, Dennis P. Nolan, Noyes Publications.
3. Oil Industry Safety Directorate (OISD) Guidelines, Ministry of Petroleum & Natural Gas, Government of India and Oil Mines Regulations-1984, Directorate General of Mines Safety, Ministry of Labor and Employment, Government of India.

Reference(s)

1. Guidelines for Process Safety Fundamentals in General Plant Operations Centre for Chemical Process Safety, American Institute of Chemical Engineers.
2. Guidelines for Fire Protection in Chemical, Petrochemical and Hydrocarbon Processing Facilities, Centre for Chemical Process Safety, American Institute of Chemical Engineers,.
3. Guidelines for Hazard Evaluation Procedures Centre for Chemical Safety, Wiley- AIChE, 3rdEdition.
4. Guideline for Process Safety Fundamentals in General Plant Operations, Centre for Chemical Process Safety, AIChE.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB. Tech. I Sem. (7th Semester)			
Course Code 201PT764	**Coal Bed Methane Engineering (Professional Elective-III)**				
Teaching	Totalcontacthours-48	L	T	P	C
Prerequisites	Process thermodynamics	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on overview of scenario of Coal Bed Methane.
- Impart knowledge on the geology of coal.
- Understand basic principles of sorption and isotherms.
- Analyze reservoir characterizes of CBM.
- Impart knowledge on basic idea of completions and driving of CBM reservoirs.
- Understand the hydrofrac job for coal seams.
- Learn in dealing with water from production and disposal.

Course Outcomes

On Completion of the course, the students will be able to-	
CO1:	Understand the fundamentals of coal bed methane.
CO2:	Construct different isotherms of CBM.
CO3:	Evaluate different logs for CBM reservoirs and understand reservoir drilling.
CO4:	Understand completions, and production and Design of CBM.
CO5:	Illustrate water disposal techniques and environmental laws.

Syllabus

UNIT-I

Introduction

Overview of coal bed methane (CBM) in India – CBM vs Conventional Reservoirs.Geological influences on cleat formation of coals – Coal chemistry – Significance of rank– Cleat system and natural fracturing.

UNIT-II

Sorption

Principles of Adsorption-The Isotherm construction-CH4 retention by coal seams-CH4 content determination in coal seams-The isotherm for recovery-prediction-Model of the micropores-coal sorption of other molecular species.

Reservoir Analysis

Coal as a reservoir**-** Permeability**,** Porosity-Gas flow-Reserve analysis-Well spacing and drainage area-Enhanced recovery.

UNIT-III

Well Construction

Drilling-Cementing. Formation Evaluations, Logging: Borehole environment -Tool measurement response in coal-wire line log evaluation of CBM wells –Gas In-Place calculations-Recovery factor - Drainage area calculations - Coal permeability/Cleating-Natural fracturing and stress orientation**-** Mechanical rock properties in CBM evaluation.

UNIT – IV

Completions

Open hole completions -Open hole cavitation process, Cased hole completions- Multizone entry in cased hole.

UNIT-V

Hydraulic Fracturing of Coal Seams

Need for fracturing coals - Unique problems in fracturing coals- Types of fracturing fluids for coal- In situ conditions - Visual observation of fractures.

Water Production and Disposal

Water production rates from methane wells - Chemical content - Environmental regulations - Water disposal techniques - Economics of coal bed methane recovery - Application of CO2 sequestration.

Text Book(s)

1. Fundamentals of Coal Bed Methane Reservoir Engineering, John Seidle, Pennwell Corp.
2. Coal Bed Methane: Principles and Practice, R. E. Rogers, 3rd Edition, Prentice Hall.
3. Coal Bed Methane, Robert A. Lamarre, American Association of Petroleum Geologists.

Reference(s)

1. Coal Bed Methane, Society of Petroleum.
2. A Guide to Coal Bed Methane Operations, B. A. Hollub, Society of Petroleum.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT765	**Advanced Well Completion Engineering** (Professional Elective-IV)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Drilling & Well Completion	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on basics of reservoir engineering and well completion operations.
- Understand concept of sand controls preventions and techniques.
- Understand factors affecting well completion and design selection.
- Impart knowledge on the well completion equipment.
- Learn fundamental of well completion techniques and installation system.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand basic idea about reservoir engineering and well completion.
CO2:	Understand the well completion life.
CO3:	Analyze complete design of well completion.
CO4:	Understand use of well completion techniques.
CO5:	Understand types of installation in onshore and offshore areas.

Syllabus

UNIT-I

Basics of Well Reservoir Engineering in Well Completion

IPR, perforation, well stimulation techniques including fracturing. Sand controls- introduction- rock strength analysis- sand control prediction and mitigation techniques including installation of screens, gavel pack job-sand consolidation methods

UNIT-II

Well Completion Life

Introduction- types of well completion- factors affecting well completion-TPR- flow through tubing, well completion fluid properties and production and injection tubing sizing analysis.

UNIT-III

Material Selection And Stress Analysis

Selection of control lines for Injection of corrosion inhibitors, scale inhibitors and use of other seals. Load and stress analysis of tubing including burst pressure, collapse, axial load calculation and some design factors.

UNIT-IV

Well Completion Equipment

Introduction- types of completion equipment- surface and subsurface equipment. Rating of SSSV, packer, landing nipple locks and sling sleeve and side pocket mandrel selection. Selection of control lines and subsea isolation valve.

UNIT-V

Well Completion Installation System

Introduction-onshore and subsea well completion installation system. Well bore clean-up operations-well fluid displacement. Filtration prior to well flow**.**

Text Book(s)

1. Advanced Well Completion Engineering, Wan Renpu, Gulf Professional Publishing.
2. Well Completion Design, Jonathan Bellar by, Elsevier.

Reference(s)

1. Well Completion and Servicing, D. Perrin, Micheal Caron, Georges Gaillot, Editions Technip.
2. Primer of Well Service, Workover and Completion, Petroleum Extension Service (PETEX), University of Texas at Austin.
3. Petroleum Engineering: Principles and Practice, J.S Archer & C.G. Wall, Graham &Trotman,Inc.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT766	**Oil & Gas Processing Plant Design** (Professional Elective-IV)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Surface Production Operations	3	0	0	3

Course Objectives

The objectives of this course are to

- Learn the design of all types of separators, pumps &compressors, heat exchangers, oil treaters, desalters, gas treating systems, different types of valves and flaring systems
- Impart Knowledge on material of construction and mechanical design of the petroleum equipment.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Design of all types of separators
CO2:	Design of pumps & compressors
CO3:	Design of heat exchangers.
CO4:	Design of oil-treaters and desalters
CO5:	Design of gas treating systems. Specify the material of construction and Carry out the mechanical design for the petroleum equipment

Syllabus

UNIT-I

Design Principles and Sizing Of Gas-Oil Separators

Principles of phase separators**-** Sizing of vertical & horizontal two-phase and three phase separators- Optimum pressure - Design of single and multistage flash vaporization equipment- Materials of construction and mechanical design of separators.

UNIT-II

Fluid Flow Equipment Design

Basic concepts of fluid handling equipment & design-Pumps Compressors - Blowers.

UNIT-III

Design of Principles and Sizing of Heat Exchangers

Process design of Shell &Tube heat exchangers -Double pipe heat exchangers- Plate and frame heat exchangers- Air cooled heat exchangers- Heat recovery units- Fired heaters- Materials of construction & mechanical design of heat exchangers.

UNIT-IV

Design Principles and Sizing Crude Oil Treaters

Sizing horizontal and vertical treaters- Design of LTX units and line treaters- Material of construction and mechanical design.

Design of Principles and Sizing of Crude Desalting Equipment

Design principles and sizing of equipment for produce water treatment and disposal.

UNIT-V

Design principles and sizing of acid gas treating system design: Design of iron sponge units - Design of H_2S and CO_2 absorbers and strippers using amine solutions – Design of rich/lean amine exchanger- Design of amine cooler- Material of construction- Mechanical design. Process design of glycol and solid bed dehydration systems-Materials of construction & mechanical design.

Text Book(s)

1. Petroleum and Gas Field Processing, H.K. Abdel- Aal, Mohamed Aggover, M.A. Fahim, Marcel Dekkar Inc.
2. Surface Production Operations, Ken Arnold, Maurice Stewart, Butterworth Heinemann, Vol 1 & 2.

Reference(s)

1. Engineering Data Book, 12th Edition (Electronic), FPS Version, Volume I & II, Gas Processers Suppliers Association (GPSA).

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT767	**Natural Gas Engineering** (Professional Elective-IV)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering-I, Fundamentals of Liquefied Natural Gas.	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on natural gas composition and its properties.
- Identify production technologies for production of natural gas from the reservoir.
- Impart knowledge on processing, transport and storage of natural gas.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand global scenario and importance of natural gas industry
CO2:	Understand the produced gas properties and unconventional gas technologies
CO3:	Understand the principles, mechanism of gas compressors
CO4:	Understand the natural gas processing operations
CO5:	Understand the metering and storage operations

Syllabus

UNIT-I

Introduction

Composition of Natural Gas, Utilization of Natural Gas, Natural Gas Industry, Natural Gas Reserves, Types of Natural Gas Resources, Future of the Natural Gas Industry.

UNIT-II

Properties of Natural Gas-Physical properties of natural gas and hydrocarbon liquids associated with natural gas. Unconventional gas**-**Coal Bed Methane, Natural Gas Hydrate, Basin Centered Gas,

Tight Gas Sands, Shale Gas. Production of Natural Gas - Overview of well Completion and wellbore Performance.

UNIT-III

Gas Compression

Types of Compressors, Selection, Thermodynamics of Compressors, Compression calculations. Heat and mass transfer principles in Natural Gas Engineering and application of Mollier Diagrams.

UNIT-IV

Gas Flow Measurement

Process control and instrumentation in natural gas processing plants.

Natural Gas Processing

Field separation and oil absorption process, Refrigeration and low Temperature processing, Liquefaction Process, Dehydration of Natural Gas, Sweetening of Natural gas and Sulphur recovery. Processing principle of LPG, CNG systems, Conversion of gas to liquid - LNG: Production and Utilization; Issue and Challenges to Enhance Supply of Natural Gas.

UNIT-V

Gas Gathering, Transport and Storage

Gas Gathering System. Steady Flow in Simple Pipeline System, Steady State and unsteady State Flow in Pipelines, Solution for Transient Flow. transmission of natural gas specifications, underground storage and Conservation of Natural Gas.

Text Book(s)

1. Arthur J. Kidnay, William R. Parrish, Taylor and Francis, “Fundamental of Natural Gas Processing”.
2. James G. Speight, “Natural Gas: A Basic Handbook”, Gulf Publishing Company.

Reference(s)

1. Thomas O. Miesner, William L. Leffler “Oil & Gas Pipelines in Nontechnical Language.” Penn Well Corp.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT768	**Geothermal Reservoir Engineering** (Professional Elective-IV)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering-I	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on basic concepts of geothermal reservoir models.
- Illustrate down hole measurements, production testing and operations of geothermal reservoirs in oil and gas field

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Analyze the mechanism of geothermal reservoir
CO2:	Analyze the down hole measurements of geothermal reservoir
CO3:	Analyze the production operations and testing of geothermal reservoir
CO4:	Analyze the filed management of geothermal reservoir
CO5:	Analyze the well stimulation of geothermal reservoir

Syllabus

UNIT-I

Geothermal Systems

Conductive Systems, Convective Systems: Liquid and Vapor Dominated Quantitative Models: Concepts of Storage, Pressure Transient Models, Lumped-Parameter Models, Steam Reservoir with Immobile Water, Reserves, Fracture Media, Chemical Flow Models, Applicability of the Models

UNIT-II

Down hole Measurement

Geothermal Well Design, Temperature-Pressure Instruments, down hole Flow Measurements, Sources of Error in down hole Measurements, Designing a down hole Measurement Program, Spinner Measurements

Interpretation of Down hole Measurements: Well Testing Program, Well Models, Well Profiles, Gas Pressure at Wellhead, Unusual or Misleading Well Profiles.

Measurements during Drilling

Pressure, Significance of Drilling Losses, Temperature, Stage Testing, The Drilling of Sample well

UNIT-III

Well Completion and Heating: Quantifying Reservoir Parameters, Wellbore Heat Transfer, Injection Performance, Vapor-Dominated Systems

Production Testing Methods: Single-Phase Fluid, Two-Phase Flow Measurement Methods, Cycling Wells, Accuracy of Flow Measurements, Well Performance

Conceptual Modelling and Simple Inferences: Mapping the Reservoir, Temperature Profiles, Pressure, Exploited Fields

UNIT-IV

Field Management

Decline and Lumped Parameter Models, Deviations from Trend, Tracer Testing, Surface Effects, Subsidence, Injection Management

UNIT-V

Well Stimulation and Engineered Geothermal System

Fracturing Rock, Thermal Stimulation, Acid Stimulation, Stimulating Existing Reservoirs: Deep Sedimentary Aquifers, EGS: Creating a Reservoir

Text Book(s)

1. William E. Glassley."Geothermal Energy-Renewable Energy and the Environment". Energy and the Environment, Abbas G. Series, CRC Press.
2. David R. Boden. "Geologic Fundamentals of Geothermal Energy." CRC Press.

Reference(s)

1. Lev Eppelbaum, Izzy Kutasov, ArkadyPilchin. "Applied Geothermics (Lecture Notes in Earth System Sciences)"
2. Böttcher, N., Watanabe, N., Görke, U.-J., Kolditz, O. "Geoenergy Modelling I: Geothermal Processes in Fractured Porous Media." Springer.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT769	**Horizontal Well Technology** (Professional Elective-V)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Understand the basics of horizontal wells and its reservoir properties.
- Impart knowledge on different types of horizontal wells.
- Identify horizontal and vertical fractured wells.
- Understand the testing and flow performance using different equations.
- Impart knowledge on critical rates of flow and challenges during different rates of flow like gas and water coning.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Have an overview of horizontal well technologies.
CO2:	Perform flow performance calculations of horizontal wells.
CO3:	Compare horizontal and fractured vertical wells
CO4:	Perform mathematical solutions to transient well testing for different flow regimes.
CO5:	Solve challenges for different flow rates.

Syllabus

UNIT-I

Overview of horizontal well technology

Introduction- Limitations of horizontal wells-Horizontal well applications- Drilling techniques-Horizontal well length based upon drilling techniques and drainage area limitations- Completion techniques.

Reservoir engineering concepts
Skin factor- Skin damage for horizontal wells- Effective wellbore radius r'w- Productivity index, *f*-Flow regimes- Influence of areal anisotropy.

UNIT-II
Steady-state solutions
Steady-state productivity of horizontal wells- Effective wellbore radius of a horizontal well-Productivity of slant wells- Comparison of slant well and horizontal well productivities- Formation damage in horizontal wells- Field histories.
Influence of well eccentricity
Introduction- Influence of well eccentricity- Drilling several wells- Horizontal wells at different elevations.

UNIT-III
Comparison of horizontal and fractured vertical wells
Vertical well stimulation- Types of fractures- Comparison of horizontal wells and finite conductivity fractures- Horizontal wells in fractured reservoirs- Fractured horizontal wells.

UNIT-IV
Transient well testing
Introduction-Mathematical solutions and their practical implications Generalized flow regimes-Pressure response- Detailed well testing flow regimes- Pressure directivities- Wellbore storage effects- Practical Considerations.

UNIT-V
Pseudo-steady state flow
Generalized pseudo-steady state equation for vertical wells- Shape factors for vertical wells- Shape factors for fractured vertical wells- Shape factors of horizontal wells- Horizontal well pseudo-steady state productivity calculations- Inflow performance of partially open horizontal wells-Inflow performance relationship (IPR) for horizontal wells in.

Text Book(s)
1. Horizontal Well Technology, S. D. Joshi, Penn Well Publishing Company.

Reference(s)
1. Horizontal Wells: Formation Evaluation, Drilling and Production Including Heavy Oil Recovery, Roberto Aguilera, G. M. Cordell, G. W. Nicholl, J. S. Artindete, M. C. Nq.,Gulf Publishing Co.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7610	**Offshore Engineering** (Professional Elective-V)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Drilling & Well completion	3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on different types of deep water offshore structures and challenges
- Impart knowledge on concept of wave theory for linear and nonlinear waves.
- Estimate wave loads on small and large bodies
- Estimate different types of loads on offshore structures such as gravity, wind, wave and current loads
- Illustrate detailed design of fixed offshore structures
- Impart knowledge on Concepts of floating structures
- Impart knowledge on fundamental aspects of semisubmersible, TLP, spar and installation methodologies
- Illustrate design aspects of risers

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Identify type of offshore structure and recommend a specific offshore structure for a given site condition and requirements of the platform.
CO2:	Estimate water particle kinematics using linear Airy's wave theory and estimate maximum wave force and overturning moment for a fixed vertical circular cylinder.
CO3:	Design fixed offshore structure
CO4:	Evaluate mass distribution of different structures such as floating structure, TLP and Spar.
CO5:	Design risers

Syllabus

UNIT-I

Overview of Offshore Structures

Introduction- Functions of offshore structures- Offshore structure configurations- Bottom-Supported fixed structures- Compliant structures- Floating structures Deepwater challenges - Classification societies and industry standard groups.

Novel and Small Field Offshore Structures

Introduction- Overview of oil and gas field developments- Technical basis for developing novel offshore structures- Other considerations for developing novel offshore structures- Novel field development systems- Future field development options.

UNIT-II

Ocean Environment

Introduction- Ocean water properties- Wave theory- Breaking waves- Internal waves- Sea spectrum- Sea states- Wave-driven current- Loop current- wind and wind spectrum offshore environment by location.

Loads and Responses

Introduction- Gravity loads- Hydrostatic loads- Resistance loads- Current loads on structures- Steady and dynamic wind loads on structures- Wave loads on structures Applicability of Morison force vs Diffraction force- Steady wave drift force- Slow-Drift wave forces Varying wind load- Impulse loads- Response of structure- Applicability of response formula.

UNIT-III

Fixed Offshore Platform Design

Field development and concept selection activities- Basic and detailed design of a fixed jacket. Analysis and design aspects of Jack-up rigs.

UNIT-IV

Floating Offshore Platform Design

Introduction- Floating platform types- Design of floaters Floating production storage and offloading systems, Mobile offshore drilling units (MODU), Station keeping of MODU's, Single Point Mooring (SPM) and Single Buoy Mooring (SBM) systems.

UNIT-V

Deep Water Offshore Structures

Semi submersibles- Tension leg platforms- Spar design- Hull structure- Construction and installation. Deep water station keeping technologies,

Drilling and Production Risers

Drilling risers- Production risers- Vortex induced vibration of risers Design aspects.

Text Book(s)

1. Handbook of Offshore Engineering, S. Chakrabarti, Volume 1 & 2, Elsevier.

Reference(s)

1. Offshore Operation facilities, Huacan Fang, MenglanDuan, 1st Edition, Gulf professional Publishing.
2. Handbook of Offshore Oil and Gas Operations, James Speight, 1st Edition, Gulf professional Publishing.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7611	**Shale Gas Reservoir Engineering** (Professional Elective-V)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Petroleum Reservoir Engineering-I	3	0	0	3

Course Objectives

The objectives of this course are to

- Understand the global significance and distribution of shale gas reservoirs
- Impart Knowledge on petro-physical properties, pore pressure prediction, performance analysis, production and testing of shale gas reservoirs.
- Illustrate gas shale asset life cycle and environmental issues and challenges.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand assessment of global distribution of shale gas reservoirs.
CO2:	Understand the different aspects of shale gas reservoirs such as organic geo-chemistry, mineralogy, petro physical properties
CO3:	Evaluate and map shale gas pockets in sedimentary basins and gained knowledge on geomechanics of gas shales
CO4:	Understand the production mechanisms to extract shale gas
CO5:	Understand shale gas environmental issues and challenges

Syllabus

UNIT-I

Global Distribution of Shale Gas Reservoirs

Gas Shale – Global significance, Distribution – Organic matter – Rich shale depositional environments – Geochemical assessment of unconventional shale gas resource system.

UNIT-II

Geological and Petro Physical Analysis of Shale Gas Reservoirs

Sequence stratigraphy of unconventional resource shales – Pore Geometry in gas shale reservoirs, Petro-physical evaluation of gas shale reservoirs.

UNIT-III

Pore Pressure Prediction of Shale Formations Using Well Log Data

Overpressure generating mechanisms – Overpressure estimation methods – Role of tectonic activity on shale pore pressure –Geo-mechanics of gas shales.

UNIT-IV

Performance Analysis of Unconventional Shale Reservoirs

Shale reservoir production – Flow rate decline analysis – Flow rate and pressure transient analysis –Specialty short term tests – Enhanced oil recovery.

Resource Estimation for Shale Gas Reservoirs

Introduction – Methodology – Reservoir evaluation of shale gas plays.

UNIT-V

Gas Shale Environmental Issues and Challenges

Overview – water use – the disposal and reuse of fracking waste water – Ground water contamination – Methane incisions – Other air emissions –social impacts on shale gas communities – Waste water injection – Earth quakes – Regulatory developments.

Text Book(s)

1. Fundamentals of Gas Shale Reservoirs, Reza Rezace, John Wiley & Sons.

Reference(s)

1. Shale Oil and Gas Handbook: Theory, Technologies and Challenges, Sohrab Zendeh boudi& A. Bahadori, Elsevier Science.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7612	**Advanced Drilling Operations** (Professional Elective-V)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Drilling & Well completion	3	0	0	3

Course Objectives

The objectives of this course are to

- Understand petroleum well drilling procedures on both onshore and offshore with an inclination of well or directional drilling.
- Impart knowledge on well survey and identify well coordinates for advanced drilling operation.
- Impart knowledge on horizontal and slim drilling operations.
- Impart knowledge and apply special methods of drilling on offshore and onshore oil fields.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Analyze the process of directional drilling operations
CO2:	Apply horizontal and slant hole drilling operations
CO3:	Apply down hole well Surveying methods for drilling operations.
CO4:	Apply measurements of drilling
CO5:	Analyze HPHT and other advanced drilling operations

Syllabus

UNIT-I
Directional Drilling
Objectives, Types of deflection tools, tool orientation, Directional well profiles, Well path deflection & correction.

Down Hole Motors
Positive displacement motors and Turbo-drills - motor description, Power calculation and applications. Auto-track and verti-track system. Rotary Steerable motors, Geo-steering tools.

UNIT-II
Horizontal Well Drilling
Horizontal well objectives and selection, Different profiles, Drilling techniques, Mud requirements & characteristics, casing and drill string requirements and completion programs.
Slant Hole Drilling
Objectives and selections, Well profiles and applications.

UNIT-III
Down the Hole Well Surveying
Well surveying objectives, surveying methods, Surveying Analysis methods and calculations for well coordinates.

UNIT-IV
Measurements While Drilling
Objectives of MWD/ LWD, MWD tools, Telemetry system and data interpretation.
Directional Drilling Problems and Their Remedies.

UNIT-V
Special Methods of Drilling
Aerated drilling, Under-balanced drilling, Overbalanced drilling, HPHT Drilling, Variable pressure regime, Plasma drilling, Electrical Drilling, Top drive drilling, Re-entry drilling, Jet Drilling, Extended reach drilling, Multilateral drilling, Slim hole drilling, coil tubing drilling.

Text Book(s)
1. Dr. Robello Samuel and Xiushan Liu. “Advanced Drilling Engineering: Principles and Designs.” Gulf Publishing Company.

Reference(s)
1. Neal Adams and Tommie Charrier, “Drilling Engineering: A Complete Well Planning Approach” PennWell Pub. Co.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7613	**Basic Concepts in Reservoir Engineering** (Open Elective-III)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on basic concepts in reservoir engineering
- Analyze PVT behavior of oil & gas reservoirs
- Apply material balance concepts to oil & gas reservoirs.
- Utilize Darcy's law in oil and gas reservoirs.
- Estimate well inflow for stabilized conditions.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Identify Reservoir rock properties
CO2:	Understand the phase behaviour of reservoir fluid.
CO3:	Understand fluid flow through porous media.
CO4:	Identify type of drive mechanism and calculate the reserve estimation
CO5:	Understand the reservoir development in oil filed.

Syllabus

UNIT I

Reservoir Rock Properties

Porosity, permeability determination, combination of permeability in parallel & series beds, porosity permeability relationship, fluid saturation determination and significance, effective and relative permeability, wettability, capillary pressure characteristics, measurements and uses.

UNIT II

Reservoir Fluids

Phase behavior of hydrocarbon system, ideal & non ideal system, equilibrium ratios, reservoir fluid sampling, and PVT properties determination.

UNIT III

Flow of Fluids through Porous Media

Darcy's law, single and multiphase flow, linear, radial& spherical flow, steady state & unsteady state flow, flow through fractures, GOR, WOR equations, Water and gas coning. Principles of Fluid Flow for steady state, semi steady state & non steady state conditions.

UNIT IV

Reservoir Drives

Reservoir drive mechanics and recovery factors

Reserve estimation

Estimation of petroleum reserve, resource & reserve concept, MBE, decline curve analysis.

UNIT V

Reservoir Development (oil and gas filed development)

Rational development plan, Rate and order of drilling well, well spacing & pattern, selection of development scheme, economic aspect of development of oil and gas fields.

Text book(s)

1. Tarek Ahmed, “Reservoir Engineering Handbook”, Gulf Professional Publishing..
2. NnaemekaEzekwe, “Petroleum Reservoir Engineering Practice”, Pearson Education, Inc.

Reference(s)

1. Benjamin Cole Craft, Murray Free Hawkins, and Ronald E. Terry, “Applied Petroleum Reservoir Engineering” by Prentice Hall.
2. LP Dake, “Fundamentals of Reservoir Engineering” shell learning and development.
3. Tarek Ahmed, Paul D. McKinney, “Advanced Reservoir Engineering” Gulf Professional Publishing.
4. BF Towler, “Fundamental Principles of Reservoir Engineering”, SPE.
5. Heriot Watt, “Reservoir Engineering Handbook”.
6. Abhijit Y. Dandekar, “Petroleum Reservoir Rock and Fluid Properties”, CRC Press.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT7614	**Introduction to Petroleum Production Engineering** (Open Elective-IV)				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		3	0	0	3

Course Objectives

The objectives of this course are to

- Impart knowledge on competition techniques
- Illustrate oil and gas well stimulation techniques
- Understand oil and gas well services.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Identify the well head equipment
CO2:	Identify the different types of well completion.
CO3:	Understand well activation and stimulate well for improving the flow at well bore
CO4:	Identify well production problems and apply mitigation techniques
CO5:	Understand work over jobs for oil well

Syllabus

UNIT-I
Well Equipment
Well Head Equipment's, Christmas tree, valves, hangers, flow control devices, packers, tubular and flow lines.

UNIT-II

Well Completion

Types of well completion, Perforating Oil & Gas Wells - Conventional and Unconventional techniques viz. through tubing and tubing conveyed underbalanced perforating techniques, type size and orientation of perforation holes.

UNIT-III

Well Activation and Stimulation Techniques

Well activation methods, stimulation type & description, design of matrix acidization and acid fracturing. Design of hydraulic fracturing (mini, massive & high energy frac.). Wave technology & microbial stimulation.

UNIT-IV

Well Production Problems and Mitigation

Scale formation, paraffin deposition, formation damage, water production, gas production, sand deposition etc.

UNIT-V

Work over Operations

Workover system, workover rigs and selection, rig less workover including Endless/ Coiled tubing unit, minor & major workover jobs-diagnosis & remedial measures water shut off and gas shut off-Chemical treatment and conformance control.

Text Book(s)

1. Thomas O Allen, Alan P. Roberts, “Production Operations: Well Completions, Workover, and Stimulation”, (Volume 1 and 2), Oil & Gas Consultants International.

Reference(s)

1. Daniel Hill, Christine Ehlig-Economides, Ding Zhu, Michael J. Economides, “Petroleum Production Systems”, 2nd Ed., Prentice Hall.
2. BoyunGuo, William C. Lyons, Ali Ghalambor, “Petroleum Production Engineering: A computer assisted approach” Elsevier Science and Technology Books.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code	**Humanities and Social Science Elective**				
Teaching	Total contact hours-	L	T	P	C
Prerequisites		0	0	0	3

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code 201PT731	**Summer Internship-II**				
Teaching	Total contact hours-	L	T	P	C
Prerequisites		0	0	0	3

Course Objectives

The objectives of this course are to

- Provide a clear, organized and accurate oral presentation of industrial/research Summer Training/Internship Report.
- Provide verbally/ through power point presentation of condensed large amounts of technical information into concise, condensed analysis.
- Sharing the practical knowledge obtained during training with fellow students.

An industrial/research summer internship report is a documentation of a student's work—a record of the original work done by the student in the industrial/research summer internship of 6 week by the end of III Year II Semester.
In case of exigency, students should take Community Service Project in place of summer internship-II.
Industrial/research summer Internship/Community Service Project of the students shall be evaluated for 100 marks for weightage of 40% - Report and 60% - oral presentation by a committee constituted by the Head of the Department for evaluation.

Course Outcomes

Students will extend their abilities to:

- Get themselves good clarity in the technical topics being presented.
- Develop good communication skills.
- Practice the behaviors of effective speakers.
- Assess strengths in speaking and set goals for future growth.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code 201PT781	**Computer Aided Pipe Line Design**				
Teaching	Total contact hours-	L	T	P	C
Prerequisites		1	0	2	2

Course Objectives

The objectives of this course are to

- Impart knowledge on basics of PDMS software.
- Illustrate selection of equipment's, pipeline for plant design.
- Impart knowledge on drawings and isometrics

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Draw equipment
CO2:	Draw pipe routing
CO3:	Create structure modelling
CO4:	Plotting Complete Standard Isometrics
CO5:	Create 2D and 3D Drafting

Syllabus

UNIT-I

Equipment

Starting the Equipment Application, Creating a SITE and a ZONE, Creating Equipment, Creating Primitives, Creating an Extrusion, Creating a Revolution, Creating Nozzles, Creating Electrical Components, Modifying Equipment, Modifying Nozzle Specifications, Modifying Electrical Component Selection, Modifying Primitives, Modifying Stretch / Trim a Primitives, Parameterised Design Template Equipment, Working with coordinate ,Attributes editing, Model Editor, Sample exercise equipment

UNIT-II

Piping

Starting the Pipework Application, Setting a Default Specification, Creating a Simple Pipework Sequence, Quick Pipe Routing, Pipe Routing Handle, Pipework Component Bore and Specification, Modification, Pipe Splitting, Checking for Clashes, Generating Isometric Plots, Adding Components to a Route, Insertion of Reducers at Bore Changes, Slope pipe routing, Sample exercise pipe routing from pid.

UNIT-III

Structural

Creating a Simple Structure, Straight Sections, Setting the Default Specification for Profiles, Creating Sections Explicitly, Creating Sections Using Graphical Picking, Trimming Connected Section Ends to Correct, Geometry, Adding and Modifying Simple Bracing, Adding Standard Bracing Configurations Adding Panels and Plates, Stair Flight Assembly, Ladder Assembly, Platform Assembly, Handrail Assembly, Sample exercise structure modelling

UNIT-IV

Isodraft

Introduction to ISODRAFT, Types of Isometrics, Isometric Output Format, Setting up a Reference Dimension, Data Consistency Checking, Splitting Long Pipelines, Plotting Complete System, Isometrics, Plotting Complete Standard Isometrics, Setup option file

UNIT-V

Draw

Creating a Drawing, a Sheet and a View, Adding Elements to 3D View, VIEW Frame positioning, View Size, View Centre, View Scale, Orientation of View Contents, Setting the VIEW, Creating Section Planes, Plotting and Drawing Output, Creating Configurable DXF and DWG Output, Linear Dimensions, Multi-valued Dimensions, Radial Dimensions, Angular Dimensions, Creating and Manipulating Labels, Creating Text, 2D Drafting

Reference(s)

1. AVEVAPDMS Design Reference Manual

Syllabus for minor courses

Regulation GRBT-20	Godavari Institute of Engineering &Technology (Autonomous)	IV B.Tech. I Sem (7th Semester)			
Course Code 201PT701	**Immiscible Flooding**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites	Reservoir Engineering, Production Engineering	4	0	0	4

Course Objectives

The objectives of this course are to

- Understand secondary / tertiary recovery of crude oils of specific reservoirs.
- Learn selection criteria to which reservoir suits for specific EOR techniques.
- Illustrate post project monitoring.
- Impart Knowledge on maintenance of injection wells / Production wells.
- Impart Knowledge on ignition of injection wells in case of thermal EORs.
- Impart Knowledge on handling of chemicals like CO2, Surfactants, and Polymers etc.
- Impart Knowledge on injection wells in case of any leakage or blowout situations.

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Understand secondary and tertiary oil recovery methods.
CO2:	Apply gas flooding methods
CO3:	Apply polymer flooding method
CO4:	Apply chemical flooding methods
CO5:	Apply thermal and microbial flooding methods

Syllabus

UNIT-I

Introduction

Different Secondary and tertiary oil recovery techniques. Methods to improve the recovery factor at pore scale and macro scale, Displacement and sweep efficiency.

UNIT-II

Gas Injection

Introduction, Predictive performance, Gas injection in carbonate reservoirs, Inert gas injection.

Carbon Dioxide Flooding

Process description, Field projects, CO2 sources- problem areas, designing a CO2 flood, Guidelines for selection of miscible CO2 projects, Immiscible CO2 flooding conclusions.

UNIT-III

Polymer Flooding

Introduction, Polymer products and theory of use, Planning polymer flood projects.

Polyacrylamides

Introduction, Polyacrylamides chemistry, Application of PAM/AA in enhanced oil recovery, Factors affecting flow in porous media, Field considerations- Site factors, Field operation.

UNIT-IV

Alkaline Flooding

Introduction, Types of caustic used, Entrapment of residue oil, Displacement mechanisms in alkaline flooding, Crude oil properties, Alkali consumption, pH of injected caustic, Effect of sodium ions and sodium chloride, Effect of divalent ions, Reservoir selection- Documented alkaline flooding - field tests.

Surfactants Flooding

Introduction, Classification of EOR surfactants, Mechanism of oil displacement by surfactant flooding, Ultra low interfacial tension in relation to oil displacement by surfactant flooding, Factors influencing oil recovery, Surfactant gas flooding for oil recovery, Interfacial phenomena in surfactant gas flooding, Mechanism of surfactant loss in porous media, Present status of the use of surfactants in oil recovery.

UNIT-V

Steam Flooding for Enhanced Oil Recovery

Introduction, Theory- Screening criteria for steam flood prospects, Reservoir rock and fluid properties, heat losses and formation heating, Oil recovery calculations, An overview of steam flood modeling, Parametric studies in steam flooding, Economics of the steam flooding process.

In-situ Combustion Technology

Introduction, Reservoir characteristics, Ignition-Ignition methods, Process In-situ Combustion, Use of In-situ Combustion, Conclusions, Current status of In-situ Combustion.

Microbial Enhanced Oil Recovery

Microorganisms, Historical development of microbial enhancement of oil recovery, Laboratory experiments - potential of microbial enhancement oil recovery, Field application of microbial enhancement of oil recovery.

Text Book(s)

1. Applied Enhanced Oil Recovery, AurelCarcoana, Prentice Hall.
2. Enhanced Oil Recovery, Larry W. Lake, Prentice Hall.

Reference(s)

1. Enhanced Oil Recovery Processes and Operations, E.C. Donaldson, G. V. Chillingarian, T.F. Yew, Elsevier.
2. Basic Concepts in Enhanced Oil Recovery Processes, Marc Baviere, SCI.
3. Enhanced Oil Recovery: Proceedings of the Third European Symposium on Enhanced Oil Recovery, F. John Fayers, Elsevier.
4. Fundamentals of Enhanced Oil Recovery, H. R. Van Pollew and Associates, PennWell.
5. Enhanced Recovery of Residual and Heavy Oil, M. M. Schumacher, Noyes Data Corp.
6. Recent Advances in Enhanced Oil and Gas Recovery, IstvanLaktos, Academy Kiado.
7. Enhanced Oil Recovery, Don W. Greew, G. Paul Willfite, Society of Petroleum Engineers.
8. Enhanced Oil Recovery: Field Planning and Development Strategies, Vladmir Alvarado, Eduardo Marriglee, Gulf Professional Publishing.

Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. ISem (7th Semester)			
Course Code 201PT702	**Offshore Structures**				
Teaching	Total contact hours-48	L	T	P	C
Prerequisites		4	0	0	4

Course Objectives

The objectives of this course are to

- Impart knowledge on different types of deep water offshore structures and challenges
- Impart knowledge on concept of wave theory for linear and nonlinear waves.
- Estimate wave loads on small and large bodies
- Estimate different types of loads on offshore structures such as gravity, wind, wave and current loads
- Illustrate detailed design of fixed offshore structures
- Impart knowledge on Concepts of floating structures
- Impart knowledge on fundamental aspects of semisubmersible, TLP, spar and installation methodologies
- Illustrate design aspects of risers

Course Outcomes

On Completion of the course, the students shall be able to-	
CO1:	Identify type of offshore structure and recommend a specific offshore structure for a given site condition and requirements of the platform.
CO2:	Estimate water particle kinematics using linear Airy's wave theory and estimate maximum wave force and overturning moment for a fixed vertical circular cylinder.
CO3:	Design fixed offshore structure
CO4:	Evaluate mass distribution of different structures such as floating structure, TLP and Spar.
CO5:	Design risers

Syllabus

UNIT-I

Overview of Offshore Structures

Introduction- Functions of offshore structures- Offshore structure configurations- Bottom-Supported fixed structures- Compliant structures- Floating structures Deepwater challenges - Classification societies and industry standard groups.

Novel and Small Field Offshore Structures

Introduction- Overview of oil and gas field developments- Technical basis for developing novel offshore structures- Other considerations for developing novel offshore structures- Novel field development systems- Future field development options.

UNIT-II

Ocean Environment

Introduction- Ocean water properties- Wave theory- Breaking waves- Internal waves- Sea spectrum- Sea states- Wave-driven current- Loop current- wind and wind spectrum offshore environment by location.

Loads and Responses

Introduction- Gravity loads- Hydrostatic loads- Resistance loads- Current loads on structures- Steady and dynamic wind loads on structures- Wave loads on structures Applicability of Morison force vs Diffraction force- Steady wave drift force- Slow-Drift wave forces Varying wind load- Impulse loads- Response of structure- Applicability of response formula.

UNIT-III

Fixed Offshore Platform Design

Field development and concept selection activities- Basic and detailed design of a fixed jacket. Analysis and design aspects of Jack-up rigs.

UNIT-IV

Floating Offshore Platform Design

Introduction- Floating platform types- Design of floaters Floating production storage and offloading systems, Mobile offshore drilling units (MODU), Station keeping of MODU's, Single Point Mooring (SPM) and Single Buoy Mooring (SBM) systems.

UNIT-V

Deep Water Offshore Structures

Semi submersibles- Tension leg platforms- Spar design- Hull structure- Construction and installation. Deep water station keeping technologies,

Drilling and Production Risers

Drilling risers- Production risers- Vortex induced vibration of risers Design aspects.

Text Book(s)

1. Handbook of Offshore Engineering, S. Chakrabarti, Volume 1 & 2, Elsevier.

Reference(s)

1. Offshore Operation facilities, Huacan Fang, MenglanDuan, 1st Edition, Gulf professional Publishing.
2. Handbook of Offshore Oil and Gas Operations, James Speight, 1st Edition, Gulf professional Publishing.

2Regulation GRBT-20	Godavari Institute of Engineering & Technology (Autonomous)	IVB.Tech. II Sem (8th Semester)			
Course Code 201PT841	**PROJECT (INDUSTRIAL/IN-HOUSE)**				
Teaching	Total contact hours-64	L	T	P	C
		0	0	0	12

Course Objectives

- Explore the given/chosen topic in detail by doing literature search from journals articles and books.
- Identify the gaps in the existing research/technology.
- Formulate the problem statement of the project and to work out the methodology of addressing the topic.
- Make some preliminary investigations on the topic experimentally or theoretically or both.
- Make an interim technical report consisting of preliminary investigations for presenting it to a committee.
- The design and simulation aspects for the topics necessary in the project work.
- The integration of knowledge gained in gathering the information required for the project.
- The improvement of personal qualities like maturity, initiative and creativity.
- The solutions to problems of a non-routine nature.
- The compilation of the work for final technical report to present it in a committee.
- The evaluation of the usage / commercial /environmental aspect of a production / supply or regulation point of view.

Course Outcomes

On Completion of the course, the students shall be able to-

- Carry out literature survey for any project.
- Do research work by bridging the gaps in the existing research/technology.
- Write the problem statements of any projects.
- Develop methodology to make calculations/simulations.
- Make the interim technical reports for the preliminary investigations.
- Carry out design and simulation of equipment and processes required for the project.
- Be competent in experimental work and subsequent analysis involving research methodology.
- Integrate the knowledge gained in gathering the information.

- Identify the gaps between theory and practice.
- Improve the personal qualities like maturity, initiative and creativity.
- Develop communication skills, both oral and written.
- Solve the problems of non-routine nature.
- Compile the final technical report for presenting it to a committee.
- Prepare a comprehensive project in a planned manner, within specified time and present the salient features of the results to the audience with confidence and clarity.

The project work may consist of any one of the following:

a) The project work should consist of a comprehensive design project of any one of the petroleum upstream processes concerned with reservoir, drilling, production, surface production operations, stimulation, enhanced oil recovery in the form of a report.
b) Modeling & Simulation of any petroleum upstream unit concerned with reservoir, drilling, production, surface production operations, stimulation, enhanced oil recovery.
c) Any experimental work with physical interpretations.
d) The internship in petroleum industry.
The project work shall be evaluated for 200 marks (12 credits), 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva-Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his/her project and evaluated by an internal committee.