PRESIDENCY UNIVERSITY
Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
Approved by AICTE, New Delhi

PRESIDENCY SCHOOL OF ENGINEERING

DEPARTMENT OF PETROLEUM ENGINEERING

Program Regulations and Curriculum

2026-2030

BACHELOR OF TECHNOLOGY (B.Tech.) in

PETROLEUM ENGINEERING

based on Choice Based Credit System (CBCS) and Outcome Based Education (OBE)

July 2026

Table of Contents

PART A – PROGRAM REGULATIONS

1. Vision and Mission of the University and the School / Department

1.1Vision of the University

To be a Value-driven Global University, excelling beyond peers and creating professionals of integrity and character, having concern and care for society.

1.2 Mission of the University

- Commit to be an innovative and inclusive institution by seeking excellence in teaching, research and knowledge-transfer. Pursue Research and Development and its dissemination to the community, at large.
- Create, sustain and apply learning in an interdisciplinary environment with consideration for ethical, ecological and economic aspects of nation building.
- Provide knowledge-based technological support and services to the industry in its growth and development.
- To impart globally applicable skill sets to students through flexible course offerings and support industry's requirement and inculcate a spirit of new-venture creation.

1.3 Vision of Presidency School of Engineering

To be a value based, practice-driven School of Engineering and Technology, committed to developing globally competent Engineers, dedicated to transforming Society.

1.4 Mission of Presidency School of Engineering

- Cultivate a practice-driven environment with a contemporary Learning-pedagogy, integrating theory and practice.
- Attract and nurture world-class faculty to excel in Teaching and Research, in the field of Core Engineering.
- Establish state-of-the-art facilities for effective Teaching and Learning-experiences.
- Promote Interdisciplinary Studies to nurture talent and impart relevant skill sets for global impact.
- Instil Entrepreneurial and Leadership Skills to address Social, Environmental, and Community-needs.

1.5 Vision of Department of Petroleum Engineering

To be a center for producing technically proficient, environmentally responsible, and globally competitivePetroleum Engineers with strong ethical values.

1.6 Mission of Department of Petroleum Engineering

- Impart industry-relevant education in petroleum engineering with a strong emphasis on sustainability, digitalization, and responsible resource management.
- Promote advanced research and innovation in sustainable and emerging technologies aligning with global energy transitions trends.

- Develop ethical professionals with environmental awareness, leadership skills, and a global perspective through interdisciplinary learning and strong industry-academia collaboration.

2. Preamble to the Program Regulations and Curriculum

This is the subset of Academic Regulations and it is to be followed as a requirement for the award of B.Tech. degree.

The Curriculum is designed to take into the factors listed in the Choice Based CreditSystem (CBCS) with focus on Social Project Based Learning, Industrial Training, and Internship toenable the students to become eligible and fully equipped for employment in industries,choosehigherstudiesorentrepreneurship.

In exercise of the powers conferred by and in discharge of duties assigned under the relevant provision(s) of the Act, Statutes and Academic Regulations of the University, the Academic Council hereby makes the following Regulations.

3. Short Title and Applicability

a. These Regulations shall be called the Bachelor of Technology Degree Program Regulations and Curriculum 2026-2030.

b. These Regulations are subject to, and pursuant to the Academic Regulations.

c. These Regulations shall be applicable to the ongoing Bachelor of Technology Degree Programs of the 2026-2030 batch, and to all other Bachelor of Technology Degree Programs which may be introduced in future.

d. These Regulations shall supersede all the earlier Bachelor of Technology Degree Program Regulations and Curriculum, along with all the amendments thereto.

e. These Regulations shall come into force from the Academic Year 2026-2030.

4. Definitions

In these Regulations, unless the context otherwise requires:

a. *"Academic Calendar" means the schedule of academic and miscellaneous events as approved by the Vice Chancellor;*
b. *"Academic Council" means the Academic Council of the University;*
c. *"Academic Regulations" means the Academic Regulations, of the University;*
d. *"Academic Term" means a Semester or Summer Term;*
e. *"Act" means the Presidency University Act, 2013;*
f. *"AICTE" means All India Council for Technical Education;*
g. *"Basket" means a group of courses bundled together based on the nature / type of the course;*
h. *"BOE" means the Board of Examinations of the University;*
i. *"BOG" means the Board of Governors of the University;*
j. *"BOM" means the Board of Management of the University;*
k. *"BOS" means the Board of Studies of a particular Department / Program of Study of the University;*
l. *"CGPA" means Cumulative Grade Point Average as defined in the Academic Regulations;*
m. *"Clause" means the duly numbered Clause, with Sub-Clauses included, if any, of these Regulations;*
n. *"COE" means the Controller of Examinations of the University;*
o. *"Course In Charge" means the teacher / faculty member responsible for developing and organising the delivery of the Course;*

p. *"Course Instructor" means the teacher / faculty member responsible for teaching and evaluation of a Course;*
q. *"Course" means a specific subject usually identified by its Course-code and Course-title, with specified credits and syllabus / course-description, a set of references, taught by some teacher(s) / course-instructor(s) to a specific class (group of students) during a specific Academic Term;*
r. *"Curriculum Structure" means the Curriculum governing a specific Degree Program offered by the University, and, includes the set of Baskets of Courses along with minimum credit requirements to be earned under each basket for a degree / degree with specialization / minor / honours in addition to the relevant details of the Courses and Course catalogues (which describes the Course content and other important information about the Course). Any specific requirements for a particular program may be brought into the Curriculum structure of the specific program and relevant approvals should be taken from the BOS and Academic Council at that time.*
s. *"DAC" means the Departmental Academic Committee of a concerned Department / Program of Study of the University;*
t. *"DAC" means, the Departmental Academic Committee;*
u. *"Dean" means the Dean / Director of the concerned School;*
v. *"Dean" means the Dean of the concerned School;*
w. *"Degree Program" includes all Degree Programs;*
x. *"Degree Program" includes all Degree Programs;*
y. *"Department" means the Department offering the degree Program(s) / Course(s) / School offering the concerned Degree Programs / other Administrative Offices;*
z. *"Discipline" means specialization or branch of B.Tech. Degree Program;*
aa. *"HOD" means the Head of the concerned Department;*
bb. *"L-T-P-C" means Lecture-Tutorial-Practical-Credit – refers to the teaching – learning periods and the credit associated;*
cc. *"MOOC" means Massive Open Online Courses;*
dd. *"MOU" means the Memorandum of Understanding;*
ee. *"NPTEL" means National Program on Technology Enhanced Learning;*
ff. *"Parent Department" means the department that offers the Degree Program that a student undergoes;*
gg. *"Program Head" means the administrative head of a particular Degree Program(s);*
hh. *"Program Regulations" means the Bachelor of Technology Degree Program Regulations and Curriculum, 2025-2029;*
ii. *"Program" means the Bachelor of Technology (B.Tech.) Degree Program;*
jj. *"PSOE" means the Presidency School of Engineering;*
kk. *"Registrar" means the Registrar of the University;*
ll. *"School" means a constituent institution of the University established for monitoring, supervising and guiding, teaching, training and research activities in broadly related fields of studies;*
mm. *"Section" means the duly numbered Section, with Clauses included in that Section, of these Regulations;*
nn. *"SGPA" means the Semester Grade Point Average as defined in the Academic Regulations;*
oo. *"Statutes" means the Statutes of Presidency University;*
pp. *"Sub-Clause" means the duly numbered Sub-Clause of these Program Regulations;*
qq. *"Summer Term" means an additional Academic Term conducted during the summer break (typically in June-July) for a duration of about eight (08) calendar weeks, with a minimum of thirty (30) University teaching days;*
rr. *"SWAYAM" means Study Webs of Active Learning for Young Aspiring Minds.*
ss. *"UGC" means University Grant Commission;*
tt. *"University" means Presidency University, Bengaluru; and*

uu. "Vice Chancellor" means the Vice Chancellor of the University.

5. Program Description

The Bachelor of Technology Degree Program Regulations and Curriculum 2026-2030 are subject to, and, pursuant to the Academic Regulations. These Program Regulations shall be applicable to the following ongoing Bachelor of Technology (B.Tech.) Degree Programs of 2026-2030 offered by the Presidency School of Engineering (PSOE):

1. Bachelor of Technology in Civil Engineering, abbreviated as B.Tech. (Civil Engineering)
2. Bachelor of Technology in Electronics and Communication Engineering, abbreviated as B.Tech. (Electronics and Communication Engineering)
3. Bachelor of Technology in VLSI, abbreviated as B.Tech. (VLSI)
4. Bachelor of Technology in Electrical and Electronics Engineering, abbreviated as B.Tech. (Electrical and Electronics Engineering)
5. Bachelor of Technology in Mechanical Engineering, abbreviated as B.Tech. (Mechanical Engineering); and
6. Bachelor of Technology in Petroleum Engineering, abbreviated as B.Tech. (Petroleum Engineering)

5.1 These Program Regulations shall be applicable to other similar programs, which may be introduced in future.

5.2 These Regulations may evolve and get amended or modified or changed through appropriate approvals from the Academic Council, from time to time, and shall be binding on all concerned.

5.3 The effect of periodic amendments or changes in the Program Regulations, on the students admitted in earlier years, shall be dealt with appropriately and carefully, so as to ensure that those students are not subjected to any unfair situation whatsoever, although they are required to conform to these revised Program Regulations, without any undue favour or considerations.

6. Minimum and Maximum Duration

6.1 Bachelor of Technology Degree Program is a Four-Year, Full-Time Semester based program. The minimum duration of the B.Tech. Program is four (04) years, and each year comprises of two academic Semesters (Odd and Even Semesters) and hence the duration of the B.Tech. program is eight (08) Semesters.

6.2 A student who for whatever reason is not able to complete the Program within the normal period or the minimum duration (number of years) prescribed for the Program, may be allowed a period of two years beyond the normal period to complete the mandatory minimum credits requirement as prescribed by the concerned Program Regulations and Curriculum. In general, the permissible maximum duration (number of years) for completion of Program is 'N' + 2 years, where 'N' stands for the normal or minimum duration (number of years) for completion of the concerned Program as prescribed by the concerned Program Regulations and Curriculum.

6.3 The time taken by the student to improve Grades / CGPA, and in case of temporary withdrawal / re-joining (Refer to Clause 16.1 of Academic Regulations), shall be counted in the permissible maximum duration for completion of a Program.

6.4 In exceptional circumstances, such as temporary withdrawal for medical exigencies where there is a prolonged hospitalization and / or treatment, as certified through hospital / medical records, women students requiring extended maternity break (certified by registered medical practitioner), and, outstanding sportspersons representing the University / State / India requiring extended time to participate in National / International

sports events, a further extension of one (01) year may be granted on the approval of the Academic Council.

6.5 The enrolment of the student who fails to complete the mandatory requirements for the award of the concerned Degree (Reefer to Section 19.0 of Academic Regulations) in the prescribed maximum duration (Sub-Clauses 18.1 and 18.2 of Academic Regulations), shall stand terminated and no Degree shall be awarded.

7. Programme Educational Objectives (PEOs)

After two years of successful completion of the program, the graduates will:

PEO1. Progress in their professional careers, earning recognition as competent Petroleum engineers in energy-related sectors.

PEO2. Take on roles that required strategic decision-making and advanced problem-solving capabilities by applying systems thinking to address technical, economic, and operational challenges in dynamic energy environments.

PEO3. Engage in activities that influence energy policies, appropriate sustainable development goals and upliftment by contributing to energy access, environmental protection and public awareness through their expertise and societal responsibility.

8. Programme Outcomes (PO) and Programme Specific Outcomes (PSO)

8.1 Programme Outcomes (PO)

On successful completion of the Program, the students shall be able to:

PO1. Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2. Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3. **Design / DevelopmentofSolutions**:Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4. Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5.Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6.The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7.Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8.Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9.Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10.Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11.Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

8.2 Program Specific Outcomes(PSOs):

On successful completion of the Program, the students shall be able to:

PSO1. Develop solutions to complex problems in the Petroleum industry by applying the principles of Exploration and Production while adhering to industry standards and leveraging specialized software tools.

PSO2. Contribute to sustainable technologies such as carbon capture and storage, unconventional energy resources, and digital oilfield technologies, leading to innovative energy development.

PSO3: Practice as Petroleum engineering professionals with strong ethical values, environmental consciousness, and global outlook by enhancing their skills in emerging trends.

9. Admission Criteria (as per the concerned Statutory Body)

The University admissions shall be open to all persons irrespective of caste, class, creed, gender or nation. All admissions shall be made on the basis of merit in the qualifying examinations; provided that forty percent of the admissions in all Programs of the University shall be reserved for the students of Karnataka State and admissions shall be made through a Common Entrance Examination conducted by the State Government or its agency and seats shall be allotted as per the merit and reservation policy of the State Government from time to time**.** The admission criteria to the B.Tech. Program is listed in the following Sub-Clauses:

9.2 An applicant who has successfully completed Pre-University course or Senior Secondary School course (+2) or equivalent such as (11+1), 'A' level in Senior School Leaving Certificate Course from a recognized university of India or outside or from Senior Secondary Board or equivalent, constituted or recognized by the Union or by the State Government of that Country for the purpose of issue of qualifying certificate on successful completion of the course, may apply for and be admitted into the Program.

9.3 Provided further, the applicant must have taken Physics and Mathematics as compulsory subjects in the Pre-University / Higher Secondary / (10+2) / (11+1) examination, along with either Chemistry / Biology / Electronics / Computer Science / Biotechnology subject, and, the applicant must have obtained a minimum of 45% of the total marks (40% in case of candidates belonging to the Reserved Category as classified by the Government of Karnataka) in these subjects taken together.

9.4 The applicant must have appeared for Joint Entrance Examinations (JEE) Main / JEE (Advanced) / Karnataka CET / COMED-K, or any other State-level Engineering Entrance Examinations.

9.5 Reservation for the SC / ST and other backward classes shall be made in accordance with the directives issued by the Government of Karnataka from time to time.

9.6 Admissions are offered to Foreign Nationals and Indians living abroad in accordance with the rules applicable for such admission, issued from time to time, by the Government of India.

9.7 Candidates must fulfil the medical standards required for admission as prescribed by the University.

9.8 If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation and any other falsification, the Registrar shall report the matter to the Board of Management (BOM), recommending revoking the admission of the candidate.

9.9 The decision of the BOM regarding the admissions is final and binding.

10. Lateral Entry / Transfer Students Requirements

10.1 Lateral Entry

The University admits students directly to the second year (3rd Semester) of the B.Tech. Degree program as per the provisions and / or regulations of the Government of Karnataka pertaining to the "Lateral Entry" scheme announced by the Government from time to time.Further, the general conditions and rules governing the provision of Lateral Entry to the B.Tech. Program of the University are listed in the following Sub-Clauses:

10.1.1 Admission to 2nd year (3rd Semester) of the B.Tech. Degree program shall be open to the candidates who are holders of a 3-year Diploma in Engineering (or equivalent qualification as recognized by the University), who have secured not less than forty-five percentage (45%) marks in the final year examination (5th and 6th Semesters of the Diploma Program) in the appropriate branch of Engineering. Provided that, in case of SC / ST and OBC candidates from Karnataka the minimum marks for eligibility shall be forty percent (40%).

10.1.2 Provided further that, candidates seeking Lateral Entry may be required to complete specified bridge Courses as prescribed by the University. Such bridge Courses, if any, shall not be included in the CGPA computations.

10.1.3 All the existing Regulations and Policies of the University shall be binding on all the students admitted to the Program through the provision of Lateral Entry.

10.1.4 The Course requirements prescribed for the 1st Year of the B.Tech. Program shall be waived for the student(s) admitted through Lateral Entry and the duration of the B.Tech. Program for such students is three (03) years, commencing from the 3rd Semester (commencement of the 2nd Year) of the B.Tech. Program and culminating with the 8th Semester (end of the 4th Year) of the B.Tech. Program.

10.1.5 Provided that, if a Lateral Entry student misses any mandatory program specific courses that are typically offered in the 1st year (1st or 2nd semesters), then those courses must be cleared by the students as soon as possible, preferably during the Summer Term.

10.1.6 The existing Program Regulations of the concerned Program to which the student is admitted through the provision of Lateral Entry shall be binding on the student with effect from the 3rd Semester of the Program. i.e., the Program Structure and Curriculum from the 3rd to 8th Semesters of the Program concerned shall be binding on the student admitted through Lateral Entry. Further, any revisions / amendments made to the Program Regulations, thereafter, shall be

binding on all the students of the concerned Program.

10.1.7 All the Courses (and the corresponding number of Credits) prescribed for the 1st Year of the concerned B.Tech. Program shall be waived for the student(s) admitted to the concerned B.Tech Program through Lateral Entry. Further, the *Minimum Credit Requirements* for the award of the B.Tech. Degree in the concerned Program shall be prescribed / calculated as follows:

The ***Minimum Credit Requirements*** for the award of the Bachelor of Technology (B.Tech.) Degree prescribed by the concerned Bachelor of Technology Degree Program Regulations and Curriculum, 2024-2028, minus the number of Credits prescribed / accepted by the Equivalence Committee for the 1st Year (1st and 2nd Semesters) of the B.Tech. Program.

For instance, if the *Minimum Credit Requirements* for the award of the Bachelor of Technology (B.Tech.) Degree as prescribed by the Regulations for B.Tech. (Petroleum Engineering) is "N" Credits, and, if the total credits prescribed in the 1st Year (total credits of the 1st and 2nd Semesters) of the Program concerned is "M" Credits, then the *Minimum Credit Requirements* for the award of the B.Tech. in Petroleum Engineering for a student who joins the Program through the provision of the Lateral Entry, shall be "N – M" Credits.

10.1.8 Further, no other waiver except the Courses prescribed for the 1st year of the B.Tech. Program of the University shall be permissible for students joining the B.Tech. Program through the provision of Lateral Entry.

10.2 Transfer of student(s) from another recognized University to the 2nd year (3rd Semester) of the B.Tech. Program of the University

A student who has completed the 1st Year (i.e., passed in all the Courses / Subjects prescribed for the 1st Year) of the B.Tech. / B.E. / B.S., Four-Year Degree Program from another recognized University, may be permitted to transfer to the 2nd Year (3rd Semester) of the B.Tech. Program of the University as per the rules and guidelines prescribed in the following Sub-Clauses:

10.2.1 The concerned student fulfils the criteria specified in Sub-Clauses 10.1.1, 10.1.2 and 10.1.3.

10.2.2 The student shall submit the Application for Transfer along with a non-refundable Application Fee (as prescribed by the University from time to time) to the University no later than July 10 of the concerned year for admission to the 2nd Year (3rd Semester) B.Tech. Program commencing on August 1 on the year concerned.

10.2.3 The student shall submit copies of the respective Marks Cards / Grade Sheets / Certificates along with the Application for Transfer.

10.2.4 The transfer may be provided on the condition that the Courses and Credits completed by the concerned student in the 1st Year of the B.Tech. / B.E. / B.S. Four Degree Program from the concerned University, are declared equivalent and acceptable by the Equivalence Committee constituted by the Vice Chancellor for this purpose. Further, the Equivalence Committee may also prescribe the Courses and Credits the concerned students shall have to mandatorily complete, if admitted to the 2nd Year of the B.Tech. Program of the University.

10.2.5 The Branch / Discipline allotted to the student concerned shall be the decision of the University and binding on the student.

11 Change of Branch / Discipline / Specialization

A student admitted to a particular Branch of the B.Tech. Program will normally continue studying in that Branch till the completion of the program. However, the University reserves the right to provide the option for a change of Branch, or not to provide the option for a change of Branch, at the end of 1st Year of the B.Tech. Program to eligible students in accordance with the following rules and guidelines: framed by the University from time to time.

11.1 Normally, only those students, who have passed all the Courses prescribed for the 1st Year of the B.Tech. Program and obtained a CGPA of not less than 6.50 at the end of the 2nd Semester, shall be eligible for consideration for a change of Branch.

11.2 Change of Branch, if provided, shall be made effective from the commencement of the 3rd Semester of the B.Tech. Program. There shall be no provision for change of Branch thereafter under any circumstances whatsoever.

11.3 The student provided with the change of Branch shall fully adhere to and comply with the Program Regulations of the concerned Branch of the B.Tech. Program, the Fee Policy pertaining to that Branch of the B.Tech. Program, and, all other rules pertaining to the changed Branch existing at the time.

11.4 Change of Branch once made shall be final and binding on the student. No student shall be permitted, under any circumstances, to refuse the change of Branch offered.

11.5 The eligible student may be allowed a change in Branch, strictly in order of *inter se* merit, subject to the conditions given below:

11.5.1 The actual number of students in the 3rd Semester in any particular Branch to which the transfer is to be made, should not exceed the intake fixed by the University for the concerned Branch;

11.5.2 The actual number of students in any Branch from which transfer is being sought does not fall below 75% of the total intake fixed by the University for the concerned Branch.

The process of change of Branch shall be completed within the first five days of Registration for the 3rd Semester of the B.Tech. Program.

12 Specific Regulations regarding Assessment and Evaluation

12.1 The academic performance evaluation of a student in a Course shall be according to the University Letter Grading System based on the class performance distribution in the Course.

12.2 Academic performance evaluation of every registered student in every Course registered by the student is carried out through various components of Assessments spread across the Semester. The nature of components of Continuous Assessments and the weightage given to each component of Continuous Assessments (refer Clause 12.5)shall be clearly defined in the Course Plan for every Course, and approved by the DAC.

12.3 Format of the End-Term examination shall be specified in the Course Plan.

12.4 Grading is the process of rewarding the students for their overall performance in each Course. The University follows the system of Relative Grading with statistical approach to classify the students based on the relative performance of the students registered in the concerned Course except in the following cases:

- Non-Teaching Credit Courses (NTCC)

- Courses with a class strength less than 30

Absolute grading method may be adopted, where necessary with prior approval of concerned DAC.

Grading shall be done at the end of the Academic Term by considering the aggregate performance of the student in all components of Assessments prescribed for the Course. Letter Grades (Clause 8.10 of Academic Regulations) shall be awarded to a student based on her / his overall performance relative to the class performance distribution in the concerned Course. These Letter Grades not only indicate a qualitative assessment of the student's performance but also carry a quantitative (numeric) equivalent called the Grade Point.

12.5 **Assessment Components and Weightage**

Table 1: Assessment Components and Weightage for different category of Courses

Nature of Course and Structure	Evaluation Component	Weightage
Lecture-based Course L component in the L-T-P Structure is predominant (more than 1) (Examples: 3-0-0; 3-0-2; 2-1-0; 2-0-2, 2-0-4 etc.)	Continuous Assessments	50%
	End Term Examination	50%
Lab/Practice-based Course P component in the L-T-P Structure is predominant (Examples: 0-0-4; 1-0-4; 1-0-2; etc.)	Continuous Assessments	100%
Skill based Courses like Industry Internship, Capstone project, Research Dissertation, Integrative Studio, Interdisciplinary Project, Summer / Short Internship, Social Engagement / Field Projects, Portfolio, and such similar Non-Teaching Credit Courses, where the pedagogy does not lend itself to a typical L-T-P structure	Guidelines for the assessment components for the various types of Courses, with recommended weightages, shall be specified in the concerned Program Regulations and Curriculum / Course Plans, as applicable.	

The exact weightages of Evaluation Components shall be clearly specified in the concerned PRC and respective Course Plan.

Normally, for Practice / Skill based Courses, without a defined credit structure (L–T–P) [NTCC], but with assigned Credits (As defined in Clause 5.2 of the Academic Regulations), the method of evaluation shall be based only on Continuous Assessments. The various components of Continuous Assessments, the distribution of weightage among such components, and the method of evaluation / assessment, shall be as decided and indicated in the Course Plan / PRC. The same shall be approved by the respective DAC.

12.6 **Minimum Performance Criteria:**

12.6.1 **Theory only Course and Lab / Practice Embedded Theory Course**

A student shall satisfy the following minimum performance criteria to be eligible to earn the credits towards the concerned Course:

a. A student must obtain a minimum of 30% of the total marks / weightage assigned to the End Term Examinations in the concerned Course.

b. The student must obtain a minimum of 40% of the AGGREGATE of the marks / weightage of the components of Continuous Assessments, Mid Term Examinations and End Term Examinations in the concerned Course.

12.6.2 **Lab / Practice only Course and Project Based Courses**
The student must obtain a minimum of 40% of the AGGREGATE of the marks / weightage of all assessment components in the concerned Course.

12.6.3 A student who fails to meet the minimum performance criteria listed above in a Course shall be declared as "Fail" and given "F" Grade in the concerned Course. For theory Courses, the student shall have to re-appear in the "Make-Up Examinations" as scheduled by the University in any subsequent semester, or, re-appear in the End Term Examinations of the same Course when it is scheduled at the end of the following Semester or Summer Term, if offered. The marks obtained in the Continuous Assessments (other than the End Term Examination) shall be carried forward and be included in computing the final grade, if the student secures the minimum requirements (as per Clause 12.6.1 and 12.6.2 of Academic Regulations) in the "Make-Up Examinations" of the concerned Course. Further, the student has an option to re-register for the Course and clear the same in the summer term / subsequent semester if he / she wishes to do so, provided the Course is offered.

13 **Additional Clarifications - Rules and Guidelines for Transfer of Credits from MOOC, etc.**

The University allows students to acquire credits from other Indian or foreign institutions and / or Massive Open Online Course (MOOC) platforms, subject to prior approval. These credits may be transferred and counted toward fulfilling the minimum credit requirements for the award of a degree. The process of transfer of credits is governed by the following rules and guidelines:

13.1 The transfer of credits shall be examined and recommended by the Equivalence Committee (Refer to ANNEXURE B of Academic Regulations) and approved by the Dean - Academics.

13.2 Students may earn credits from other Indian or foreign Universities / Institutions with which the University has an MOU, and that MOU shall have specific provisions, rules and guidelines for transfer of credits. These transferred credits shall be counted towards the minimum credit requirements for the award of the degree.

13.3 Students may earn credits by registering for Online Courses offered by *Study Web of Active Learning by Young and Aspiring Minds* (SWAYAM) and *National Program on Technology Enhanced Learning* (NPTEL), or other such recognized Bodies / Universities / Institutions as approved by the concerned BOS and Academic Council from time to time. The concerned School / Parent Department shall publish / include the approved list of Courses and the rules and guidelines governing such transfer of credits of the concerned Program from time to time. The Rules and Guidelines for the transfer of credits specifically from the Online Courses conducted by SWAYAM / NPTEL / other approved MOOCs are as stated in the following Sub-Clauses:

13.3.1 A student may complete SWAYAM / NPTEL / other approved MOOCs as mentioned in Clause13.2 (as per Academic Regulations) and transfer equivalent credits to partially or fully complete the mandatory credit requirements of Discipline Elective Courses and / or the mandatory credit requirements of Open Elective Courses as prescribed in the concerned Curriculum Structure. However, it is the sole responsibility of the student to complete the mandatory credit requirements of the Discipline Elective Courses and the Open Elective Courses as prescribed by the Curriculum Structure of the concerned Program.

13.3.2 SWAYAM / NPTEL / other approved MOOCs as mentioned in Clause 13.2 (as per Academic Regulations) shall be approved by the concerned Board of Studies and placed (as Annexures) in the concerned PRC.

13.3.3 Parent Departments may release a list of SWAYAM / NPTEL / other approved MOOCs for Pre-Registration as per schedule in the Academic Calendar or through University Notification to this effect.

13.3.4 Students may Pre-Register for the SWAYAM / NPTEL / other approved MOOCs in the respective Departments and register for the same Courses as per the schedule announced by respective Online Course Offering body / institute / university.

13.3.5 A student shall request for transfer of credits only from such approved Courses as mentioned in Sub-Clause 13.3.1 above.

13.3.6 SWAYAM / NPTEL / other approved MOOCs Courses are considered for transfer of credits only if the concerned student has successfully completed the SWAYAM / NPTEL / other approved MOOCs and obtained a certificate of successful / satisfactory completion.

13.3.7 A student who has successfully completed the approved SWAYAM / NPTEL / other approved MOOCs and wants to avail the provision of transfer of equivalent credits, must submit the original Certificate of Completion, or such similar authorized documents to the HOD concerned, with a written request for the transfer of the equivalent credits. On verification of the Certificates / Documents and approval by the HOD concerned, the Course(s) and equivalent Credits shall be forwarded to the COE for processing of results of the concerned Academic Term.

13.3.8 The credit equivalence of the SWAYAM / NPTEL / other approved MOOCs are based on Course durations and / or as recommended by the Course offering body / institute / university. The Credit Equivalence mapped to SWAYAM / NPTEL approved Courses based on Course durations for transfer of credits is summarised in Table shown below. The Grade will be calculated from the marks received by the Absolute Grading Table8.11 in Academic Regulations.

Table 2: Durations and Credit Equivalence for Transfer of Credits from SWAYAM-NPTEL / other approved MOOC Courses

Sl. No.	Course Duration	Credit Equivalence
1	4 Weeks	1 Credit
2	8 Weeks	2 Credits
3	12 Weeks	3 Credits

13.3.9 The maximum permissible number of credits that a student may request for credit transfer from MOOCs shall not exceed 20% of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum forthe award ofthe concernedDegree.

13.3.10 The University shall not reimburse any fees / expense; a student may incur for the SWAYAM / NPTEL / other approved MOOCs.

13.4 Themaximumnumberofcreditsthatcanbetransferredbyastudentshallbelimitedtoforty percent (40%) of the mandatory minimum credit requirements specified by the concerned Program Regulations and Curriculum forthe award ofthe concernedDegree. However, the grades

obtained in the Courses transferred from other Institutions / MOOCs, as mentioned in this Section (13.0), shall not be included in the calculation of the CGPA.

13.5 Mandatory Non-Credit Course Completion Requirements: All mandatory non-credit courses shall be satisfactorily completed by the student as part of the degree requirements. These courses will be evaluated and awarded letter grades based on the following criteria:

- **S (Satisfactorily Completed):** Awarded when the student successfully completes all prescribed course requirements.
- **NC (Not Completed):** Awarded when the student fails to meet the prescribed course requirements.

A student receiving an NC grade must reappear for and complete the course in accordance with the guidelines prescribed by the University.

In the case of non-taught and non-credited mandatory courses—where students are advised to undertake learning through MOOC platforms—there shall be a clearly defined Course Catalogue and a corresponding Course Plan. The Course Plan shall outline the assessment components, which will form the basis for evaluation.

PART B – PROGRAM STRUCTURE

14. Structure / Component with Credit Requirements Course Baskets & Minimum Basket wise Credit Requirements

The B.Tech. (Petroleum Engineering) Program Structure (2026-2030) totalling 160 credits. Table 3A summarizes the type of baskets, and the associated credits that are mandatorily required for the completion of the Degree.

Table 3A: B.Tech. (Petroleum Engineering) 2026-2030: Summary of Mandatory Courses and Minimum Credit Contribution from various Baskets

Sl. No.	Baskets	Credit Contribution
1	Humanities and Social Sciences including Management Course (HSMC)	09
2	Basic Science Course (BSC)	24
3	Engineering Science Course (ESC)	23
4	Professional Core Course (PCC)	64
5	Practice Work Course (PWC)	16
6	Mandatory Course (MAC)	00
7	Professional Elective Course (PEC)	18
8	Open Elective Course (OEC)	06
	Total Credits	**160**

In the entire Program, the practical, skill-based, and problem solvingcourse component contribute to an extent of approximately 55% out of the total credits of 160 for B.Tech. (Petroleum Engineering) program of four years' duration.

The curriculum structure is designed as per the CBCS and incorporating OBE Principles. The students are provided with at most flexibility in selection of the courses of their choice. The curriculum provides an opportunity to the students to obtain a specific specialization with the basic degree of Bachelor of Technology in Petroleum Engineering. To obtain a specialization. the student must register and earn minimum credits for discipline electives courses from the various specialization baskets as indicated in Table 3B.

Table 3B: Minimum Credits for Professional Elective Courses from various Specialization Tracks

Specialization Tracks → / ↓	General Petroleum Engineering	Petroleum Exploration and Drilling Engineering	Reservoir and Production Engineering	Pipeline and Petroleum Refining Engineering
General Petroleum Engineering	3	-	-	-
Petroleum Exploration and Drilling Engineering	6	**15**	-	-

Reservoir and Production Engineering	6	3	**15**	3
Pipeline and Petroleum Refining Engineering	3	-	3	**15**
TOTAL	**18**	**18**	**18**	**18**

NOTE:
(1) A student will have to earn a minimum of 15 credits from his/her preferred specialization basket to earn a specialization. This rule does not apply to "General Petroleum Engineering" Basket.
(2) The credits from other baskets shown above for each minor are indicative and not binding.

A student will have to complete a minimum of 15 credits of Discipline Electives from a given specialization basket, to earn a specialization certificate in addition to the base degree to which he / she has taken admission

15. Minimum Total Credit Requirements of Award of Degree

As per the AICTE guidelines, a minimum of 160 credits is required for the award of a B.Tech. degree.

16. Other Specific Requirements for Award of Degree, if any, as prescribed by the Statutory Bodies

16.1 The award of the Degree shall be recommended by the Board of Examinations and approved by the Academic Council and Board of Management of the University**.**

16.2 A student shall be declared to be eligible for the award of the concerned Degree if she / he:

a. Fulfilled the Minimum Credit Requirements and the Minimum Credits requirements under various baskets;

b. Secure a minimum CGPA of 4.50 in the concerned Program at the end of the Semester / Academic Term in which she / he completes all the requirements for the award of the Degree as specified in Sub-Clause 19.2.1 of Academic Regulations;

c. No dues to the University, Departments, Hostels, Library, and any other such Centers / Departments of the University; and

d. No disciplinary action is pending against her / him.

PART C – CURRICULUM STRUCTURE

17. Curriculum Structure – Basket Wise Course List

Table 3.1: List of Humanities and Social Sciences including Management Courses (HSMC)									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	ENG1030	Fundamentals of Communication	1	0	2	2	3	FC	-
2	ENG2030	Communication in Practice	1	0	2	2	3	FS	-
3	APT4005	Aptitude for Employability	0	0	2	1	2	EM	-
4	PPS3018	Preparedness for Interview	0	0	2	1	2	EM	-
5	FIN1005	Finance Essentials for Decision Making	3	0	0	3	3	SD/EM/EN	HP/GS
Total No. of Credits						**09**			
Lecture = L, Tutorial = T, Practical = P, Credit = C, Contact Hour = CH, Foundation Course = FC, Skill Development = SD, Employability = EM, Entrepreneurship = EN Gender Sensitization = GS, Environment and Sustainability = ES, Human Values and Professional Ethics = HP									

Table 3.2: List of Basic Science Courses (BSC)									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	CHE2505	Materials Chemistry for Engineers	3	0	0	3	3	FC	-
2	CHE2506	Materials Chemistry Lab	0	0	2	1	2	FC	-
3	MAT2301	Calculus and Differential Equations	3	1	0	4	4	FC	-
4	MAT2302	Transform Techniques, Partial Differential Equations and Complex Variables	3	1	0	4	4	FC	-
5	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	FC	-
6	MAT2304	Numerical Methods, Probability Distributions and Sampling Techniques	3	1	0	4	4	FC	-
7	PHY2503	Fundamentals of Materials Physics	3	0	0	3	3	FC	-
8	PHY2506	Fundamentals of Materials Physics Lab	0	0	2	1	2	FC	-
Total No. of Credits						**24**			

Table 3.3: List of Engineering Science Courses (ESC)									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	FC/SD	-
2	CHE2507	Industrial Chemistry	2	0	0	2	2	SD	-
3	CHE2508	Industrial Chemistry Lab	0	0	2	1	2	SD	-
4	CSE2282	Computational Thinking and AI Programming	3	0	0	3	3	SD/EM	-
5	CSE2283	Computational Thinking and AI Programming Lab	0	0	2	1	2	SD/EM	-

6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	SD/EM	-
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	SD/EM	-
8	ECE1512	Design Thinking in Practice	2	0	2	3	4	SD/EM	-
9	MAT2305	Advanced Statistics for Petroleum Engineers	3	0	0	3	3	SD/EM	-
10	MEC1006	Engineering Graphics	2	0	0	2	2	SD/EM	-
11	PET1502	Basics of Petroleum Engineering Calculations	2	0	0	2	2	SD/EM	-
Total No. of Credits						**23**			

Table 3.4: List of Professional Core Courses (PCC)

Sl. No.	Course Code	Course Name	L	T	P	C	CH	Type of Skills	Course Caters To
1	PET1201	Fundamentals of Oil and Gas Operations	2	0	0	2	2	SD	ES/HP
2	PET2101	Petroleum Geology	3	0	0	3	3	SD	-
3	PET2102	Petroleum Geology Lab	0	0	2	1	2	SD	ES
4	PET2103	Drilling Fluids and Cements	3	0	0	3	3	EM	-
5	PET2104	Drilling Fluids and Cements Lab	0	0	2	1	2	EM	ES
6	PET2105	Fundamentals of Oil and Gas Well Drilling Technology	3	0	0	3	3	EM	-
7	PET2106	Heat and Mass Transfer for Petroleum Engineering	3	0	0	3	2	SD	-
8	PET2107	Heat and Mass Transfer for Petroleum Engineering Lab	0	0	2	1	2	SD	ES
9	PET2108	Fundamentals of Petroleum Reservoir Engineering	4	0	0	4	4	EM	-
10	PET2109	Fundamentals of Petroleum Reservoir Engineering Lab	0	0	2	1	2	EM	ES
11	PET2110	Fundamentals of Oil and Gas Production Technology	3	0	0	3	3	EM	-
12	PET2111	Fundamentals of Instrumentation and Control Engineering	2	0	0	2	2	FC	-
13	PET2112	Fundamentals of Instrumentation and Control Engineering Lab	0	0	2	1	2	FC	ES
14	PET2113	Fundamentals of Geophysical Logging Techniques	3	1	0	4	4	SD	-
15	PET2114	Reservoir Fluid Mechanics	2	0	0	2	2	SD	-
16	PET2115	Reservoir Fluid Mechanics Lab	0	0	2	1	2	SD	ES
17	PET2116	Oil and Gas Surface Facility Design	2	0	0	2	2	EM	-
18	PET2117	Oil and Gas Surface Facility Design Lab	0	0	2	1	2	EM	ES
19	PET2118	Methods for Oil and Gas Exploration	3	0	0	3	3	SD	-
20	PET2119	Oil and Gas Well Test Analysis	3	0	0	3	3	EM	-
21	PET2120	Advanced Petroleum Reservoir Engineering	3	0	0	3	3	EM	HP
22	PET2121	Oil and Gas Downstream Operations	3	0	0	3	3	EM	-
23	PET2122	Oil and Gas Downstream	0	0	2	1	2	EM	ES

		Operations Lab							
24	PET2123	Petroleum Reservoir Modelling and Simulation	2	0	0	2	2	EM	-
25	PET2124	Petroleum Reservoir Modelling and Simulation Lab	0	0	4	2	4	EM	ES
26	PET2125	Enhanced Oil and Gas Recovery Techniques	3	0	0	3	3	EM	-
27	PET2126	Well Intervention Technologies	3	0	0	3	3	EM	HP
28	PET2127	Offshore Drilling and Petroleum Production Practices	3	0	0	3	3	SD	ES
Total No. of Credits						**64**			

Table 3.5: List of Courses in Practice Work Course (PWC) Basket

Sl. No.	Course Code	Course Name	L	T	P	C	CH	Type of Skills	Course Caters To
1	PET7001	Internship	-	-	-	2	0	SD/EM/EN	ES/HP
2	PET7101	Mini Project	-	-	-	4	0	SD/EM/EN	ES/HP
3	PET7301	Capstone Project	-	-	-	10	0	SD/EM/EN	ES/HP
Total No. of Credits						**16**			

Table 3.6: List of Mandatory Courses (MAC)

Sl. No.	Course Code	Course Name	L	T	P	C	CH	Type of Skills	Course Caters To
1	APT4002	Introduction to Aptitude	0	0	2	0	2	-	-
2	APT4004	Aptitude Training - Intermediate	0	0	2	0	2	-	-
3	APT4006	Logical and Critical Thinking	0	0	2	0	2	-	-
4	CHE7601	Environmental Studies	-	-	-	0	0	-	-
5	CIV7601	Universal Human Values and Ethics	-	-	-	0	0	-	-
6	LAW7601	Indian Constitution	-	-	-	0	0	-	-
7	PPS1025	Industry Readiness Program - I	0	0	2	0	2	-	-
8	PPS1026	Industry Readiness Program - II	0	0	2	0	2	-	-
Total No. of Credits						**00**			

18. Practical / Skill based Courses – Internships / Thesis / Dissertation / Capstone Project Work / Portfolio / Mini Project

Practical / Skill based Courses like internship, project work, capstone project, research project / dissertation, and such similar courses, where the pedagogy does not lend itself to a typical L-T-P-C Structure as defined in Clause 5.1 of the Academic Regulations are simply assigned the number of Credits based on the quantum of work / effort required to fulfill the learning objectives and outcomes prescribed for the concerned Courses. Such courses are referred to as Non-Teaching Credit Courses (NTCC). These Courses are designed to provide students with hands-on experience and skills essential for their professional development. These courses aim to

equip students with abilities in problem identification, root cause analysis, problem-solving, innovation, and design thinking through industry exposure and project-based learning. The expected outcomes are first level proficiency in problem solving and design thinking skills to better equip B.Tech. graduates for their professional careers. The method of evaluation and grading for the Practical / Skill based Courses shall be prescribed and approved by the concerned Departmental Academic Committee (refer Annexure A of the Academic Regulations). The same shall be prescribed in the Course Plan.

18.1 Internship

A student may undergo an Internship for a period of 4-6 weeks in an industry / company or academic / research institution during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters, subject to the following conditions:

18.1.1 The Internship shall be in conducted in accordance with the Internship Policy prescribed by the University from time to time.

18.1.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Internship to a student;

18.1.3 The number of Internships available for the concerned Academic Term. Further, the available number of internships shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Internship, as stated in Sub-Clause 18.1.2 above.

18.1.4 A student may opt for Internship in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Internship on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Internship confirms to the University that the Internship shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

18.1.5 A student selected for an Internship in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Internship Policy of the University.

18.2 Project Work

A student may opt to do a Project Work for a period of 4-6 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Internship during the Semester Break between 4th and 5th Semesters or 6th and 7th Semesters or during the 5th / 6th / 7th Semester as applicable, subject to the following conditions:

18.2.1 The Project Work shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.2.2 The student may do the project work in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.2.1). Provided further, that the Industry / Company or academic / research institution offering such project work confirms to the University that the project work will be conducted in accordance with the Program Regulations and

requirements of the University.

18.3 Capstone Project

A student may undergo a Capstone Project for a period of 12-14 weeks in an industry / company or academic / research institution in the 7th / 8th Semester as applicable, subject to the following conditions:

18.3.1 The Capstone Project shall be in conducted in accordance with the Capstone Project Policy prescribed by the University from time to time.

18.3.2 The selection criteria (minimum CGPA, pass in all Courses as on date, and any other qualifying criteria) as applicable / stipulated by the concerned Industry / Company or academic / research institution for award of the Capstone Project to a student;

18.3.3 The number of Capstone Project available for the concerned Academic Term. Further, the available number of Capstone Project shall be awarded to the students by the University on the basis of merit using the CGPA secured by the student. Provided further, the student fulfils the criteria, as applicable, specified by the Industry / Company or academic / research institution providing the Capstone Project, as stated in Sub-Clause 18.3.2 above.

18.3.4 A student may opt for Capstone Project in an Industry / Company or academic / research institution of her / his choice, subject to the condition that the concerned student takes the responsibility to arrange the Capstone Project on her / his own. Provided further, that the Industry / Company or academic / research institution offering such Capstone Project confirms to the University that the Capstone Project shall be conducted in accordance with the Program Regulations and Internship Policy of the University.

18.3.5 A student selected for a Capstone Project in an industry / company or academic / research institution shall adhere to all the rules and guidelines prescribed in the Capstone Project Policy of the University.

18.4 Research Project / Dissertation

A student may opt to do a Research Project / Dissertation for a period of 12-14 weeks in an Industry / Company or academic / research institution or the University Department(s) as an equivalence of Capstone Project, subject to the following conditions:

18.4.1 The Research Project / Dissertation shall be approved by the concerned HOD and be carried out under the guidance of a faculty member.

18.4.2 The student may do the Research Project / Dissertation in an Industry / Company or academic / research institution of her / his choice subject to the above mentioned condition (Sub-Clause 18.4.1). Provided further, that the Industry / Company or academic / research institution offering such Research Project / Dissertation confirms to the University that the Research Project / Dissertation work will be conducted in accordance with the Program Regulations and requirements of the University.

19. List of Professional Elective Courses under various Specialisation Baskets

Table 3.7: List of Professional Elective Courses (PECs) / Specialization Baskets
Specialization Basket 1: General Petroleum Engineering Basket

Sl. No.	Course Code	Course Name	L	T	P	C	CH	Type of Skills	Course Caters To
1	PET1701	Petroleum Data Analysis	2	0	2	3	4	SD/EM	ES
2	PET1702	Carbon Capture and Utilization for Sustainability	3	0	0	3	3	SD/EM	ES
3	PET1703	Hydrogen Energy Systems and Technologies	3	0	0	3	3	SD/EM/EN	ES/HP
4	PET1704	Geothermal Engineering and Energy Systems	3	0	0	3	3	SD/EM/EN	ES
5	PET1705	Energy Transition Towards Net-Zero	3	0	0	3	3	SD/EM/EN	ES/HP
6	PET1706	Nuclear Energy Systems for Energy Transition	3	0	0	3	3	SD/EM/EN	ES
7	PET3101	Quality Management Practices in Oil and Gas Industry	3	0	0	3	3	EM	HP
8	PET3102	Occupational Health and Safety	3	0	0	3	3	EM	ES/HP
9	PET3103	Overview of Material Science	3	0	0	3	3	FC/SD	-
10	PET3104	Petroleum Economics	3	0	0	3	3	SD/EM/EN	ES
11	PET3105	Petroleum Logistics, Marketing, and Management	3	0	0	3	3	FC/SD/EM	-
12	PET4001	Digital Oilfield Software Laboratory	0	0	6	3	6	SD/EM/EN	ES/HP
13	PET7100	Minor Project	-	-	-	3	0	EM	ES/HP
14	PET7102	University Research Experience	-	-	-	3	-	SD/EM/EN	-
Specialization Basket 2: Petroleum Exploration and Drilling Engineering Basket									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	PET3106	Coal Bed Methane	3	0	0	3	3	SD	HP
2	PET3107	Shale Gas	3	0	0	3	3	SD	HP
3	PET3108	Natural Gas Hydrates	3	0	0	3	3	SD	HP
4	PET3109	Geomechanics for Wellbore Stability Analysis	3	0	0	3	3	EM	ES/HP
5	PET3110	Directional Drilling Technology	3	0	0	3	3	EM	HP
6	PET3111	Advanced Well Engineering	3	0	0	3	3	EM	HP
7	PET3112	Multilateral and Horizontal Well Technology	3	0	0	3	3	EM	HP
8	PET3113	Remote Sensing and GIS for Oil and Gas Exploration	3	0	0	3	3	SD	HP
Specialization Basket 3: Reservoir and Production Engineering Basket									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	PET3114	Integrated Field Development and Planning	3	0	0	3	3	SD	HP
2	PET3115	Solids Handling in Oil and Gas Industry	3	0	0	3	3	SD	ES
3	PET3116	Petroleum Production Optimization Techniques	3	0	0	3	3	EM	HP
4	PET3117	Wellbore Problems and Mitigation	3	0	0	3	3	EM	HP
5	PET3118	Fluid Flow through Porous Media	3	0	0	3	3	EM	HP

6	PET3119	Natural Gas Reservoir Engineering	3	0	0	3	3	EM	HP
7	PET3120	Natural Gas Production Engineering	3	0	0	3	3	EM	HP
8	PET3121	Introduction to Computational Fluids Dynamics	3	0	0	3	3	SD/EN	-
Specialization Basket 4: Pipeline and Petroleum Refining Engineering Basket									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	PET3122	Process Design and Calculations	3	0	0	3	3	SD	HP
2	PET3123	Process Pipeline Design	3	0	0	3	3	EM	HP
3	PET3124	Corrosion Science and Technology	3	0	0	3	3	EM	ES
4	PET3125	Polymer Science and Technology	3	0	0	3	3	FC/SD/EM	-
5	PET3126	Fundamentals of Chemical Engineering	3	0	0	3	3	SD	ES
6	PET3127	Advanced Refining Engineering	3	0	0	3	3	EM	HP
7	PET3128	Advanced Petrochemical Engineering	3	0	0	3	3	SD	HP/ES
8	PET3129	Process Equipment Design	3	0	0	3	3	EN	HP
9	PET3130	Chemical Reaction Engineering	3	0	0	3	3	SD	HP

20. List of Open Electives to be offered by the Department for other Departments/ Schools

Table 3.8: List of Open Elective Courses (OEC)									
Petroleum Engineering Basket									
Sl. No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**CH**	**Type of Skills**	**Course Caters To**
1	PET3301	Energy Industry Dynamics	3	0	0	3	3	FC/SD/EM	ES
2	PET3302	Energy Sustainability Practices	3	0	0	3	3	FC/SD/EM	ES

21. List of MOOC (NPTEL) Courses

As the Massive Open Online Courses (MOOC) offered by National Program on Techno0logy Enhanced Learning (NPTEL) keeps on changing alomost in event semester, therefore the Deparment of Petroleum Engineeing, in general, update the lists of MOOC (NPTEL) courses with the approval Board of Studies (BoS) in each Semester for the benefit of the students.

Sometimes the pre-approved courses are offered again (repeated) in the next semester / academic year with the same Course Name and Course Duration but with different Course Code. The updated list of NPTEL courses shall be notified before the commencement of the semester after the same is approved by BoS. Hence, students are required to seek prior approval from the Head of the Department (HOD) before enrolling in any course.

21.1 List of NPTEL - Discipline Elective Courses approved in the BoS for B.Tech. (Petroleum Engineering)

Sl. No.	**Course Code**	**Course Name**	**Course Duration (Weeks)**

1	noc26-ch77	Polymers: Concepts, Properties, Uses and Sustainability	12 Weeks
2	noc26-ch76	Hydrogen Energy: Production, Storage, Transportation and Safety	12 Weeks
3	noc26-ge80	Hydrogen Energy: Technology and Economics	12 Weeks
4	noc26-ch97	Petroleum Formation Evaluation	12 Weeks
5	noc26-ch93	Enhanced Oil Recovery Techniques	12 Weeks
6	noc26-ch88	Engineering Aspects of Biofuels and Biomass Conversion Technologies	12 Weeks
7	noc26-ch89	Introduction to Python and Petroleum Data Analytics	12 Weeks
8	noc26-ch82	Artificial Lift	12 Weeks
NOTE: In general, the above list of courses will be revised / updated in every semester depending on the availability of the courses. Hence, students are required to seek prior approval from the Head of the Department (HOD) before enrolling in any course.			

21.2 List of NPTEL - Open Elective Courses approved in the BoS.

Sl. No.	Course Code	Course Name	Course Duration (Weeks)
1	noc26-ge93	Fundamentals of Artificial Intelligence	12 Weeks
2	noc26-ge85	Machine Learning for Core Engineering Disciplines	12 Weeks
3	noc26-ch104	Aspen Plus® Simulation Software - An Advanced Course for Learners	12 Weeks
4	noc26-hs164	Entrepreneurship and IP Strategy	8 Weeks
5	noc26-hs237	Energy Economics And Policy	8 Weeks
NOTE: In general, the above list of courses will be revised / updated in every semester depending on the availability of the courses. Hence, students are required to seek prior approval from the Head of the Department (HOD) before enrolling in any course.			

22. Recommended Semester Wise Course Structure / Flow including the Programme / Discipline Elective Paths / Options

Semester I (Physics Cycle)										
Sl. No.	Course Code	Course Name	Credit Structure				CH	Type of Course	Type of Skills	Course Addresses To
			L	T	P	C				
1	ENG1030	Fundamentals of Communication	1	0	2	2	3	HSMC	FC	-
2	MAT2301	Calculus and Differential Equations	3	1	0	4	4	BSC	FC	-
3	PHY2503	Fundamentals of Materials Physics	3	0	0	3	3	BSC	FC	-
4	PHY2506	Fundamentals of Materials Physics Lab	0	0	2	1	2	BSC	FC	-
5	MEC1006	Engineering Graphics	2	0	0	2	2	ESC	SD/EM	-
6	ECE1512	Design Thinking in	2	0	2	3	4	ESC	SD/EM	-

		Practice								
7	PET1201	Fundamentals of Oil and Gas Operations	2	0	0	2	2	PCC	SD	ES/HP
8	PPS1025	Industry Readiness Program - I	0	0	2	0	2	MAC	-	-
		TOTAL	**13**	**01**	**08**	**17**	**22**			

Semester II (Chemistry Cycle)										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Course**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				
1	ENG2030	Communication in Practice	1	0	2	2	3	HSMC	FS	-
2	MAT2302	Transform Techniques, Partial Differential Equations and Complex Variables	3	1	0	4	4	BSC	FC	-
3	CHE2505	Materials Chemistry for Engineers	3	0	0	3	3	BSC	FC	-
4	CHE2506	Materials Chemistry Lab	0	0	2	1	2	BSC	FC	-
5	CIV1200	Foundations of Integrated Engineering	2	0	0	2	2	ESC	FC/SD	-
6	EEE1200	Basics of Electrical and Electronics Engineering	3	0	0	3	3	ESC	SD/EM	-
7	EEE1250	Basics of Electrical and Electronics Engineering Lab	0	0	2	1	2	ESC	SD/EM	-
8	PET1502	Basics of Petroleum Engineering Calculations	2	0	0	2	2	ESC	SD/EM	-
9	PPS1026	Industry Readiness Program - II	0	0	2	0	2	MAC	-	-
		TOTAL	**14**	**01**	**08**	**18**	**23**			

Semester III										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Cours**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				

								e		
1	FIN1005	Finance Essentials for Decision Making	3	0	0	3	3	HSMC	SD/EM/EN	HP/GS
2	MAT2303	Linear Algebra and Vector Calculus	3	1	0	4	4	BSC	FC	-
3	CHE2507	Industrial Chemistry	2	0	0	2	2	ESC	SD	-
4	CHE2508	Industrial Chemistry Lab	0	0	2	1	2	ESC	SD	-
5	PET2101	Petroleum Geology	3	0	0	3	3	PCC	SD	-
6	PET2102	Petroleum Geology Lab	0	0	2	1	2	PCC	SD	ES
7	PET2103	Drilling Fluids and Cements	3	0	0	3	3	PCC	EM	-
8	PET2104	Drilling Fluids and Cements Lab	0	0	2	1	2	PCC	EM	ES
9	PET2105	Fundamentals of Oil and Gas Well Drilling Technology	3	0	0	3	3	PCC	EM	-
10	CIV7601	Universal Human Values and Ethics	-	-	-	0	0	MAC	-	-
11	APT4002	Introduction to Aptitude	0	0	2	0	2	MAC	-	-
TOTAL			**17**	**01**	**08**	**21**	**26**			

Semester IV										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Course**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				
1	MAT2304	Numerical Methods, Probability Distributions and Sampling Techniques	3	1	0	4	4	BSC	SD/EM	-
2	CSE2282	Computational Thinking and AI Programming	3	0	0	3	3	ESC	SD/EM	-
3	CSE2283	Computational Thinking and AI Programming Lab	0	0	2	1	2	ESC	SD/EM	-
4	PET2106	Heat and Mass Transfer for Petroleum Engineering	3	0	0	3	3	PCC	SD	-
5	PET2107	Heat and Mass Transfer for	0	0	2	1	2	PCC	SD	ES

		Petroleum Engineering Lab								
6	PET2108	Fundamentals of Petroleum Reservoir Engineering	4	0	0	4	4	PCC	EM	-
7	PET2109	Fundamentals of Petroleum Reservoir Engineering Lab	0	0	2	1	2	PCC	EM	ES
8	PET2110	Fundamentals of Oil and Gas Production Technology	3	0	0	3	3	PCC	EM	-
9	PET2113	Fundamentals of Geophysical Logging Techniques	3	1	0	4	4	PCC	SD	-
10	PET2118	Methods for Oil and Gas Exploration	3	0	0	3	3	PCC	SD	-
11	CHE7601	Environmental Studies	-	-	-	0	0	MAC	-	-
12	APT4004	Aptitude Training - Intermediate	0	0	2	0	2	MAC	-	-
TOTAL			**22**	**02**	**08**	**27**	**32**			

Semester V										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Course**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				
1	MAT2305	Advanced Statistics for Petroleum Engineers	3	0	0	3	3	ESC	SD/EM	-
2	PET2114	Reservoir Fluid Mechanics	2	0	0	2	2	PCC	SD	-
3	PET2115	Reservoir Fluid Mechanics Lab	0	0	2	1	2	PCC	SD	ES
4	PET2116	Oil and Gas Surface Facility Design	2	0	0	2	2	PCC	EM	-
5	PET2117	Oil and Gas Surface Facility Design Lab	0	0	2	1	2	PCC	EM	ES
6	PET2119	Oil and Gas Well Test Analysis	3	0	0	3	3	PCC	EM	-
7	PETXXXX	Professional Elective Course-I	3	0	0	3	3	PEC	SD/EM	-
8	PETXXX	Professional	3	0	0	3	3	PEC	SD/EM	-

	X	Elective Course-II								
9	PET7001	Internship	-	-	-	2	0	PWC	SD/EM/EN	ES/HP
10	APT4006	Logical and Critical Thinking	0	0	2	0	2	MAC	-	-
TOTAL			**16**	**00**	**06**	**20**	**22**			

Semester VI										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Course**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				
1	APT4005	Aptitude for Employability	0	0	2	1	2	HSMC	EM	-
2	PET2111	Fundamentals of Instrumentation and Control Engineering	2	0	0	2	2	PCC	FC	-
3	PET2112	Fundamentals of Instrumentation and Control Engineering Lab	0	0	2	1	2	PCC	FC	ES
4	PET2120	Advanced Petroleum Reservoir Engineering	3	0	0	3	3	PCC	EM	HP
5	PET2121	Oil and Gas Downstream Operations	3	0	0	3	3	PCC	EM	-
6	PET2122	Oil and Gas Downstream Operations Lab	0	0	2	1	2	PCC	EM	ES
7	PET2123	Petroleum Reservoir Modelling and Simulation	2	0	0	2	2	PCC	EM	-
8	PET2124	Petroleum Reservoir Modelling and Simulation Lab	0	0	4	2	4	PCC	EM	ES
9	PET2125	Enhanced Oil and Gas Recovery Techniques	3	0	0	3	3	PCC	EM	-
10	PETXXXX	Professional Elective Course-III	3	0	0	3	3	PEC	SD/EM	-
11	PETXXXX	Professional Elective Course-IV	3	0	0	3	3	PEC	SD/EM	-

12	XXXXXX X	Open Elective Course-I	3	0	0	3	3	OEC	SD/EM	-
13	LAW760 1	Indian Constitution	-	-	-	-	-	MAC	-	-
		TOTAL	**22**	**00**	**10**	**27**	**32**			

Semester VII										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Course**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				
1	PPS3018	Preparedness for Interview	0	0	2	1	2	HSMC	EM	-
2	PET2126	Well Intervention Technologies	3	0	0	3	3	PCC	EM	HP
3	PET2127	Offshore Drilling and Petroleum Production Practices	3	0	0	3	3	PCC	SD	ES
4	PETXXX X	Professional Elective Course-V	3	0	0	3	3	PEC	SD/EM	-
5	PETXXX X	Professional Elective Course-VI	3	0	0	3	3	PEC	SD/EM	-
6	XXXXXX X	Open Elective Course-II	3	0	0	3	3	OEC	SD/EM	-
7	PET7101	Mini Project	-	-	-	4	0	PWC	SD/EM/EN	ES/HP
		TOTAL	**15**	**00**	**02**	**20**	**17**			

Semester VIII										
Sl. No.	**Course Code**	**Course Name**	**Credit Structure**				**CH**	**Type of Course**	**Type of Skills**	**Course Addresses To**
			L	**T**	**P**	**C**				
1	PET7301	Capstone Project	-	-	-	10	0	PWC	SD/EM/EN	ES/HP
		TOTAL	**0**	**0**	**0**	**10**	**0**			

23.Course Catalogue

Course Catalogue of all Courses are presented below.

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)

<table>
<tr><td>Course Code:
ENG1900</td><td colspan="4">Course Tittle: English for Technical Communication
Type of Course: 1] Humanities and Social Sciences including Management Course
2] Theory only</td><td>L-T-P-C</td><td>2</td><td>0</td><td>0</td><td>2</td></tr>
<tr><td>Version No.:</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites:</td><td colspan="9">+2 Level</td></tr>
<tr><td>Anti-requisites:</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description:</td><td colspan="9">This course enhances the technical communication skills of BTech students, focusing on clarity, precision, and conciseness in academic and professional settings. Students will learn to differentiate between general and technical communication, analyze technical content, develop structured writing skills, and deliver effective presentations. Through interactive activities such as TED Talk analyses, report writing, and presentation practice, the course provides hands-on experience for real-world applications. By the end, students will be equipped to communicate complex technical information effectively in various professional contexts.</td></tr>
<tr><td>Course Objective:</td><td colspan="9"></td></tr>
<tr><td>Course Outcomes:</td><td colspan="9">On successful completion of the course the students shall be able to:
CO1: Differentiate between general and technical communication,
CO2: Explain key reading comprehension techniques to enhance understanding of technical texts,
CO3: Write clear, concise, and well-structured technical reports and documents,
CO4: Deliver technical presentations and implement peer feedback for continuous improvement,
CO5: Explain ethical practices in digital communication for professional use.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1:</td><td colspan="2">Technical Communication</td><td>Quiz</td><td>Listening</td><td>09 Periods</td></tr>
<tr><td colspan="10">Topics:
Introduction to Communication,
Technical vs. General Communication,
Characteristics of technical communication,
Importance of clarity, precision, and objectivity
Activity:
• Watching TED Talks/videos to identify differences in technical and general vocabulary</td></tr>
<tr><td>Module 2:</td><td colspan="2">Technical Reading</td><td>Assignment</td><td>Reading</td><td>12 Periods</td></tr>
<tr><td colspan="10">Topics:
Reading Comprehension,
Note making & Notetaking,
Content Analysis
Activity:
• Reading technical articles and answering comprehension questions,
• Note making techniques</td></tr>
<tr><td>Module 3:</td><td colspan="2">Technical Writing</td><td>Assignment</td><td>Writing</td><td>12 Periods</td></tr>
<tr><td colspan="10">Topics:
Paragraph Writing,
Structure of a paragraph (topic sentence, supporting details, coherence),
Report Writing,
Structure of technical and project reports (Introduction, Methods, Results, Discussion)
Activity:
• Writing a structured paragraph on a technical topic,</td></tr>
</table>

• Writing project reports				
Module 4:	Professional Presentation	Presentation	Speaking	12 Periods

Topics:
Introduction to Presentation Skills,
Preparing a Presentation
- Structuring content (Introduction, Body, Conclusion),
- Designing effective slides (Text. visual aids, readability, and impact)

Delivering a Presentation
- Engagement techniques, Storytelling, narration, pitching ideas handling Q&A
- Conviction, commitment, generating interest through enthusiasm

Demonstration & Practice
- Giving presentations on topics based on their academic interest
- Evaluating and providing peer feedback

Activity:
- Analyze a real-world engineering issue and present solutions using a structured approach.

Targeted Application and Tools that can be used:
YouTube, Instagram, Quill Bot, Grammarly, & Padlet**.**

Textbooks:
T1. Gupta, R.C. Technical Communication. 2nd ed., Cambridge University Press, 2021.
T2. Lannon, John M., and Laura J. Gurak. Technical Communication. 15th ed., Pearson, 2022.

References:
R1. Gerson, Sharon J., and Steven M. Gerson. Technical Communication: Process and Product. 9th ed., Pearson, 2020.
R2. Lannon, John M., and Laura J. Gurak. Technical Communication. 15th ed., Pearson, 2022.
R3. Markel, Mike, and Stuart A. Selber. Technical Communication. 13th ed., Bedford/St. Martin's, 2020.

e-resources:
1. https://owl.purdue.edu/owl/subject_specific_writing/technical_writing.
2. https://journals.ieeeauthorcenter.ieee.org/.
3. https://www.stc.org/.
4. https://ocw.mit.edu/.https://www.ted.com/talks.

Skill Sets:
TopicsRelevantto**"Employability":**TeamworkandCollaboration,CriticalThinkingandProblem- Solving
TopicsRelevantto**"HumanValuesandProfessionalEthics":** Criticalreasoning,Inclusivityand Fairness

Catalogue prepared by:	Dr. Vinodhini Chinnaswamy, and Dr. T. Naresh Naidu, Department of Languages
Recommended by the Board of Studies on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **ENG2501**	**Course Title: Advanced English Communication** **Type of Course: 1] Humanities and Social Sciences including Management Course** **2] Theory only**	**L-T-P-C**	2	0	0	2
Version No.:	1.0					
Course Pre-requisites:	ENG1900 – English for Technical Communications					
Anti-requisites:	NIL					

Course Description:	This course is designed to equip students to enhance their communication abilities in Listening, Speaking, Reading, and Writing. The curriculum covers interpersonal communication principles, the art of speech writing and delivery (including impromptu speaking), strategic approaches to critical reading, the identification of logical fallacies, and persuasive writing. Furthermore, the course will introduce students to the potential of AI tools and the techniques of prompt engineering to elevate their communication skills in the digital age. Upon course completion, students will be well-prepared to communicate effectively and critically in both academic and professional environments.			
Course Objective:	To equip students with advanced communication skills by engaging them in structured speech writing, spontaneous speaking exercises, and the practical application of prompt engineering. The course fosters critical thinking, creativity, and adaptability in both human and AI-assisted communication contexts.			
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recognize the elements of interpersonal and cross-cultural communication to address communication challenges effectively, CO2: Demonstrate the ability to deliver structured and impromptu speeches using effective speaking techniques, CO3: Interpret textual and visual materials using critical reading strategies to evaluate arguments, logic, and persuasion, CO4: Produce persuasive and analytical essays using effective argumentation techniques and structured writing strategies.			
Course Content:				
Module 1:	Foundations of Effective Communication	CaseStudies/Role play	Cross-Cultural Competency	08 Sessions
Topics: • FundamentalsofInterpersonalCommunication • Verbal,Non-verbal,andParaverbal communication • Culturaldimensionstheory(Hofstede'sCulturalDimensions) • ActiveListeningTechniques				
Module 2:	Mastering Speech Delivery	JAM	Public Speaking Confidence	08 Sessions
Topics: • Introduction to Prompt Engineering • Speech Preparation and Organization • Techniques for Effective Impromptu Speaking • Practice Speech Delivery				
Module 3:	Critical Reading and Logical Analysis	Worksheet	Critical Thinking and Analysis	07 Sessions
Topics: • Critical Reading Strategies: Contextualizing, Figurative Language, Evaluating Logic of an Argument, Recognizing Emotional Manipulation, Analysing Visuals • Recognizing Logical Fallacies: Slippery Slope, False Dilemma, Post Hoc, Hasty Generalization, Ad Hominem, Straw Man, Bandwagon, No True Scotsman, Red Herring, Appeal to Authority, Sunk Cost, Appeal to ignorance				
Module 4:	WritingEffective Arguments	Assignment	ClearandCoherent Writing	07 Sessions
Topics: • UnderstandingCritical Writing • Building Arguments (Pathos,Ethos, Logos • TechniquesforPersuasion				
Targeted Application and Tools that can be used: Quizziz, Chatgpt, Gemini, Youtube, Instagram, Quillbot, Grammarly, Padlet				
References: R1. Adler, R. B., Rodman, G., &DuPré, A. (2019). Understanding human communication (14th ed.). Oxford University Press. R2. Moore, B. N., & Parker, R. (2020). Critical thinking (13th ed.). McGraw-Hill Education. R3. DeVito, J. A. (2019). The interpersonal communication book (15th ed.). Pearson. R4. Ting-Toomey, S., & Dorjee, T. (2018). Intercultural competence: A model for teaching and assessing cross-				

cultural communication. Journal of Intercultural Communication, 47(2), 213–229. https://doi.org/10.1016/j.jicc.2018.03.004
R5. https://www.ted.com/

Skill Sets:
Topics Relevant to **"Employability":** Teamwork and Collaboration, Critical Thinking and Problem- Solving
Topics Relevant to **"Human Values and ProfessionalEthics"**: Critical reasoning, Inclusivity and Fairness

Catalogue prepared by:	Dr. Tychicus David, Department of Languages
Recommended by the Board of Studies on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **APT4005**	**Course Title:** **Aptitude For Employability** **Type of Course:** **1] Humanities and Social Sciences including Management Course** **2] Practical only**			**L-T-P-C**	0	0	2	1
Version No.:	1.0							
Course Pre-requisites:	Students should have the basic concepts of Quantitative aptitude, Verbal ability along with its applications in real life problems.							
Anti-requisites:	NIL							
Course Description:	This course is designed to enable the students to enhance their skills in quantitative aptitude and verbal ability skills.							
Course Objective:	The objective of the course is to familiarize the learners with concepts in Quantitative Aptitude and Verbal ability through problem solving techniques suitable for their career development.							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recall all the basic mathematical concepts, CO2: Identify the principle concept needed in a question, CO3: Solve the quantitative and logical ability questions with the appropriate concept.							
Course Content:								
Module 1:	Quantitative Ability	Lab: 10 Hrs.	Platform Assessment: 10 Hrs.	20 Hours				
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss, Time Speed and Distance, Simple Interest and Compound Interest, Probability, Permutation and Combination.								
Module 2:	Verbal Ability	Lab: 5 Hrs.	Platform Assessment: 5 Hrs.	10 Hours				
Topics: Parts of Speech, Subject Verb Agreement, Spotting Error, Cloze Test, Verbal Analogies, Reading Comprehension, Idioms & Phrases, Para Jumbles								
Evaluation: **Continuous Evaluation** • Topic wise evaluation								
Textbooks: 1. Fast track objective by Rajesh Verma 2. R S Aggarwal								

3. S.P Bakshi	
References: 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos	
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Quantitative and reasoning aptitude for **Skill Development** through **Problem Solving Techniques.** This is attained through assessment component mentioned in course handout.	
Catalogue prepared by:	Faculty Members of the Department of Learning and Development
Recommended by the Board of Studies on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PPS3018**	**Course Title: Preparedness for Interview** **Type of Course: 1] Humanities and Social Sciences including Management Course** **2] Practical only**		**L-T-P-C**	0	0	2	1
Version No.:	1.0						
Course Pre-requisites:	Students are expected to understand Basic English. Students should have desire and enthusiasm to involve, participate and learn.						
Anti-requisites:	NIL						
Course Description:	This course is designed to enable students to understand soft skills concepts to be corporate ready. The modules are set to improve self-confidence, communicate effectively and Prepare for the Interview to assist in employability. It helps the students to get a glimpse of the acceptable corporate readiness and equip them with the fundamental necessities of being able to confidently deal with the highly competitive corporate environment and helps in crafting different types of resumes. The pedagogy used will be group discussions, flipped classrooms, continuous feedback, role-play and mentoring.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of "Preparing for Interview" and attain **Skill Development**through **Participative Learning Techniques**.						
Course Outcomes:	On successful completion of this course the students shall be able to: CO1: Develop professional Resumes, CO2: Illustrate Resumes effectively, CO3: Apply skills and knowledge learnt for active and effective Group Discussions and Interview						
Course Content:							
Module 1:	Resume Building	Classroom Activity		10 Hours			
Topics: Resume structure, use of templates, Do's and Don'ts, ATS methods, Cover Letter and Video Resume **Activity:** Real world scenarios							
Module 2:	Group Discussion	Mock G D		9 Hours			
Topics: Group discussion as a placement process, GD techniques like Keyword. SPELT & POV of affected parties. Do & Don't of GD, Case-lets and topics for GD, practice session and evaluation **Activity:** Real world scenarios							
Module 3:	Personal Interview	Grooming checks + Evaluation + Mock Interview + Role Play		9 Hours			

Topics: Placement process, Different interview rounds, HR interviews, Interview questions and desired answers, Different types of interviews, Do's and Don'ts. **Activity:** Role Play & Real-world scenario				
Module 4:	Recap/Revision /Feedback Session	Practice Sessions		2 Hours
Targeted Application & Tools that can be used: 1. TED Talks 2. You Tube Links 3. Role Play activities				
Project work/Assignment: Mention the Type of Project /Assignment proposed for this course Continuous Individual Assessment				
Textbooks:				
References:				
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Art of Presentation and Group Discussion for **Skill Development** through **Participative Learning Techniques**. This is attained through assessment Component mentioned in course handout.				
Catalogue prepared by:	Faculty Members of the Department of Learning and Development			
Recommended by the Board of Studies on:				
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **DES1146**	**Course Title: Introduction to Design Thinking** **Type of Course: 1] Humanities and Social Sciences including Management Course** **2] Theory only**	**L-T-P-C**	1	0	0	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The course aims to introduce concepts of Design thinking and orient the students towards importance of design thinking, its definition and applications keeping Human Centric Design as pivotal. Emphasizing how it can be applied to solve complex problems, innovate, and create user-centered solutions. Students will engage in hands-on learning through exercises, case studies, and projects, fostering creative problem-solving skills and an iterative approach to design. By the end of the course, students will be equipped to apply the design thinking process to various fields, including product development, service design, business innovation, and social entrepreneurship and will have gained the foundational knowledge and practical experience to approach real-world problems using design thinking.					
Course Objective:	The objective of the course is promoting **Entrepreneurship** for students by using **Participative Learning Techniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe Design thinking essentials, CO2: Discover grey areas in chosen designs, CO3: Interpret design flaws with possible solutions.					
Course Content:	All assignments and projects must be developed using the reference materials available from the PU e-resource database – JSTOR, EBSCO, Library OPAC, NPTEL Videos, etc.					

Module 1:	Introduction to Design Thinking	Visual Journal, Case studies, User research, context-specific assignment/project	Visual output generation - Visual Journal and narrative and Prototype	03 Sessions

			development	
Topics: 1) Definition and introduction to Design Thinking (Evolution) 2) Understanding Design Thinking-Conceptual and contextual meaning of Design Thinking				
Module 2:	Design Flaws and Interpretations	Visual journal. Documentation (Project reports) Prototypes of Major & Minor Projects	Visual output generation, narrative development & Prototypes of Products/processes	12 Sessions
Topics: 1) Steps in Design Thinking (SCAMPER, Double Diamond) 2) IDEO tool kit- EDIPT 3) D-School HCD principles 4) Problems. Ill-defined, well defined 5) Definition of design flaw and its Identification-Discovering a bottleneck in process/Product/Understanding 6) Observational studies on design flaws in various areas of application with possible solutions - Two case studies (Major and Minor) 7) Purposeful designs				
Targeted Application & Tools that can be used: 1) Design ideation and concept development for innovative projects—SCAMPER/EDIPT 2) Double diamond concept.				
Textbooks: Thinking Design by S Balaram. New Delhi [India]: Sage Publications Pvt. Ltd. 2010. eBook., Database: eBook Collection (EBSCOhost) https://puniversity.informaticsglobal.com:2284/ehost/detail/detail?vid=6&sid=18ab1f43-1f92-4d02-ae2e-a9c06dc06d8c%40redis&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#AN=354920&db=nlebk				
References: Design Thinking by Clarke, Rachel Ivy. Series: Library Futures, Vol. 4. Chicago: ALA Neal-Schuman. 2020. eBook., Database: eBook Collection (EBSCOhost)				
Skill Sets:				

Catalogue prepared by:	Dr. Ashok A Itagi, Presidency School of Design
Recommended by the Board of Studies on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **FIN1002**	**Course Title: Essentials of Finance** **Type of Course: 1] Humanities and Social Sciences including Management Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	This course is designed to be accessible to all students, regardless of their prior financial knowledge.					
Anti-requisites:	NIL					
Course Description:	This course is designed to equip students with a foundational understanding of key financial concepts and principles. It will enable them to comprehend the core functions of finance, delve into the intricacies of financial management within organizations, and gain insights into the fundamental aspects of taxation. The course aims to develop students' abilities to interpret financial statements, evaluate investment opportunities, understand capital structure decisions, and navigate the basics of tax implications.					
Course Objective:	Upon successful completion of this course, students will be able to: • Understand the basic forms of business organization and their financial implications,					

	• Understand the fundamental principles and concepts that influence financial decision-making in various contexts, • Analyse and interpret financial statements to assess the financial health and performance of an organization. • Identify income under various heads of income as per Income Tax Act, 1961 and determine the tax liability.			
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Understand the basic concepts of finance and financial markets and organizations, CO2: Apply and interpret financial information for business decision making, CO3: Identify various heads of income and deduction under Income Tax Act, 1961.			
Course Content:				
Module 1:	Introduction to Finance	Assignment / Quiz	Numerical Solving Task	10 Periods
Topics: Definition and Scope of Finance, Areas of Finance: Corporate Finance, Investments, Financial Institutions, International Finance; Types of Financial Markets: Money Markets vs. Capital Markets, Primary vs. Secondary Markets; Forms of Business Organization and Financial Goals: Shareholder Wealth Maximization vs. Profit Maximization; Understanding Financial Statements: Balance Sheet and Income Statement- Simple Numerical.				
Module 2:	Financial Management	Assignment / Quiz	Numerical Solving Task	18 Periods
Topics: Capital Budgeting Decisions: Payback Period, Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR); Leverage- Basic Numerical; Capital Structure Decisions: Optimal Capital Structure, Trade-off Theory of Capital Structure; Cost of Capital: Equity, Debt, WACC; Dividend Policy: Factors influencing Dividend Policy.				
Module 3:	Taxation	Assignment / Quiz	Numerical Solving Task	17 Periods
Topics: Principles of a Good Tax System: Equity, Certainty, Convenience, Economy; Direct vs. Indirect Taxes; Residential Status of an Individual- Basic Problems; Heads of Income; Salary, House Property- Basic Numerical; Deductions under Chapter VI-A; Computation of Taxable Income and Tax Liability; E-Filing procedure.				
Targeted Application & Tools that can be used: Textbooks, PPT, Spreadsheet Software (e.g., Microsoft Excel), Official Website of Income Tax Department.				
Project Work/ Assignment: **1. Presentation:** There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same. **2. Case Study:** - At the end of the course students will be given a 'real-world' cases like business models of successful companies or tax evasion by reputed companies on which they have to come up with detailed analysis and assessment.				
Textbooks: T1. Dr. Vinod K. Singhania & Dr. Monica Singhania. (Latest Assessment Year Edition). Students' Guide to Income Tax including GST. Taxmann Publications. T2: Pandey, I. M. (2025). Financial Management. Vikas Publishing House.				
References: R1: Bhole, L.M., & Mahakud, J. (Current Edition). Financial Institutions and Markets: Structure, Growth and Innovations. McGraw Hill Education India. R2: Mehrotra, H.C., & Goyal, S.P. (Latest Assessment Year Edition). Income Tax Law & Practice. Sahitya Bhawan Publications. R3: Gordon, E., & Natarajan, K. (Current Edition). Financial Markets and Services. Himalaya Publishing House. **e-Resources:** 1. https://presidencyuniversity.linways.com 2. https://onlinecourses.nptel.ac.in/noc24_ec01/preview 3. https://www.incometax.gov.in/iec/foportal/				
Skill Sets: Topics relevant to **"SKILL DEVELOPMENT":** This course is designed to provide practical financial skills through **Participative Learning Techniques**. Students will engage in performing suitable calculations to determine financial parameters (e.g., time value of money, investment returns, tax liabilities) and analysing financial statements to assess organizational performance and make informed decisions.				

Catalogue prepared by:	Dr. Amit Saha, Presidency School of Commerce
Recommended by the Board of Studies on:	6th Meeting of the Board of Studies held on 5th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

BASIC SCIENCE COURSES (BSC)

ENGINEERING SCIENCE COURSES (ESC)

Course Code: **EEE1200**	**Course Title: Basics of Electrical and Electronics Engineering** **Type of Course: 1] Engineering Science Course 2] Theory only**			**L-T-P-C**	3 0 0 3	
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This is a fundamental Course which is designed to know the use of basics of electrical and electronics engineering principles occurs in various fields of Engineering. The course emphasises on the characteristics and applications of electrical and electronic devices. The course also emphasizes on the working, analysis and design of electrical circuits using both active & passive components. Additionally, this course creates a foundation for the future courses such as Electrical machines, power system, power electronics Linear Integrated Circuits, Analog Communication and Digital Communication etc.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain **Skill Development** through **Participative Learning**T**echniques**.					
Course Outcomes:	On successful completion of this course the students shall be able to: CO1: Apply basic laws of Electrical Engineering to compute voltage, currents and other parameters in the circuits. CO2: Discuss various fundamental parameters appearing in the characteristics of semiconductor devices and their applications. CO3: Summarize the operations of different biasing configurations of BJTs and amplifiers. CO4: Discuss the performance characteristics and applications of various electrical Machines.					
Course Content:						
Module 1	Introduction to Electrical Circuits	Assignment/ Quiz	Numerical solving Task	10 Sessions		
DC Circuits: Concept of Circuit and Network, Types of elements, Network Reduction Techniques- Series and parallel connections of resistive networks, Star–to-Delta Transformations, Mesh Analysis, Nodal Analysis, Numerical examples. **AC Circuits:** Fundamentals of single phase circuits - Series RL, RC and R-L-C Circuits, Concept of active power, reactive power and Power factor, Numerical examples. Introduction to three phase system and relation between line and phase values in Star & Delta connection, Numerical examples.						
Module 2	Semiconductor and Diode Applications	Assignment/ Quiz	Memory Recall based Quizzes	10 Sessions		

Mass Action Law, Charge densities in a semiconductor, Types of SC, Junction diodes -Ideal and practical behaviour, Modelling the Diode Forward Characteristic, and Diode applications like rectifiers, Zener diode, characteristics and its applications like voltage regulator.

Module 3	Transistors and its Applications	Assignment/ Quiz	Memory Recall-based Quizzes	10 Sessions

Transistor characteristics, Current components, BJT Configurations (CB, CC, CE configurations) and their current gains. Operating point, Biasing, Fixed Bias, and load line analysis. Single Stage amplifier. JFET (Construction, principal of Operation and Volt –Ampere characteristics). Pinch- off voltage, Comparison of BJT and FET. MOSFET (Construction, principal of Operation and symbol), MOSFET characteristics in Enhancement and Depletion modes.

Module 4	Fundamentals of Electrical Machines	Assignment/ Quiz	Numerical solving Task	10 Sessions

Electrical Machines: Single phase transformers: principle of operation and EMF equation, Numerical examples. DC Motor: principle of operation, Back EMF, torque equation, Numerical examples. AC Motor: Principle operation of Induction Motors and its Applications.

Self-Learning Topics:

Clipping and clamping circuits, Stabilization Techniques, Voltage divider bias and its stability factor, Multistage amplifier, Darlington pair.

Special Machines: Introduction to special electrical machines and its applications.

Targeted Application & Tools that can be used:

Targeted Applications: Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: Multisim/ P Spice

Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis..

Project Work/ Assignment:

1. Article review: At the end, of course an article topic will be given to an individual or a group of students. They need to refer the library resources and write a report on their understanding about the assigned article in appropriate format.

2. Presentation: There will be a group presentation, where the students will be given a topic. They will have to explain/demonstrate the working and discuss the applications for the same.

3. Case Study: - At the end of the course students will be given a 'real-world' application based circuits like Power Amplifier, Signal/Function Generator etc. as a case study. Students will be submitting a report which will include Circuit Diagrams, Design, Working Mechanism and Results etc. in appropriate format

Textbooks:

1. Kothari D. P. & Nagrath I. J., "Basic Electrical and Electronics Engineering", Tata McGraw-Hill
2. Education
3. Theraja B.L. and Theraja A.K., "A Textbook of Electrical Technology: Basic Electrical Engineering" in S.I. System of Units, 23rd ed., New Delhi: S. Chand, 2002.
4. A.P.Malvino, Electronic Principles,7thEdition, Tata McGraw Hill,2007
5. J. Millman, C. C. Halkias and C. D. Parikh, "Millman's Integrated Electronics", McGraw Hill Education, 2nd Edition.
6. Basics of Electrical & Electronics Laboratory Manual.

References:

1. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
2. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
3. K Uma Rao, A Jaya Lakshmi, "Basic Electrical engineering" IK International publishing house Pvt. Ltd
4. R. L. Boylestad and L. Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education India 7th Edition.
5. A K. Maini, V. Agrawal, "Electronic Devices & Circuits", Wiley, 2nd Edition
6. A.S Sedra, K. C. Smith, "Microelectronic Circuits", Oxford University Press, 6th Edition

Online Resources (e-books, notes, ppts, video lectures etc.):

1. https://presidencyuniversity.linways.com
2. https://www.digimat.in/nptel/courses/video/108105112/L01 “Fundamentals of Electrical Engineering-Basic Concepts, Examples”
3. Seminar Topic: https://nptel.ac.in/courses/108/105/108105153/ “Electrical Measurements”
4. Video lectures on “Electronic Devices” by Prof. Dr. A. N. Chandorkar, IIT Bombay http://www.satishkashyap.com/2013/03/video-lectures-on-electron-devices-by.html
5. Video lectures on “Analog Electronics” by Prof. S.C. Dutta Roy, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/
6. Video lectures on “Diodes”, by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

E-content:

1. “Introduction to Electrical Machines https://nptel.ac.in/courses/108/102/108102146/”
   M. -Y. Kao, H. Kam and C. Hu, "Deep-Learning-Assisted Physics-Driven MOSFET Current Voltage Modeling," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 974-977, June 2022, doi: 10.1109/LED.2022.3168243 https://ieeexplore-ieee-org-resiuniv.knimbus.com/document/9758727
2. F. Bonet, O. Aviñó-Salvadó, M. Vellvehi, X. Jordà, P. Godignon and X. Perpiñà, "Carrier Concentration Analysis in 1.2 kV SiC Schottky Diodes Under Current Crowding," in IEEE Electron Device Letters, vol. 43, no. 6, pp. 938-941, June 2022, doi: 10.1109/LED.2022.3171112. https://ieeexplore-ieeeorg- presiuniv.knimbus.com/document/9764749
3. M. Chanda, S. Jain, S. De and C. K. Sarkar, "Implementation of Subthreshold Adiabatic Logic for Ultralow-Power Application," in IEEE Transactions on Very Large Scale Integration (VLSI) Systems, vol. .23, no. 12, pp. 2782-2790, Dec. 2015. https://ieeexplore.ieee.org/document/7018053
4. R. Raut and O. Ghasemi, "A power efficient wide band trans-impedance amplifier in submicron CMOS integrated circuit technology," 2008 Joint 6th International IEEE Northeast Workshop on Circuits and Systems and TAISA Conference, 2008, pp. 113-116, doi: 0.1109/NEWCAS.2008.4606334. https://ieeexplore.ieee.org/document/4606334

Topics relevant to “SKILL DEVELOPMENT”:
Performing suitable experiments to compute the electric circuit parameters, performance operation of machines, and operation of semiconductor devices for **Skill Development** through **Participative Learning Techniques.** This is attained through assessment component mentioned in course plan.

Catalogue prepared by	Dr. Ajay Kumar Maurya
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **EEE1250**	**Course Title: Basics of Electrical and Electronics Engineering Lab** **Type of Course: 1] Engineering Science Course 2] Lab only**	**L-T-P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	**NIL**					
Anti-requisites:	**NIL**					
Course Description:	This fundamental laboratory provides an opportunity to validate the concepts taught in the basics of electrical and electronics engineering and enhances the ability to visualize real system performance, using both hardware and simulation tools.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Basics of Electrical and Electronics Engineering and attain **Skill Development** through **Experiential Learning Techniques**.					

Basic skill sets required for the laboratory:	**The students shall be able to develop:** **1) An attitude of enquiry.** **2) Confidence and ability to tackle new problems.** **3) Ability to interpret events and results.** **4) Ability to work as a leader and as a member of team.** 5) Assess errors and eliminate them. **6) Observe and measure physical phenomenon.** **7) Write Reports.** **8) Select suitable equipment, instrument and materials.** 9) Locate faults in systems. 10) Manipulative skills for setting and handling equipment. **11) The ability to follow standard test procedures.** **12) An awareness of the need to observe safety precautions.** To judge magnitudes without actual measurement.
Course Outcomes:	**On successful completion of the course the students shall be able to:** CO1: Apply basic laws of Electrical Engineering to compute voltage, currents, and other parameters in the circuits. CO2: Demonstrate the working of electrical machines to observe performance characteristics. CO3: Demonstrate the working of electronic circuits to obtain the V-I Characteristics of various semiconductor devices. CO4: Sketch the characteristics and waveforms relevant to standard electrical and electronic circuits.
Course Content:	**List of Laboratory Tasks:** **Experiment No 1:** Verification of KVL and KCL for a given DC circuit. **Level 1:** Study and Verify KVL and KCL for the given electrical Circuit. **Level 2:** For the same circuit considered in level 1, perform the simulation using NI LabVIEW/Multisim/MATLAB. **Experiment No 2:** Analyse AC series circuits – RL, RC and RLC . **Level 1:** Conduct an experiment to perform and verify the impedance, current and power of Series RL and RC circuits **Level 2:** Conduct an experiment to perform and verify the impedance and current of RLC series circuits. **Experiment No 3:** Calculation of power and power factor of the given AC Circuit. **Level 1:** Conduct an experiment to measure the power and power factor for given resistive load. **Level 2:** Conduct an experiment to measure the power and power factor for given inductive load. **Experiment No 4:** Perform the experiments on given Transformer. **Level 1:** Verify the EMF equation of a transformer and compute the voltage transformation ratio. **Level 2:** Study the effect of load on the secondary side of the transformer and verify the EMF equation under load conditions. **Experiment No 5:** Load test on DC shunt motor **Level 1:** Conduct load test on DC shunt motor and find its efficiency at different loads **Level 2:** Conduct load test on DC shunt motor and plot the performance characteristics. **Experiment 6:** Study of PN-Junction Diode Characteristics in Forward and Reverse Bias Conditions. **Level 1:** Carry out an experiment to plot VI Characteristics and hence find the cut-in voltage on forward characteristics for the Silicon P-N Junction diode. **Level 2:** Carry out an experiment to plot Load Line Characteristics of P-N Junction diode. **Experiment No. 7:** To observe the output waveform of half wave and full

	wave rectifier circuit and compute ripple factor and efficiency **Level 1:** Identify the components required for a rectifier circuit, rig up the circuit, and sketch the output waveforms without filter. **Level 2:** Rig up the rectifier circuit with RC filter, observe the output waveforms, determine the efficiency and ripple factor. **Experiment 8:** Study of Zener Diode Characteristics. **Level 1:** Carry out an experiment to plot VI Characteristics of Zener Diode and hence find the Zener voltage on reverse characteristics. **Level 2:** Assemble the circuit for a Zener Diode as Voltage Regulator. **Level 2:** Given a sinusoidal input of 10 V p-p, implement a positive / negative clipper with output clipped at 2 V. **Experiment 9:** Study the characteristics of the NPN transistor in common emitter configuration. **Level 1:** To study the input and output characteristics of the NPN transistor in common emitter configuration. **Level 2:** Identify the components required to implement an emitter follower circuit. Rig up the circuit and observe the variations in output waveform with respect to the variations in input waveform. **Experiment 10:** To Implement RC Coupled amplifier using a BJT. **Level 1**: To study, analyze and implement the common Emitter amplifier and observe their results for DC Analysis. **Level 2**: To study, analyze and implement the common Emitter amplifier and observe their results for AC Analysis.

Targeted Application & Tools that can be used:

Targeted Applications: Application Area includes all electrical and electronic circuits (power supply unit, regulator unit, embedded devices, hardware electronics etc.). The students will be able to join a profession which involves basics to high level of electronic circuit design.

Professionally Used Software: Multisim/ P Spice

Besides these software tools hardware equipment such as Multimeters, Function Generators, Power Supplies, Oscilloscopes etc., can be used to perform component/circuit testing and analysis.

Course Material

1. Basics of Electrical and Electronics Engineering Laboratory Manual, Presidency University, Bengaluru.

Textbooks:

2. Kothari D. P. & Nagrath I. J., “Basic Electrical and Electronics Engineering”, Tata McGraw-Hill

References:

3. John Hiley, Keith Brown and Ian McKenzie Smith, "HUGHES Electrical and Electronic Technology", 10th Edition (Indian Edition published by Dorling Kindersley), Pearson,2011
4. Samarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", 2nd Edition, Prentice Hall India, 2007.
5. K Uma Rao, A Jaya Lakshmi, “Basic Electrical engineering” IK International publishing house Pvt. Ltd
6. R. L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education India 7th Edition.
7. A K. Maini, V. Agrawal, “Electronic Devices & Circuits”, Wiley, 2nd Edition
8. A.S Sedra, K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 6th Edition

Online Learning Resources:

9. https://presidencyuniversity.linways.com
10. https://www.digimat.in/nptel/courses/video/108105112/L01 “Fundamentals of Electrical Engineering-Basic Concepts, Examples”
11. Video lectures on “Diodes”, by Prof. Chitralekha Mahanta, IIT Guwahati, https://nptel.ac.in/courses/117/103/117103063/

Topics relevant to “SKILL DEVELOPMENT”:

All the experiments which are listed are for**Skill Development** through **Experiential Learning Techniques**. This is attained through the assessment component mentioned in course handout.

Catalogue prepared by	Dr. Ajay Kumar Maurya
Recommended by the Board of Studies on	
Date of Approval by the Academic Council	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET1502**	**Course Title:** **Basics of Petroleum Engineering Calculations** **Type of Course:** **1] Engineering Science Course** **2] Theory only**		**L-T-P-C**	2	0	0	2
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	This course enables students to apply fundamental calculation techniques to solve practical problems in reservoir and production engineering. Using scientific principles such as gas laws, thermodynamics, and fluid flow, students will interpret graphs and perform calculations involving production rates, pressure, and fluid properties. Emphasis is placed on applying analytical methods to optimize production and manage reservoirs effectively, fostering practical decision-making skills essential for petroleum engineering applications.						
Course Objective:	The objective of the course is to familiarize learners with fundamental petroleum engineering calculations and scientific principles and attain **Skill Development** through **Participative Learning Techniques.**						
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Explain the roles and interrelationships of oilfield and SI units, CO2: Apply the principles of ideal and real gas behavior to solve basic reservoir engineering problems, CO3: Solve basic fluid flow related problems, CO4: Demonstrate the principles of conservation of mass and energy, along with enthalpy and entropy concepts, CO5: Analyze to thermodynamic diagrams and graphical tools related to petroleum processes.						
Course Content:							
Module 1:	Petroleum Units, Conversions, and Material Calculations	Quiz / Assignment	Numerical Solving	08 Periods			
Topics: Introduction to Petroleum Engineering Units (Field vs SI), Unit Conversion Techniques (Pressure, Volume, Temperature, etc.), Area, Volume, and Thickness Calculations, Basics of API Gravity and Conversion to Specific Gravity, Dimensional Analysis, Basic Stoichiometry Applications, Reservoir vs Surface Volume: Concept of Shrinkage.							
Module 2:	Reservoir and Flow Calculations	Assignment	Numerical Solving	11 Periods			
Topics: Ideal and Real Gas Concepts in Reservoir Engineering, Rate and Gradient Calculations in Reservoir Systems, Diffusion and Osmosis in Porous Media, Flow Rate Calculations: Oil, Gas, Water, Introduction to Water Cut and Gas-Oil Ratio (GOR), Well Production Rate Concept (Q = A × v), Stroke Length and Pump Speed Basics.							
Module 3:	Thermodynamics and Graph-Based Analysis	Assignment	Numerical Solving	11 Periods			
Topics: Fundamentals of Energy and Heat in Petroleum Systems, Conservation of Mass and Energy, Enthalpy and							

Entropy: Concepts and Applications, Sign Conventions in Thermodynamics, Condensation and Evaporation in Petroleum Processes, Pressure Units: Absolute, Gauge, and Vacuum, Introduction to Thermodynamic Diagrams, Graphical Interpretation: Log-Log, Semi-Log, and Production Data.
Targeted Application and Tools that can be used: **Application Area:**Reservoir Data Analyst, Production Support Engineer, Field Operations Intern **Tools:**MS Excel (for basic engineering calculations, data handling, and graphical analysis)
Textbooks: T1: Moshood Sanni, 2018, Petroleum Engineering: Principles, Calculations, and Workflows, ISBN:9781119387947 |Online ISBN:9781119387985 |DOI:10.1002/9781119387985, Geophysical Monograph Series. T2. John R. Fanchi, Richard L. Christiansen, 2016 Introduction to Petroleum Engineering Hardcover, Wiley. T3. Richard M. Felder, Ronald W. Rousseau, 2004, Elementary Principles of Chemical Processes, John Wiley &Sons.
Reference Book(s): R1: Cenk Temizel, Tayfun Tuna, Mehmet Melih Oskay, Luigi A. Saputelli 2019 Formulas and Calculations for Petroleum Engineering, Gulf Professional Publishing. **e-resources:** 1. Link for Knimbus remote login: https: / / presiuniv.knimbus.com
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Core petroleum engineering calculations, graph interpretation, and basic production and reservoir analysis for**Skill Development** through **Participative Learning Techniques**. This is attained through the assessment components outlined in the course plan.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Amolina Doley, Dr. Niladri Shekhar Samanta, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

PROFESSIONAL CORE COURSES (PCC)

Course Code: **PET1201**	**Course Title: Fundamentals of Oil and Gas Operations** **Type of Course: 1] Professional Core Course 2] Theory Only**	**L-T-P-C**	2	0	0	2
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The course aims to give a comprehensive overview of the Oil and Gas industry, providing a foundation for understanding advanced petroleum engineering courses. It will cover key concepts such as oil and gas production, reservoir energy and dynamics, petroleum deposit drainage, development systems, and well operation techniques. Students will gain an understanding of the field life cycle and learn about the interdisciplinary approaches to petroleum field development and operation.					
Course Objective:	The objective of the course is to familiarize the learners with the fundamental concepts of Oil and Gas Operations and attain **Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	Upon successful completion of the course the students shall be able to: CO1: Describe the fundamentals of the energy business, including energy resources, global energy demand and supply, energy security, key stakeholders, and the risks associated with the oil and gas industry, CO2: Explain the exploration and drilling process by describing geological and geophysical exploration techniques, drilling rigs and their components, well-					

	site organization, drilling operation chronology, the reservoir–wellbore interface, and onshore and offshore drilling techniques, CO3:Apply the principles of reservoir engineering to select appropriate production methods, well operation techniques, and field development strategies throughout the reservoir life cycle, CO4:Determine suitable refining, transportation, and storage practices for efficient petroleum operations, CO5: Employ environmental management and sustainable practices to mitigate the impacts of petroleum operations.			
Course Content:				
Module 1:	Overview of the Global Energy Industry	Assignment / Quiz	Literature Review	07 Periods
Topics: Introduction to the Energy Business, Energy Resources: Types and Distribution, Global Energy Demand and Supply Dynamics, Energy Security: Concepts and Importance, Key Players in the Oil and Gas Industry, Risks in the Oil and Gas Industry: Economic, Environmental, and Geopolitical.				
Module 2:	Fundamentals of Exploration and Drilling Operations	Assignment / Quiz	Poster Presentation	08 Periods
Topics: Geological and Geophysical Exploration Techniques, Drilling Rigs and heir Components, Well Site Organization and Roles, Chronology of Drilling Operations, Reservoir-Wellbore Interface, Onshore and Offshore Drilling Techniques.				
Module 3:	Basics of Petroleum Reservoir Engineering and Production Operations	Assignment / Quiz	Case Study	08 Periods
Topics: Basics of Reservoir Engineering, Production Methods: Primary, Secondary, and Enhanced Recovery, Well Operation Techniques, Field Life Cycle and Development Strategies.				
Module 4:	Petroleum Processing Facilities and Environmental Impact	Team Activity / Quiz	Group Discussion	07 Periods
Topics: Overview of Petroleum Refining Processes, Transportation and Storage of Oil and Gas, Environmental Impact of Petroleum Operations, Sustainable Practices in Petroleum Operations.				
Targeted Applications and Tools that can be used: **Applications:** Oil and Gas Industry **Tools:**MS Office				
Textbooks: T1: Tarek Al-Arbi Omar Ganat, Technical Guidance for Petroleum Exploration and Production Plans, Springer International Publishing, 2020. T2: John R. Fanchi, and Richard L. Christiansen, Introduction to Petroleum Engineering, Wiley, 2016. T3: Samir Dalvi, Fundamentals of Oil & Gas Industry for Beginners, Notion Press, 1st Edition, 2015. T4: Robert F. Mitchell, and Stefan Miska, Fundamentals of Drilling Engineering, Society of Petroleum Engineers, 2011. T5: Tarek Ahmed, Reservoir Engineering Handbook, Elsevier Science, 2010. T6: Mohamed A. Fahim, Taher A. Al-Sahhaf, and Amal Elkilani, Fundamentals of Petroleum Refining, Elsevier Science, 2009.				
Reference Books: R1: Vaclav Smil, Energy - A Beginner's Guide, Oneworld Publications, 2017. R2: James G. Speight, Handbook of Offshore Oil and Gas Operations, Elsevier Science, 2014. R3: Ronald E. Terry, and J. Brandon Rogers, Applied Petroleum Reservoir Engineering, Pearson Education, 2014. R4: Havard Devold, Oil and Gas Production Handbook - An Introduction to Oil and Gas Production, Lulu Press, 2013. R5: Daniel Yergin, The Prize - The Epic Quest for Oil, Money & Power, Simon & Schuster UK, 2012. R6: David S. J. Jones, and Peter R. Pujadó, Handbook of Petroleum Processing, Springer, 2006.				
Case Study:				

1. Thermal EOR Souring Prediction Tool - Technology for Cost Reduction; a Case Study from Thermal EOR Asset, Sultanate of Oman: https://onepetro.org/SPEOGWA/proceedings-abstract/18OGWA/2-18OGWA/D021S008R001/216024 2. Model-Based Life-Cycle Optimization for Field Development and Management Integrated with Production Facilities: https://onepetro.org/SPEEURO/proceedings-abstract/22EURO/2-22EURO/D021S003R004/48567 **e-Resource:** 1. Link for PU e-resources: https://presiuniv.knimbus.com/user#/home 2. Introduction to the Oil and Gas Sector: https://www.youtube.com/watch?v=k4cVxGndh9g 3. Oil and Gas Industry Overview: https://youtu.be/O-qiUD9TEtQ 4. Fundamentals of Oil & Gas Exploration and Production: https://www.youtube.com/watch?v=ohBywIrr_-Q 5. Introduction to Drilling Engineering: https://www.youtube.com/watch?v=SOsg_m2SCyU 6. Reservoir Engineering Overview: https://www.youtube.com/watch?v=XLqWeQ92INA&list=PL4kCxFVdSSQSJnpRuGoJnmF8wib3LsGRI&index=2 7. Introduction to Petroleum Production Engineering: https://www.youtube.com/watch?v=g8GkuPmAXJk 8. Introduction to Downstream Petroleum Industry: https://www.youtube.com/watch?v=tt_hxclkKpM 9. Position Descriptions - Oil and Gas Petroleum Engineers and Reservoir Engineers: https://www.youtube.com/watch?v=WH9D7aqOp0Q&list=PL4kCxFVdSSQSJnpRuGoJnmF8wib3LsGRI 10. Conflict in the Middle-East OPEC's 1970's Oil Embargo: https://youtu.be/FiLnj5WD0ao 11. Birth of an Oil Field 1949 Shell Oil Industrial Film: https://youtu.be/uPUC-GDfYO8 12. AI Is Fueling Growth ForThe Oil & Gas Industry: https://www.youtube.com/watch?v=iRt9DLycobc
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Energy Resources, Global Energy Demand and Supply Dynamics, Energy Security, Reservoir-Wellbore Interface, Onshore and Offshore Drilling Techniques, Well Operation Techniques, Field Life Cycle and Development Strategies, Transportation and Storage of Oil and Gas, Environmental Impact of Petroleum Operations, and Sustainable Practices in Petroleum Operations for **Skill Development** through **Participative Learning Techniques**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Amolina Doley, Dr. Niladri Shekhar Samanta, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2101**	**Course Title:** **Petroleum Geology** **Type of Course:** **1] Professional Core Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive foundation in geology tailored for petroleum engineering students. It covers geological processes, the structure and dynamics of the Earth, and their influence on petroleum systems. Students explore petroleum geology, source and reservoir rocks, hydrocarbon migration and accumulation, and various types of geological traps. The course also introduces sedimentary basins, depositional environments, and their significance in hydrocarbon exploration, enhancing both theoretical understanding and practical application skills.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Petroleum Geology and attain **Skill Development** through **Participative LearningTechniques**.					

Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Describe the origin, envelope, internal structure, chemical composition, and heat source of the earth, CO2: Classify various internal and external dynamic processes acting below and above the surface of the earth, CO3: Illustrate source, reservoir, and cap rocks in a petroleum system using their physical and chemical characteristics, CO4: Demonstrate the concepts of hydrocarbon generation and migration to predict possible pathways and accumulation zones in a given geological setting, CO5: Apply the principles of basin formation and plate tectonics to classify sedimentary basins in different tectonic settings, CO6: Differentiate between continental, marginal-marine, siliciclastic marine, carbonate, and evaporite environments using sedimentological and paleontological evidence.			
Course Content:				
Module 1:	Overview of Geology and Geological Processes	e-resource Review / Report Writing	Writing Communication	14 Periods
Topics: Introduction to Geology: Definition of Geology, Branches of Geology, Importance of Geology in Petroleum Engineering. The Solar System and the Earth: Orbital Characteristics of the Earth, Shape of the Earth, Physical Characteristics of the Earth, Origin of the Earth, Envelopes of the Earth, Internal Structure of the Earth, Chemical Composition of the Earth, Origin of Heat of the Earth, Age of the Earth. Dynamic Processes of the Earth: Internal Processes - Plate Tectonics, Continental Drift, Earthquake, and Volcanism, External Processes - Weathering, Erosion, Transportation, and Deposition.				
Module 2:	Petroleum Geology and Petroleum Systems	Poster Designing and Presentation	Verbal Communication	18 Periods
Topics: Petroleum Geology: Definition of Petroleum Geology, Responsibilities of Petroleum Geologists. Petroleum Systems: Definition, Concept of Petroleum System, Essential Elements of Petroleum System - Source Rock - Definition, Origin of Petroleum, Organic rich Sediments, Source Rock Materials, Nature and Types of Source Rocks, Conversion of Organic Materials to Hydrocarbons, Generation of Hydrocarbons, Kerogen, Evaluation of Petroleum Source Rock Potential, Subsurface condition for Petroleum Generation, Oil Window. Reservoir Rock - Definition, Characteristics of Reservoir Rocks, Principle properties of Reservoir Rocks, Clastic Reservoirs, Carbonate Reservoirs, Conventional and Unconventional Reservoirs, Fractures Reservoirs, Properties of Reservoir, Understanding the parameters to evaluate Reservoirs. Seal (Cap) Rock - Definition, Mechanism of Sealing, Factors affecting the effectiveness of Cap Rocks. Overburden Rock. Processes of Petroleum System – Generation of Hydrocarbons. Migration of Hydrocarbons - Definition, Types of Migration, Processes of Migration, Oil and Gas Seepages, Factors affecting Primary and Secondary Migrations – Buoyancy, Surface Tension, Capillary Pressure, Tilted Oil-Water Contact – Spill Point, Lateral Migration, Vertical Migration. Accumulation of Hydrocarbons - Definition, Pre-requisites for Formation and Accumulation of Hydrocarbons, Entrapment of Hydrocarbons - Definition, Classification of Traps, Traps associated with diapir.				
Module 3:	Sedimentary Basins and Depositional Environments	Quiz / Written Tests	Preparedness for Competitive Exams	13 Periods
Topics: Sedimentary Basin: Definition, Mechanisms of Basin Formation, Plate Tectonics and Sedimentary Basins; Classification of Sedimentary Basins; Sedimentary Basins of India. Depositional Environments: Continental Environments, Marginal-Marine Environments, Siliciclastic Marine Environments, Carbonate and Evaporite Environments.				
Targeted Application and Tools that can be used: **Applications:** Geoscientist or Wellsite Geologist at Oil & Gas industry. **Tools:** Microsoft Excel and other Data Analysis Tools				
Textbooks: T1: Knut Bjørlykke, Petroleum Geoscience: From Sedimentary Environments to Rock Physics, Springer Berlin Heidelberg, 2nd Edition, 2015. T2: Richard C. Selley, and Stephen A. Sonnenberg, Elements of Petroleum Geology, 3rd Edition, Elsevier				

Science, 2014.
T3: Richard J. Lisle, Peter J. Brabham, and John W. Barnes, Basic Geological Mapping, 5th Edition, Wiley-Blackwell, 2011.
T4: Maurice E. Tucker, Sedimentary Rocks in the Field – The Geological Field Guide Series, 3rd Edition, Wiley, 2003.
T5: R.E. Chapman, Petroleum Geology, Elsevier Science, 2000.

References:

R1: Caineng Zou, Unconventional Petroleum Geology, Elsevier Science, 2017.
R2: D.H. Welte, B. Harsfieldand and D. R. Baker (Eds.), Petroleum and Basin Evolution – Insights from Petroleum Geochemistry, Geology and Basin Modeling, Springer-Verlag, Berlin Heidelberg, 2012.
R3: Arville Irving Levorsen, Geology of Petroleum, 2nd Edition (Reprint), CBS Publishers & Distributors, 2004.
R4: Richard J. Lisle, Geological Structures and Maps – A Practical Guide, 3rd Edition, Elsevier Butterworth – Heinemann, 2004.

e-resources:

1. Link for PU e-resources: https: / / puniversity.informaticsglobal.com / login
2. Link for DGH Website: https: / / dghindia.gov.in /
3. An Introduction to Geology (YouTube Video): https: / / www.youtube.com / watch?v=rAYiBSo3JKY
4. From Black Oil to Green Gas (TEDx Talk): https: / / www.youtube.com / watch?v=Pd4BqGXHxy8
5. What if fossil fuels had never existed? (TEDx Talk): https: / / www.youtube.com / watch?v=K67Qou3m4_E
6. Why renewables can't save the planet (TEDx Talk): https: / / www.youtube.com / watch?v=N-yALPEpV4w
7. Can 100% renewable energy power the world? (TED Ed): https: / / www.youtube.com / watch?v=RnvCbquYeIM
8. CNBC Exclusive Interview with Chevron CEO Mike Wirth: https: / / www.youtube.com / watch?v=PG1g8cohcMU
9. The future of oil & gas: Interview with Head of Research at OPEC: https: / / www.youtube.com / watch?v=RCN1hRHq32o

Skill Sets:

Topics relevant to "**SKILL DEVELOPMENT**": Petroleum Systems, Sedimentary Basins and Depositional Environments are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Suman Paul, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Amolina Doley, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2102**	**Course Title:** **Petroleum Geology Lab** **Type of Course:** **1] Professional Core Course** **2] Laboratory Only**	**L-T-P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course introduces students to fundamental geological field and lab techniques through map analysis, mineral and rock identification, and structural measurements. Emphasis is placed on interpreting contour profiles and geological maps, understanding mineral and rock properties using hand specimens, and estimating structural orientations like dip, strike, plunge, and trend using a clinometer compass. Progressive learning levels ensure a strong foundation in geological observation, interpretation, and practical skill development for fieldwork.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of					

	Petroleum Geology and attain **Skill Development** through **Experiential LearningTechniques**.			
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Interpret various contour and geological maps, CO2: Distinguish rock forming minerals and ore minerals from their physical properties, CO3: Identify igneous, sedimentary, and metamorphic rocks from their physical properties, CO4: Compare the attitude of planar and linear geological structures, CO5: Examine the given information to determine the dipping bed angle and true dip using the stereographic projections, CO6: Analyze basic borehole related problems.			
Course Content:				
Module 1:	Contour and Geological Maps	Quiz / Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	05 Sessions
Topics: Mapping: Definition, Purpose of Maps, Types of Maps. Contour Maps: Experiment No. 1, 2 Geological Maps: Experiment No. 3				
Module 2:	Physical Properties of Minerals	Quiz / Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	04 Sessions
Topics: Mineral: Definition, Importance of study of minerals, Different methods to identify minerals, Identification of minerals in hand specimen. Rock Forming Minerals: Experiment No. 4 Ore Minerals: Experiment No. 5				
Module 3:	Physical Properties of Rock	Quiz / Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	02 Sessions
Topics: Rock: Definition, Classification of rocks, Rock Cycle, Identification of rocks in hand specimen. Igneous Rocks: Experiment No. 6 Sedimentary Rocks: Experiment No. 7 Metamorphic Rocks: Experiment No. 8				
Module 4:	Planar and Linear Geological Structures	Quiz / Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	01 Sessions
Topics: Geological Structures: Planar and Linear Structures, Folds, Faults, Joints, Fractures, Unconformity - Definition and their Measurements, Planar Structures: Experiment No. 9 Linear Structures: Experiment No. 10				
Module 5:	Stereographic Projections	Quiz / Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	02 Sessions
Topics: Stereographic Projection: Introduction, and Purpose. Dipping Surface using Stereographic Projection: Experiment No. 11 True Dip using Stereographic Projection: Experiment No. 12				
Module 6:	Borehole Problem	Quiz / Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	01 Sessions
Topics: Borehole Problem: Introduction, and Purpose. Borehole related Problem Solving: Experiment No. 13				
List of Laboratory Tasks:				
Experiment 01: (a)Interpret the contour profile in the given map along Section line A-A' (Level 1) (b) Interpret the contour profile in the given map along the Section line A-B (Level 2) (c) Interpret the contour profile along Section X-Y (Level 3) (d) Interpret the contour profile in the map along Section A-B (Level 4) **Experiment 02:** Interpret 3-D schematic diagrams and the contour profiles given for six V-shaped valleys **Experiment 03:** Interpret geological map to establish the relationship between lithological boundaries and				

contour lines

Experiment 04: Distinguish rock forming minerals in hand specimen

Experiment 05: Distinguish ore minerals in hand specimen

Experiment 06: Identify igneous rocks from their physical properties

Experiment 07: Identify sedimentary rocks from their physical properties

Experiment 08: Identify metamorphic rocks from their physical properties

Experiment 09: Compare the attitude of the given planer features

Experiment 10: Compare the attitude of the given linear features

Experiment 11: Examine the given information to determine the dipping bed angle using the stereographic projections,

Experiment 12: Examine the given information to determine the true dip using the stereographic projections,

Experiment 13: Analyze thegiven data to solve borehole problems

Any 10 Experiments must be conducted.

Targeted Application and Tools that can be used:
Applications: Geoscientist or Wellsite Geologist at Oil & Gas industry.
Tools: Microsoft Excel and other Data Analysis Tools

Textbooks:

T1: Knut Bjørlykke, Petroleum Geoscience: From Sedimentary Environments to Rock Physics, Springer Berlin Heidelberg, 2nd Edition, 2015.
T2: Richard C. Selley, and Stephen A. Sonnenberg, Elements of Petroleum Geology, 3rd Edition, Elsevier Science, 2014.
T3: Richard J. Lisle, Peter J. Brabham, and John W. Barnes, Basic Geological Mapping, 5th Edition, Wiley-Blackwell, 2011.
T4: Maurice E. Tucker, Sedimentary Rocks in the Field – The Geological Field Guide Series, 3rd Edition, Wiley, 2003.
T5: R.E. Chapman, Petroleum Geology, Elsevier Science, 2000.

References:

R1: Petroleum Geology Lab Manual, Presidency University, Bengaluru.
R2: Caineng Zou, Unconventional Petroleum Geology, Elsevier Science, 2017.
R3: D.H. Welte, B. Harsfieldand and D. R. Baker (Eds.), Petroleum and Basin Evolution – Insights from Petroleum Geochemistry, Geology and Basin Modeling, Springer-Verlag, Berlin Heidelberg, 2012.
R4: Arville Irving Levorsen, Geology of Petroleum, 2nd Edition (Reprint), CBS Publishers & Distributors, 2004.
R5: Richard J. Lisle, Geological Structures and Maps – A Practical Guide, 3rd Edition, Elsevier Butterworth – Heinemann, 2004.

e-resources:

1. Link for PU e-resources: https: / / puniversity.informaticsglobal.com / login
2. Link for DGH Website: https: / / dghindia.gov.in /
3. An Introduction to Geology (YouTube Video): https: / / www.youtube.com / watch?v=rAYiBSo3JKY

Skill Sets:

Topics relevant to "**SKILL DEVELOPMENT**": All the experiments are designed for **Skill Development** through **Experiential LearningTechniques**. The course attainment will be assessed through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Amolina Doley, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: PET2103	**Course Title:** Drilling Fluids and Cements **Type of Course:** 1] Professional Core Course 2] Theory Only			**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	This course provides a comprehensive understanding of drilling fluids and oil well cementing practices. It covers the classification and components of drilling fluids, fundamentals of clay chemistry, and evaluation of rheological and flow properties through various flow models and calculations. Students explore mud conditioning systems and their components, and gain insights into oil well cement types, functions, and methods.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Drilling Fluids and Cements and attain **Skill Development** through **Participative LearningTechniques**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Classify the types and components of drilling fluids based on their composition and functionality, CO2:Differentiate the various types of clay and their associated electrochemical properties, CO3:Examine drilling fluid behavior using rheological properties and flow-model concepts, CO4: Analyze the significance of drilling fluid properties and their impact on optimizing drilling performance, CO5: Compare the function of various mud conditioning equipment, CO6: Appraise the selection criteria for oil well cement types and cementing accessories.						
Course Content:							
Module 1:	Introduction to Drilling Fluid	Seminar	Literature Survey	06 Periods			
Topics: Drilling fluid, its classification, components.							
Module 2:	Clay Chemistry	Seminar	Literature Survey	08 Periods			
Topics: Clay, Type of clay, Particle association, Electrostatic double layer, Nernst Potential, Zeta potential.							
Module 3:	Properties of Drilling Fluid	Assignment, Quiz	Programming	13 Periods			
Topics: Study of different flow models for Drilling fluid, Rheological properties of Drilling fluid, Mud calculation**.**							
Module 4:	Mud Conditioning System	Case Study	Project Work	05 Periods			
Topics: Basics of Shale shaker, Desander and Desilter, Mud cleaner, Hydro cyclone, Centrifuge.							
Module 5:	Oil well Cement	Quiz	Online Quiz	13 Periods			
Topics: Cements, its functions, classification, cementing accessories, Cementing method.							
Targeted Application and Tools that can be used: **Applications:** Mud Engineer / Cement Engineer at Oil & Gas industry.							

Tools: MUDWERE, Equipment used in Drilling fluid testing as per API standards, Microsoft excel

Textbooks:

T1. H.C. H. Darly and George R. Gray, "Composition and Properties of Drilling fluid Completion Fluid", 2011 6th Edition, Gulf Publication.

T2. Samuel Bridges, Leon Robinson, A Practical Handbook for Drilling Fluids Processing (Gulf Drilling Guides) Hardcover – 18 February 2020

References:

R1. Hayden H. murray, "Applied clay Mineralogy"; 2006, Volume-1, First edition, Elsevier

R2. R. Monicard, Drilling Mud and Cement Slurry Rheology Manual, 1982, Springer

R3. H. Rabia, Graham and Trotman, "Oil Well Drilling Engineering: Principle and Practice", 1985,Gaithersburg, MD, USA: Graham & Trotman, 1985.

Case Study:

1. Verified 99.9% Drilling Fluids Recovery
https: / / www.katchkan.com / 2019 / 09 / 03 / case-study-verified-drilling-fluids-recovery /
2. Hollow-Glass Sphere Application in Drilling Fluids
https: / / doi.org / 10.2118 / 174010-MS

e-book:

1. Fundamentals and Applications of Bionic Drilling Fluids Book by Guancheng Jiang https: / / www.google.co.in / books / edition / Fundamentals_and_Applications_of_Bionic / CgUhEAAAQBAJ?hl=en&gbpv=0
2. Shale Shakers and Drilling Fluid Systems: Techniques and Technology for Improving Solids Control Management
https: / / www.google.co.in / books / edition / Shale_Shakers_and_Drilling_Fluid_Systems / M8LbOAw9sykC?hl=en&gbpv=1&printsec=frontcover

e-resources:

1. Presidency University e-Resource:
https: / / puniversity.informaticsglobal.com / login
2. Drilling Fluid Software: MUDWARE
https: / / www.slb.com / drilling / drilling-fluids-and-well-cementing / drilling-fluids / drilling-fluids-simulation-software / mudware
3. Online 5 day course on Drilling Fluid:
https: / / www.nexttraining.net / course / drilling-fluids / 1420
4. Newpark, Drilling Fluid service provider's website:
https: / / www.newpark.com / drilling-fluids /

Online videos:

1. Oil Well drilling process-A shell film https: / / youtu.be / guFiQ87tg_s
2. Drilling animation- https: / / youtu.be / eBOtXD_UQSo
3. Oil well drilling animation- https: / / youtu.be / SdgeSFbxQps
4. Functions of Drilling fluid- https: / / youtu.be / grdEOy7AKv4
5. Introduction to drilling fluid- https: / / youtu.be / 9rnYK7cQ6wA

Skill Sets:

Topics relevant to "**SKILL DEVELOPMENT**": Drilling fluid properties, Mud calculation, Cement slurry volume calculation, etc. are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2104**	**Course Title:** **Drilling Fluids and Cements Lab** **Type of Course:** **1] Professional Core Course** **2] Laboratory Only**		**L-T-P-C**	0	0	2	1
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	This course offers hands-on training in drilling fluid preparation, testing, and analysis through a series of structured laboratory experiments. Students learn to evaluate drilling fluid properties such as mud weight, viscosity, pH, gel strength, sand content, filtrate loss, lubricity, and clay reactivity using industry-standard equipment. Emphasis is placed on understanding the influence of additives and fluid composition on drilling performance, ensuring proficiency in both fundamental measurements and advanced data interpretation.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Drilling Fluids and Cements and attain **Skill Development** through **Experiential LearningTechniques**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Prepare water-based drilling fluids using standard laboratory procedures and common additives, CO2: Calculate the hydrostatic head of drilling fluids through mud weight measurements, CO3: Analyze the rheological behavior of drilling fluids under varying compositions and conditions, CO4: Examine the filtration characteristics and viscosity of drilling fluids in relation to solid content, CO5: Determine the reactive clay content in drilling fluids using standard testing methods.						
Course Content:							
Module 1:	Preparation and Density Determination of Drilling Fluids	Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	05 Sessions			
Topics: Preparation of drilling fluid samples, Measurement of drilling fluid density using standard methods							
Module 2:	Rheological and Flow Properties of Drilling Fluids	Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	05 Sessions			
Topics: Determination of rheological properties of drilling fluids, Measurement of gel strength of drilling fluids, Determination of pH of drilling fluids							
Module 3:	Solid Content and Filtration Characteristics of Drilling Fluids	Viva-Voce / Lab Performance Test	Evaluation for Real-life Situations	05 Sessions			
Topics: Determination of solid content in drilling fluids, Evaluation of filtration behavior of drilling fluids, Measurement of funnel viscosity of drilling fluids, Determination of reactive clay content in drilling fluids							
List of Laboratory Tasks:							
Experiment No. 1: **Level 1:** Preparation of drilling fluid using Hamilton or REMI stirrer **Level 2:** Preparation of drilling fluids with the given composition at various mixing rate and duration **Experiment No. 2:** **Level 1:** Determination of Mud Weight of the given fluid sample using Mud Balance **Level 2:** Analyze the change in Hydrostatic head with the addition of weighting material and water **Experiment No. 3:** **Level 1:** Determination of Mud Weight of the given fluid sample using Hydrometer **Level 2:** Analyze the change in Hydrostatic head with the addition of weighting material and Oil							

Experiment No. 4:
Level 1: Determination of Gel strength of the given fluid samples using Shearometer
Level 2: Analyze the change in Gel strength with the addition of various polymers

Experiment No. 5:
Level 1: Determination of pH of the given fluid samples using pH meter
Level 2: Analyze the change in pH with various additives

Experiment No. 6:
Level 1: Determination of Rheological properties of the given fluid sample using Hand Crank Viscometer
Level 2: Development of Drilling fluid with the help of various additives to meet YP / PV ratio

Experiment No. 7:
Level 1: Determination of Rheological properties of the given fluid sample using 6-speed Viscometer
Level 2: Development of Drilling fluid with the help of various additives to meet YP / PV ratio

Experiment No. 8:
Level 1: Determination of Sand content of the given fluid samples using Sand Content Kit
Level 2: Analyze the effect of solid loading on sand content of drilling fluid

Experiment No. 9:
Level 1: Determination of Filtration properties of the given fluid samples using API Filter Press
Level 2: Analyze the effect of various polymers on filtration properties of drilling fluid

Experiment No. 10:
Level 1: Determination of Funnel Viscosity of the given fluid sample using Marsh Funnel
Level 2: Examine the funnel viscosity at various temperature

Experiment No. 11:
Level 1: Determination of Reactive clay content of the given fluid sample using Methylene Blue Test
Level 2: Study the effect of particle size distribution on the reactivity of the clay

Any 10 Experiments must be conducted.

Targeted Application and Tools that can be used:
Applications: Mud Engineer / Cement Engineer at Oil & Gas industry.
Tools: MUDWERE, Equipment used in Drilling fluid testing as per API standards, Microsoft excel

Textbooks:
T1. H.C. H. Darly and George R. Gray, "Composition and Properties of Drilling fluid Completion Fluid", 2011 6th Edition, Gulf Publication.
T2. Samuel Bridges, Leon Robinson, A Practical Handbook for Drilling Fluids Processing (Gulf Drilling Guides) Hardcover – 18 February 2020

References:
R1. Drilling Fluids and Cements Lab Manual, Presidency University, Bengaluru.
R2. Hayden H. murray, "Applied clay Mineralogy"; 2006, Volume-1, First edition, Elsevier
R3. R. Monicard, Drilling Mud and Cement Slurry Rheology Manual, 1982, Springer
R4. H. Rabia, Graham and Trotman, "Oil Well Drilling Engineering: Principle and Practice", 1985,Gaithersburg, MD, USA: Graham & Trotman, 1985.

e-resources:
1. Presidency University e-Resource:
https: / / puniversity.informaticsglobal.com / login
2. Drilling Fluid Software: MUDWARE
https: / / www.slb.com / drilling / drilling-fluids-and-well-cementing / drilling-fluids / drilling-fluids-simulation-software / mudware
3. Online 5 day course on Drilling Fluid:
https: / / www.nexttraining.net / course / drilling-fluids / 1420
4. Newpark, Drilling Fluid service provider's website:
https: / / www.newpark.com / drilling-fluids /

Skill Sets:
Topics relevant to "**SKILL DEVELOPMENT**": All the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2105**	**Course Title: Fundamentals of Oil and Gas Well Drilling Technology** **Type of Course: 1] Professional Core Course 2]Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	Fundamentals of Drilling Engineering deals with understanding the processes and selecting the equipment required for drilling a stable wellbore and providing it with casing for preventing various wellbore problems. This course discusses about various mechanical systems used for drilling a well bore and how to design them. This course is both conceptual and analytical in nature and require the knowledge on basic science.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Oil and Gas Well Drilling Technology and attain **Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of the course the student shall be able to: CO1: Explain the fundamentals of oil well drilling, functions and operation of drilling rig components, including the hoisting, derrick, circulation, rotary, pressure control, and power systems, CO2: Determine the design parameters of drill string systems, including drill string design requirements, drill collar design, drill pipe design (collapse and burst considerations), and the requirements for controlling washout, vibration, and shock loading during drilling operations, CO3: Calculate the design parameters of casing systems, including casing type selection, casing seat selection, and collapse, burst, and tension requirements based on mechanical properties and mud-hole characteristics, CO4: Determine drilling cost, pressure losses in the circulation system and through the drill bit, bit velocity, bit area, and optimize bit hydraulics for efficient drilling operations, CO5: Illustrate the types, design features, and applications of drill bits, including roller cone (milled tooth and insert), PDC, and diamond bits, and their influence on drilling performance.					
Course Content:						
Module 1:	Drilling Rig Components	Assignment / Quiz	Programming	11 Periods		
Topics: Drilling fluid and cementation; Introduction to Oil Well Drilling; Drilling Rig Component: Hoisting system, Derrick and derrick capacity, Circulation system, Rotary system, Pressure control system, Power systems.						
Module 2:	Drill String Design	Assignment / Quiz	Programming	11 Periods		
Topics: Functions and components of drill string; Drill collar design; Drill pipe design: Collapse calculation, Burst calculation; Drill string washout; Drill string vibration; Shock sub.						
Module 3:	Casing Design	Assignment / Quiz	Group discussion	11 Periods		

Topics: Functions of casing; Type of casing; Casing seat selection; Collapse, burst and tension calculation: Based on mechanical properties, Based on mud and hole characters.				
Module 4:	Drill Bit and Rig Hydraulics	Article Review	Presentation	12 Periods
Topics: Drill bit - Types of drill bits; Roller cone bit design: Milled tooth bit and Insert bit; PDC bit design; Diamond bit design; Drilling cost calculation. Rig hydraulics - Pressure loss in circulation system; Pressure loss through bit; Bit velocity and area calculation; Bit hydraulic optimization.				
Targeted Application and Tools that can be used: **Applications:** Targeted for Upstream oil and gas industry as a Drilling Engineer in Upstream Oil and Gas Industry / Mineral Exploration Company **Tools:** Drillworks Predict (Landmark Halliburton)				
Textbooks: T1.Deepak Sharma, "Oil Well Drilling Technology", 1st Edition, 2015, Venus Books Publications. T2. H. Rabia, Graham and Trotman, "Oil Well Drilling Engineering: Principles and Practice", 1st Edition, 1986, Springer.				
References: R1. Drilling Engineering, Heriot Watt Institute of Petroleum Engineering, Herriot Watt University, 2005. R2. V.K. Jain, A.B. Sharma, R. Dhupar, R.P. Patel, D. Das Gupta, A. K. Joshi, and R. Shanker, "ONGC – Drilling Operation Practices Manual", 1st Edition, 2007, Shiva Offset Press, Dehradun. R3. Drilling Engineering: A Complete Well Planning Approach, Neal Adams, Tommie Charrier; 1985; 1st Edition; 1985; PennWell Books **e-resources:** 1. Presidency University e-access portal: https: / / presiuniv.knimbus.com / user# / home 2. Dr. Petro YouTube channel: Drilling Rig Components Animated- https: / / youtu.be / JjGXsLWcwI0 3. Drilling Rig Online Courses YouTube channel: Drill String components and their functions- https: / / youtu.be / M6tic_OcNPY 4. Encyclopedia of petrochemistry YouTube channel: Casing and Cementing- https: / / youtu.be / iMUsMOopwpU 5. Harvest Chemical YouTube channel: Bit Hydraulics-https: / / youtu.be / I178EdbDV_Y 6. Case Studies: Best Practice Case Studies for Drilling Engineers: https: / / www.drillingpoint.com / 7. Robert F. Mitchell, "Fundamentals of Drilling Engineering", 1st Edition, 2016, Society of Petroleum Engineers, Inc. https: / / www.amazon.in / Fundamentals-Drilling-Engineering-Robert-Mitchell-ebook / dp / B01L0O8WJA				
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Drill bit - Types of drill bits; Roller cone bit design: Milled tooth bit and Insert bit; PDC bit design for **Skill Development** through **Participative Learning Techniques**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: PET2106	**Course Title: Heat and Mass Transfer for Petroleum Engineering** **Type of Course: 1] Professional Core Course 2] Theory Only**		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	This course introduces the fundamentals of heat and mass transfer processes essential for engineering applications. Topics include conduction, convection, radiation, extended surface heat transfer, and boiling phenomena. It also covers radiation laws, heat exchanger design, and challenges like fouling and scaling. The course concludes with mass transfer principles, focusing on diffusion, convective transfer, and analogies with momentum and heat transfer, reinforced through assignments, quizzes, and hands-on data collection.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Heat and Mass Transfer for Petroleum and attain **Skill Development** through **Participative LearningTechniques**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Generalize conduction, convection, radiation, and heat-conduction equations in various coordinates, CO2: Demonstrate heat flux and temperature profiles and basic boiling–condensation mechanisms, CO3: Operate radiation laws and LMTD concepts to interpret heat-exchanger performance CO4: Analyse boiling, condensation, and evaporator systems to relate operating behaviour, CO5: Examine diffusive and convective mass-transfer processes to calculate mass-transfer rates.						
Course Content:							
Module 1:	Heat Transfer by Conduction and Convection	Assignment / Quiz	Data Collection and Report Submission	11Periods			
Topics: Introduction, Basic modes of heat transfer – conduction, Convection and Radiation, General heat conduction equation in Cartesian, cylindrical and spherical coordinates – extended surface heat transfer – fin performance – Newton's law – concept of boundary layer – boundary layer equations– film and drop wise condensation – film boiling and pool boiling – boiling curve.							
Module 2:	Radiation Heat Transfer and Heat -Exchange Equipment	Assignment / Quiz	Poster Designing and Presentation	12Periods			
Topics: Fundamentals of radiation – radiation spectrum – thermal radiation – concept of black body and grey body – monochromatic and total emissive power – absorptivity, reflectivity and transmissivity - laws of radiation – radiation between two surfaces –Classification – log mean temperature difference – overall heat transfer coefficient – fouling and scaling of heat exchangers.							
Module 3:	Boiling and Evaporation	Assignment / Quiz	Poster Designing and Presentation	11 Periods			
Topics: Newton's law – concept of boundary layer – boundary layer equations– film and drop wise condensation – film boiling and pool boiling – boiling curve, Evaporation and evaporators – Types of evaporator- Principle of evaporation and evaporators, Single effect evaporator calculation, Multiple effect evaporators-classification based on the mode of feed supply, Feed forward and feed backward evaporator, Comparison between Feed forward and feed backward evaporator.							
Module 4:	Mass Transfer	Assignment / Quiz	Data Collection and Report Submission	11 Periods			
Topics:							

Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations
Targeted Application and Tools that can be used: **Application:** Process Engineer in Chemicals Industries, Pipeline Engineer in Upstream / Midstream Oil and Gas Industry **Tools:** MS Excel, Grapher, Unisim Design Software
Textbooks: T1: R.K. Rajput, "A Textbook of Heat and Mass Transfer Si Units", S Chand, 1st Edition,2018. T2: P.K. Nag, "Heat and Mass Transfer", McGraw Hill, 3rd Edition,2011.
References: R1. Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell, "Fluid Mechanics: SI Version", Wiley India. R2. J.P. Holman, "Heat Transfer", 10thEdition, McGraw Hill, 2002. R3. Treybal "Mass Transfer Operations", 3rdEdition, Mc.Graw Hill Book Co., New York. **e- References:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / nptel.ac.in / courses / 112 / 108 / 112108149 / 3. https: / / nptel.ac.in / courses / 112 / 101 / 112101097 / 4. https: / / www.newtondesk.com / heat-and-mass-transfer-study-notes-hand-written /
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Heat Transfer by Conduction and Convection, Radiation Heat Transfer, Heat -Exchange Equipment, and Mass Transfer are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2107**	**Course Title: Heat and Mass Transfer for Petroleum Engineering Lab** **Type of Course: 1] Professional Core Course** **2] Laboratory Only**	**L-T-P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The course is designed to discuss the fundamental laws relating to the heat and mass transfer processes. It enables the need for analyze the heat and mass transfer applications in oil and gas industries. The course is both conceptual and analytical in nature. It needs fair knowledge of Physics and Mathematics. The course develops the critical thinking and analytical skills. The associated laboratory experiments provide an opportunity to validate the concepts taught and enhances the ability to visualize the real system performance. Knowledge gained from this course can be applied for analyzing the heat and mass transfer applications in oil and gas industries.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Heat and Mass Transfer for Petroleum and attain **Skill Development** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to:					

	CO1: Determine the thermal conductivity of metallic and insulating materials, CO2: Test computer-controlled heat transfer through composite walls and lagged pipes and also to analyse the Boltzmann constant, CO3: Determine unsteady-state heat transfer parameters, CO4: Analyse theoretical and experimental temperature distribution in fin heat transfer, CO5: Demonstrate heat exchanger characteristics and surface emissivity.			
Course Content:				
Module 1:	Introduction to Surface Facility and Phase Separation	Conduction of Experiment	Presentation	15 Sessions

Topics:
Basic modes of heat transfer – Conduction, Convection and Radiation, General heat conduction equation in Cartesian, cylindrical and spherical coordinates. Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy.

List of Laboratory Tasks:

Experiment No. 1: Thermal Conductivity of Metal Rod
Level 1: To find the thermal conductivity of the metal rod
Level 2: To plot the variation of temperature along the length of the metal rod (Graph Paper / Grapher / MS Excel)

Experiment No. 2: Thermal Conductivity of Insulating Powder
Level 1: To find the thermal conductivity of insulating powder
Level 2: To plot the variation of temperature along the length of the metal rod

Experiment No. 3: Computer Controlled Heat Transfer Through Composite Wall
Level 1: To calculate total thermal resistance of the composite wall
Level 2: To calculate total thermal conductivity of the composite wall

Experiment No. 4: Computer Controlled Heat Transfer Through Lagged Pipe
Level 1: To find the actual rate of heat transfer through the composite cylinders from the measured interface temperature of the two insulating materials with known thermal conductivities
Level 2: To find the effective thermal conductivity of the composite cylinders

Experiment No. 5: Unsteady State Heat Transfer
Level 1: To find the Fourier number, the Biot number
Level 2: To findthe heat transfer coefficient, and the heat transfer rate

Experiment No. 6: Heat Transfer from A Pin – Fin By Free Convection
Level 1: To calculate the heat transfer coefficient experimentally and theoretically for free convection
Level 2: To plot a graph between the theoretical temperature distributions with experimentally obtained distribution

Experiment No. 7: Heat Transfer from A Pin – Fin By Force Convection
Level 1: To calculate the heat transfer coefficient experimentally and theoretically for force convection
Level 2: To plot a graph between the theoretical temperature distributions with experimentally obtained distribution

Experiment No. 8: To study the heat transfer phenomena in parallel and counter flow heat exchanger

Level 1: To find out the heat transfer rate for given fluids in parallel and counter flow condition
Level 2: To calculate the overall heat transfer coefficient for both parallel and counter flow arrangements

Experiment No. 9: Emissivity Measurement Apparatus
Level 1: To find the emissivity of the test plate
Level 2: To find the emissivity of different test plate

Experiment No. 10: Computer-Controlled Stefan–Boltzmann Apparatus
Level 1: To determine the Stefan–Boltzmann constant using the computer-controlled radiation setup.
Level 2: To record and analyse temperature–radiation data using computer software and verify the Stefan–Boltzmann law

Experiment 11: 2D Steady-State Heat Conduction Simulation (Software: GNU Octave / FreeFEM / Elmer FEM)
Level 1: To simulate steady-state heat conduction in a 2D plate with specified boundary conditions
Level 2: To analyse temperature contours and heat flux distribution

Any 10 Experiments must be conducted.

Targeted Application and Tools that can be used:
Application: Process Engineer in Chemicals Industries, Pipeline Engineer in Upstream / Midstream Oil and Gas Industry
Tools: MS Excel, Grapher, Unisim Design Software

Textbooks:
T1: R.K. Rajput, "A Textbook of Heat and Mass Transfer Si Units", S Chand, 1st Edition,2018.
T2: P.K. Nag, "Heat and Mass Transfer", McGraw Hill, 3rd Edition,2011.

References:
R1. Heat and Mass Transfer Lab Manual, Presidency University, Bengaluru.
R2. Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell, "Fluid Mechanics: SI Version", Wiley India.
R3. J.P. Holman, "Heat Transfer", 10thEdition, McGraw Hill, 2002.
R4. Treybal "Mass Transfer Operations", 3rdEdition, Mc.Graw Hill Book Co., New York.

e- References:
1. https: / / puniversity.informaticsglobal.com / login
2. https: / / nptel.ac.in / courses / 112 / 108 / 112108149 /
3. https: / / nptel.ac.in / courses / 112 / 101 / 112101097 /
4. https: / / www.newtondesk.com / heat-and-mass-transfer-study-notes-hand-written /

Skill Sets:
Topics relevant to "**SKILL DEVELOPMENT**": All the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2108**	**Course Title: Fundamentals of Petroleum Reservoir Engineering** **Type of Course: 1] Professional Core Course 2] Theory Only**	**L-T-P-C**	4	0	0	4
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive understanding of reservoir engineering fundamentals, focusing on rock and fluid properties, flow behavior in porous media, oil recovery mechanisms, and reserve estimation techniques. Students will explore porosity, permeability, flow regimes, Darcy's law applications, recovery methods, and reserve estimation through volumetric, material balance, and decline curve analysis. Data analysis and programming tasks enhance hands-on learning and technical problem-solving skills.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Petroleum Reservoir Engineering and attain **Skill Development** through **Participative Learning Techniques**.					

Course Outcomes:	On successful completion of this course the students shall be able to: CO1: Determine key reservoir rock properties for effective reservoir evaluation, CO2: Interpret the thermodynamic behavior and phase properties of reservoir fluids, CO3: Demonstrate the flow behavior of reservoir fluid through porous media, CO4: Identify various drive mechanisms, CO5: Apply the concept of different reserve estimation methods.			
Course Content:				
Module 1	Fundamentals of Reservoir Rock Properties	Assessment 1: Assignment	Assignment	15 Periods
Topics: Porosity: absolute porosity, effective porosity, Saturation, Wettability, Surface and interfacial tension, capillary pressure, Permeability (K): relative permeability: two phase relative permeability: drainage, imbibition problems, Saturation-K relationship.				
Module 2	Fundamentals of Reservoir fluid Behavior	Assessment 2: Quiz	Quiz	10 Periods
Topics: Thermodynamics of reservoir fluids, Basic concepts, First law of thermodynamics, Energy balance for closed systems, Equilibrium, Reversible process, Mass and Energy balances for Open systems, Phase Behavior of pure component and hydrocarbon mixture, classification of reservoirs and reservoir fluids, Raoult's Law, Dew point and Bubble point Calculations with Raoult's Law, Oil reservoirs, condensate reservoir, Gas reservoirs.				
Module 3	Fundamentals of Reservoir Fluid Flow	Assessment 3: Assignment	Programming	15 Periods
Topics: Types of fluids, flow regimes, reservoir geometry, Fluid flow through porous media: Application of Darcy's law, Different types of flow.				
Module 4	Oil Recovery Mechanisms	Assessment 4: Assignment	Data analysis task	08 Periods
Topics: Primary recovery mechanisms: Expansion of the individual rock grains and Formation compaction, Solution gas drive, gas cap with little or no water drive, water drive, gravity drainage drive, combination drive mechanisms				
Module 5	Reserve Estimation Technique	Assessment 5: Term Paper	Programming	12 Periods
Topics: Volumetric estimation of reserve, The material balance equation and Decline curve analysis				
Targeted Application & Tools that can be used: **Applications**: Reservoir Engineer in Oil and Gas industry **Professionally used Software**: Eclipse, Petrel				
Textbooks: T1. Abhijit Y. Dandekar, "Petroleum Reservoir Rock and Fluid Properties", CRC Press. T2. Tarek Ahmed, "Reservoir Engineering Handbook" Elsevier, 5th Edition, 2019.				
References R1. L. P. Dake, "Fundamentals of Reservoir Engineering", Elsevier, 17th Impression, 1998. R2. SM1 "Reservoir Engineering Lab Manual", Presidency University **e-resources:** 1. Presidency University Link- https: / / puniversity.informaticsglobal.com / login 2. Reservoir rock properties- https: / / www.youtube.com / watch?v=iubNxQLKcow 3. Fundamentals of reservoir fluid flow- https: / / wiki.aapg.org / Fluid_flow_fundamentals 4. Oil recovery mechanisms- http: / / large.stanford.edu / courses / 2015 / ph240 / zerkalov2 / docs / sino.pdf 5. Reserve estimation technique- https: / / wiki.aapg.org / Reserves_estimation				
Skill Sets:				

Topics relevant to "**SKILL DEVELOPMENT**": Reservoir Rock Properties, Reservoir Fluid Flow, Oil Recovery Mechanisms, and Reserve Estimation Technique are designed for **Skill Development** through **Participative LearningTechniques**. The course attainment will be assessed through assessment component mentioned in course plan.	
Catalogue prepared by	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2109**	**Course Title: Fundamentals of Petroleum Reservoir Engineering Lab** **Type of Course: 1] Professional Core Course 2] Laboratory Only**	**L-T-P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This laboratory course provides hands-on experience in fundamental petrophysical and fluid property measurements essential for reservoir characterization. Students will conduct experiments to determine bulk volume, porosity, permeability, fluid density, viscosity, surface and interfacial tension, and core sample preparation. The course emphasizes the impact of temperature, pressure, and surfactant concentration on these properties, enhancing the understanding of reservoir fluid behavior and rock-fluid interactions. This course develops the critical thinking, analytical skills and programming abilities through assignments. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to correlate with the real time field experiment.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Petroleum Reservoir Engineering and attain **Skill Development** through **Experiential Learning Techniques**.					
Course Outcomes:	On successful completion of this course the students shall be able to: CO1: Determine bulk volume, grain density, and porosity of reservoir core samples using standard laboratory methods CO2: Determine porosity and fluid saturation of reservoir rocks using solvent extraction and saturation techniques CO3: Calculate liquid and gas permeability of reservoir rock samples using permeameters and Darcy's law CO4: Determine viscosity, surface/interfacial tension, and oil–water percentage of reservoir fluids using laboratory instruments CO5: Analyze bottom-hole pressure charts and formation water properties to estimate permeability and characterize reservoir fluids.					
Course Content:						
Module 1	Core Sample Characterization and Fluid Property Analysis	Quiz / Viva-Voce / Lab Performance Test	Data Collection and Analysis	08 Sessions		
Topics: Introduction to reservoir core samples and their role in reservoir characterization. Measurement of bulk volume of core samples using Vernier calipers, calibration procedures, sources of experimental error, and uncertainty analysis. Determination of grain density of reservoir rocks using a pycnometer and its significance in evaluating rock matrix properties. Fundamentals of porosity and its classification, experimental determination of porosity using the saturation method, and interpretation of porosity results.						

Principles of Dean–Stark and Soxhlet extraction techniques, determination of porosity and in-situ fluid saturation, estimation of oil, water, and gas saturation, and interpretation of saturation data for reservoir evaluation. Fundamentals of fluid flow in porous media and Darcy's law. Measurement of absolute permeability using a liquid permeameter and interpretation of flow behavior in reservoir rocks. Principles of gas flow in porous media, experimental determination of gas permeability using a gas permeameter, understanding gas slippage and the Klinkenberg effect, and correction of gas permeability data
Related Experiment: Experiment No. 1, 2, 3, 4, 5, 6, 7, and 8.

Module 2	Experimental Methods in Reservoir and Fluid Characterization	Quiz / Viva-Voce / Lab Performance Test	Data Collection and Analysis	07 Sessions

Topics:
Fundamentals of fluid rheology, measurement of reservoir fluid viscosity using a Cannon–Fenske viscometer, and analysis of viscosity variation with temperature. Concept and significance of surface tension and interfacial tension in reservoir engineering and multiphase flow. Experimental determination of surface and interfacial tension using a ring tensiometer. Effect of temperature and fluid composition on interfacial properties. Fundamentals of fluid–fluid interaction, mixing behavior of produced fluids, and evaluation of oil–water separation efficiency using rotary mixing and gravity separation techniques. Introduction to bottom-hole pressure (BHP) data and its importance in reservoir performance analysis. Interpretation of BHP charts and estimation of formation permeability from pressure data. Fundamentals of formation water chemistry, measurement of water quality parameters such as pH, salinity, hardness, and TDS using a water analyzer, and assessment of their impact on reservoir performance, scaling, corrosion, and formation damage.
Related Experiment: Experiment No. 9, 10, 11, and 12.

List of Laboratory Tasks:

Experiment No. 1: Bulk Volume Measurement of Core Sample
Level 1: To determine the bulk volume of a reservoir core sample using a Vernier caliper
Level 2: To compare bulk volume measurements before and after calibration correction

Experiment No. 2: Fluid Density Determination
Level 1: To determine the density of a reservoir fluid sample using a pycnometer
Level 2: To compare fluid density values obtained at different temperature conditions or samples

Experiment No. 3: Core Cleaning and Fluid Extraction (Soxhlet Apparatus)
Level 1: To clean the core sample and remove organic and inorganic fluids using the Soxhlet apparatus
Level 2: To determine porosity and fluid saturation of the core sample using the Dean–Stark extraction method

Experiment No. 4: Porosity Measurement by Saturation Method
Level 1: To determine the porosity of a given core sample using the saturation technique
Level 2: To correlate porosity variation of core samples obtained from different depths

Experiment No. 5: Fluid Saturation Determination
Level 1: To determine oil, water, and gas saturation in a reservoir rock sample using solvent extraction
Level 2: To study the effect of fluid saturation on reservoir rock properties

Experiment No. 6: Liquid Permeability Measurement
Level 1: To determine the absolute permeability of a core sample using a liquid permeameter and Darcy's law
Level 2: To estimate the relative permeability of oil, water, and injection fluids

Experiment No. 7: Gas Permeability Measurement
Level 1: To determine the gas permeability of a core sample using a gas permeameter
Level 2: To determine the Klinkenberg (gas slippage) effect

Experiment No. 8: Viscosity Measurement of Reservoir Fluids
Level 1: To determine the viscosity of reservoir fluids using a Cannon–Fenske viscometer
Level 2: To determine the variation of viscosity with temperature

Experiment No. 9: Interfacial / Surface Tension Measurement
Level 1: To determine the surface and interfacial tension of reservoir fluids using a ring tensiometer
Level 2: To study the effect of temperature and surfactant concentration on surface and interfacial tension

Experiment No. 10: Effect of Mixing on Fluid Properties
Level 1: To determine the oil and water percentage in produced water using gravity separation

Level 2: To study the effect of mixing intensity on separation efficiency

Experiment No. 11: Bottom-Hole Pressure (BHP) Analysis
Level 1: To interpret the supplied BHP chart for reservoir pressure analysis
Level 2: To determine formation permeability from BHP test data

Experiment No. 12: Water Quality Analysis for Reservoir Applications
Level 1: To analyze formation water properties such as pH, salinity, hardness, and TDS using a water analyzer
Level 2: To assess the impact of water quality on reservoir performance and rock–fluid interaction

Any 10 Experiments must be conducted.

Targeted Application & Tools that can be used:
Applications: Reservoir Engineer in Oil and Gas industry
Professionally used Software: Eclipse, Petrel

Textbooks:
T1. Abhijit Y. Dandekar, "Petroleum Reservoir Rock and Fluid Properties", CRC Press.
T2. Tarek Ahmed, "Reservoir Engineering Handbook" Elsevier, 5th Edition, 2019.

References
R1. Reservoir Engineering Lab Manual, Presidency University, Bengaluru.
R2. L. P. Dake, "Fundamentals of Reservoir Engineering", Elsevier, 17th Impression, 1998.
R3. SM1 "Reservoir Engineering Lab Manual", Presidency University

e-resources:
1. Presidency University Link- https: / / puniversity.informaticsglobal.com / login
2. Reservoir rock properties- https: / / www.youtube.com / watch?v=iubNxQLKcow
3. Fundamentals of reservoir fluid flow- https: / / wiki.aapg.org / Fluid_flow_fundamentals
4. Oil recovery mechanisms- http: / / large.stanford.edu / courses / 2015 / ph240 / zerkalov2 / docs / sino.pdf
5. Reserve estimation technique- https: / / wiki.aapg.org / Reserves_estimation

Skill Sets:
Topics relevant to "**SKILL DEVELOPMENT**": All the experiments are designed for **Skill Development** through **Experiential LearningTechniques**. The course attainment will be assessed through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2110**	**Course Title:** **Fundamentals of Oil and Gas Production Technology** **Type of Course:** **1] Professional Core Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course deals with the various processes dealing with production of petroleum from the subsurface. The course also discuss the well performance analysis through inflow and tubing performance relationships, multiphase fluid flow regimes; productivity index, well potential, flow rate variation with pressure drawdown, nodal analysis and choke performance; Artificial lift systems and their working; Flow assurance techniques applicable in the petroleum industry.					

<table>
<tr><td>Course Objective:</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Fundamentals of Oil and Gas Production Technology and attain Skill Development through Problem SolvingMethodologies.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="4">On successful completion of the course the students shall be able to:
CO1: Illustrate well performance behavior by applying Inflow Performance Relationship (IPR) models, Productivity Index (PI), and Absolute Open Flow Potential (AOF) concepts,
CO2:Examine well deliverability by applying nodal analysis, tubing performance relationship (TPR), and choke performance principles,
CO3: Illustrate the principles, components, and working mechanisms of artificial lift systems, with emphasis on the Sucker Rod Pump (SRP),
CO4: Demonstrate the application of operating parameters in the design and performance evaluation of Sucker Rod Pump (SRP) systems,
CO5: Predict the depth of gas lift valve installation by applying gas lift design principles and operating parameters,
CO6: Compare the performance and suitability of various artificial lift systems, including SRP, Gas Lift, ESP, Hydraulic Pumps, and PCP, for different production conditions.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1:</td><td>Well Performance</td><td>Assignment 1</td><td>Quiz</td><td>12 Periods</td></tr>
<tr><td colspan="5">Topics:
Basic surface equipment; Productivity index; IPR: Vogel / Fetkovich; Absolute open flow potential; Future IPR; Tubing performance relationship; Well potential; Choke Performance; Nodal Analysis.</td></tr>
<tr><td>Module 2:</td><td>Artificial Lift Introduction and SRP</td><td>Assignment 2</td><td>Course Based Problems</td><td>11 Periods</td></tr>
<tr><td colspan="5">Topics:
Definition and purpose of artificial lift; Type of artificial lifts: SRP, Gas lift, ESP, Hydraulic pumps. SRP - Introduction; Surface components; Wellhead equipment; Type of pump; working mechanism; subsurface components; Dynamometer; Operating parameter description and calculation.</td></tr>
<tr><td>Module 3:</td><td>Gas Lift</td><td>Assignment 3</td><td>Quiz</td><td>12 Periods</td></tr>
<tr><td colspan="5">Topics:
Introduction; Working mechanism; Types of gas lifts: Continuous gas lift, intermittent gas lift; Gas lift valves: Valve mechanism, Type of valves, Valve selection, Valve pressure calculation; Gas lift mandrel; Type of installations; Surface components; Basic design calculation; Plunger and chamber gas lifts.</td></tr>
<tr><td>Module 4:</td><td>ESP and other Pumps</td><td>Assignment 4</td><td>Article Review</td><td>10 Periods</td></tr>
<tr><td colspan="5">Topics:
ESP - Introduction; ESP system; Subsurface components; Wellhead equipment; surface components; Working principle; Basic design calculations.
Other Pumps - Hydraulic pumps: Components and working principle; PCP: Components and working principle. Comparison Between Various Artificial Lift Techniques.</td></tr>
<tr><td colspan="5">Targeted Application and Tools that can be used:
Applications: Oil and Gas Industries- Production engineer
Tools: PROSPER and OLGA Multi Phase Flow Simulator</td></tr>
<tr><td colspan="5">Textbooks:
T1. BoyunGuo, Xinghui Liu, Xuehao Tan, “Petroleum production engineering”, Gulf Professional Publishing. (2nd Edition, 2017)
T2. Tan Nguyen, “Artificial Lift Methods: Design, Practices and Applications”, Springer.(1st Edition, March 2020)</td></tr>
<tr><td colspan="5">References:
R1. Boyun Guo Ali Ghalambor William C. Lyons,"Petroleum Production Engineering, A Computer-Assisted Approach”, Gulf Professional Publishing. (1 Edition, 2007)
R2. Kermit E Brown, “The Technology of Artificial Lift Methods”, PennWell Books. (Volume: 3B, 1983)</td></tr>
</table>

e-resources: 1. Presidency University e-access portal: https: / / presiuniv.knimbus.com / user# / home 2. Petrowiki Forum: https: / / petrowiki.spe.org / Oil_well_performance 3. Well Performance Model One Petro: https: / / onepetro.org / JPT / article-abstract / 44 / 02 / 220 / 107815 / Well-Performance-Model?redirectedFrom=PDF 4. Petrowiki: https: / / petrowiki.spe.org / Gas_lift#:~:text=Gas%20lift%20is%20a%20method,scrubbing%E2%80%9D%20action%20on%20the%20liquids 5. Kimray Official Website: https: / / kimray.com / training / 5-common-methods-artificial-lift 6.Oil and Gas IQ Website: https: / / www.oilandgasiq.com / oil-and-gas-production-and-operations / news / what-is-flow-assurance	
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Gas lift valves: Valve mechanism, Type of valves, Valve selection, and Valve pressure calculation for **Skill Development** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by:	Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Niladri Shekhar Samanta, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2111**	**Course Title: Fundamentals of Instrumentation and Control Engineering** **Type of Course: 1] Professional Core Course 2] Theory Only**	**L-T-P-C**	2	0	0	2
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course introduces the principles and applications of process control in engineering systems. Students learn fundamental concepts of feedback control, open and closed-loop systems, and control strategies. It covers the dynamic behavior of first and second-order systems, transportation lag, and the design and analysis of linear control systems. Emphasis is placed on understanding control elements, block diagrams, and transient response, preparing students for real-world control system implementation.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Instrumentation and Control Engineering and attain **Skill Development** through **Participative Learning Techniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Describe the dynamic behavior and feedback mechanisms of linear control systems, including feedback control techniques, open- and closed-loop control systems, ideal control actions, and control strategies, CO2:Apply feedback control techniques and control strategies to analyze the performance of open- and closed-loop control systems using block diagrams, ideal control actions, and their advantages and disadvantages, CO3:Employ transfer function models to analyze the response characteristics of first-order, second-order, higher-order, and transportation lag systems, CO4:Apply transfer function models to determine the response of first-order, higher-order, and transportation lag systems under step input conditions, CO5:Analyze the performance of cascade and closed-loop control systems using controllers, final control elements, chemical reactor control system					

	block diagrams, closed-loop transfer functions, and transient response characteristics for petroleum refinery process control.			
Course Content:				
Module 1:	Introduction to Process Control	Team Exercise	Presentation	10 Periods
Topics: Introductory Concepts: Introduction, Technique of control, Feedback control system-Advantage and disadvantage, Block diagram, Open and Closed loop system, Ideal control actions, Control Strategies.				
Module 2:	Linear Open-Loop System	Quiz	Online Quiz	10 Periods
Topics: 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.				
Module 3:	Linear Closed-Loop System	Team Activity	Poster Presentation	10 Periods
Topics: Control System- Controllers and Final Control Elements- Block Diagram of a Chemical-Reactor Control System- Closed-Loop Transfer Functions- Transient response of Simple Control Systems.				
Targeted Application and Tools that can be used: **Applications:** Process Engineer in various Chemical and Petrochemical Industry. **Tools:**Grapher				
Textbooks: T1. ProcessSystems Analysis and Control, Donald R. Coughanowr, Steven E. LeBlanc. 3rd Edition, 2009, Mcgraw-Hill Chemical Engineering Series. T2. Process Control and Instrumentation, R. P. Vyas,7thEdition,2015, Denett & Co				
References: R1. Process Dynamics and Control, Sudheer S.Bhagade, First Edition, 2011, PHI Learning. R2. Instrumentation and Process Control, M.N.Jayaswal, First Edition, 2009 IK International House Pvt. Ltd. **e- References:** 1. https://puniversity.informaticsglobal.com/login 2. https://nptel.ac.in/courses/103/103/103103037 3. https://ch503ns.wordpress.com/a-to-z/lecture-notes/				
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Open and Closed loop system, Ideal control actions, Control Strategies, Response of first order systems in series- Higher Order systems: Second Order and transportation lag, and Control System- Controllers and Final Control Elements are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.				
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: PET2112	**Course Title: Fundamentals of Instrumentation and Control Engineering Lab** **Type of Course: 1] Professional Core Course 2] Laboratory Only**	**L-T-P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to enable the student to understand the different process control methods used in the industry. It will help the student in selection of the different control method for different types of processes in industry. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking and analytical skills. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to correlate with the real time experiment.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Instrumentation and Control Engineering and attain **Skill Development** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Determine the step response of a Single Tank System, and apply the concept of transfer function of an open loop system and interpret the theoretical response with actual response in a Two Tank Interacting System and two tank non-interacting system for step input, CO2: Apply dynamic system equations to evaluate the step response of a Two Tank Non-Interacting System, and examine the closed loop operation of the Temperature Control, Pressure Control, Flow Control, and level control using PID controller with computerized system, CO3: Calculate the step response of a Two Tank Non-Interacting System and compare theoretical predictions with experimental observations, and demonstrate the closed loop operation of Flow Control, and level control system using PID controller with computerized system, CO4: Analyze the dynamic behavior of a second-order system by determining and interpreting its time constant using a mercury manometer, and analyze the characteristics of diaphragm actuated pneumatic linear control valve and equal percentage valve, and experiment the dynamics and compare theoretical response with actual response Two Tank Interacting with multiple step input, CO5: Examine calibration data of a thermocouple by comparing its temperature response with that of a resistance temperature detector (RTD) and calculate the deviations and accuracy and examine the dynamics and compare theoretical response with actual response Two Tank Non-Interacting with multiple step input.					
Course Content:						
Module 1:	Introduction to Process Control	Team Exercise	Presentation	10 Periods		
Topics: Introductory Concepts: Introduction, Technique of control, Feedback control system-Advantage and disadvantage, Block diagram, Open and Closed loop system, Ideal control actions, Control Strategies **Related Experiment No:** 1, 2 ,3, 4, 5, and 6						
Module 2:	Linear Open-Loop System	Quiz	Online Quiz	10 Periods		
Topics: 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						

Related Experiment No:7, 8, 9, and 10				
Module 3:	Linear Closed-Loop System	Team Activity	Poster Presentation	10 Periods
Topics: Control System- Controllers and Final Control Elements- Block Diagram of a Chemical-Reactor Control System- Closed-Loop Transfer Functions- Transient response of Simple Control Systems. **Related Experiment No:**11 and 12				
List of Laboratory Experiments:				15 Sessions

Experiment No. 1: To study the Dynamics and Compare Theoretical Response with Actual Response in a single tank system for step input.
Level 1: To find the time constant of single tank system for single step input,
Level 2: To plot the response graph for single tank.

Experiment No. 2: To study the dynamics and compare theoretical response with actual response in a Two Tank Interacting System for step input.
Level 1: To find the time constant of Two Tank Interacting System for single step input,
Level 2: To plot the response graph of Two Tank Interacting.

Experiment No. 3: To study the dynamics and compare theoretical response with actual response in a Two Tank Non Interacting System for step input.
Level 1: To find the time constant of Two Tank Non Interacting System for single step input,
Level 2: To plot the response graph of Two Tank Non Interacting System.

Experiment No. 4: To study the dynamics and compare theoretical response with actual response in a Two Tank Interacting System for multi-step input.
Level 1: To find the time constant of Two Tank Interacting System for multi-step input,
Level 2: To plot the response graph of Two Tank Interacting.

Experiment No. 5: To study the dynamics and compare theoretical response with actual response in a Two Tank Non Interacting System for multi-step input.
Level 1: To find the time constant of Two Tank Non Interacting System for multi-step input,
Level 2: To plot the response graph of Two Tank Non Interacting System.

Experiment No. 6: To determine the time constant of a second order system (Mercury manometer).
Level 1: To find the time constant of Mercury manometer,
Level 2: To plot the response graph Mercury manometer.

Experiment No. 7: To calibrate the given thermocouple using resistance temperature detector.
Level 1: To find out the error and error% of the thermocouple,
Level 2: Plot the graph for error and error %.

Experiment No. 8: To study of Characteristics of Diaphragm actuated pneumatic Linear control valve and Equal percentage valve.
Level 1: To find the flow rate for the valve Characteristics,
Level 2: To plot the valve trip characteristics graph.

Experiment No. 9: Study of Characteristics of Diaphragm actuated pneumatic Linear control valve and Equal percentage valve.
Level 1: To find the flow rate for the valve Characteristics.
Level 2: To plot the valve trip characteristics graph.

Experiment No. 10: To Study the dynamics and compare theoretical response with actual response Two Tank Interacting and Non-interacting System.
Level 1: To find the time constant of Two Tank Interacting and non-interacting System for multi-step input.
Level 2: To plot the response graph of Two Tank Interacting and non- Interacting system.

Experiment No. 11: To calibrate the given thermocouple using resistance temperature detector.
Level 1: To find out the error and error% of the thermocouple.
Level 2: Plot the graph for error and error %.

Experiment No. 12: Study of the step response of Mercury and Water Manometer.
Level 1: To study the step response of second order system in a mercury manometer.
Level 2: To study the step response of second order system in a water manometer.

Any 10 Experiments must be conducted.
Targeted Application and Tools that can be used: **Applications:** Process Engineer in various Chemical and Petrochemical Industry. **Tools:**Grapher
Textbooks: T1: "Process Systems Analysis and Control", Steven E. LeBlanc, and Donald Coughanowr, 3rd Edition, McGraw-Hill Education, 2009. T2: "Process Control and Instrumentation", R. P. Vyas, 7th Edition, Denett & Company, 2015.
References: R1. Process Control Lab Manual, Presidency University, Bengaluru. R2. "Process Dynamics and Control", Sudheer S.Bhagade, First Edition, 2011, PHI Learning. R3. "Instrumentation and Process Control", M.N.Jayaswal, First Edition, 2009 IK International House Pvt. Ltd. **e- References:** 1. Presidency University Link: https: / / puniversity.informaticsglobal.com / login 2. NPTEL Courses on Process Control and Instrumentation: https: / / nptel.ac.in / courses / 103 / 103 / 103103037 3. Lecture Notes on Instrumentation and Process Control: https: / / ch503ns.wordpress.com / a-to-z / lecture-notes /
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": As it is a laboratory integrated course, all the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through assessment component mentioned in Course Plan.

Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2113**	**Course Title: Fundamentals of Geophysical Logging Techniques** **Type of Course: 1] Professional Core Course** **2] Theory only**	**L-T-P-C**	3	1	0	4
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	Geophysical Logging is very crucial to be carried out during the life cycle of any oilfield drilling operation. It provides data to answer fundamental questions associated with petrophysical, geological, and mechanical properties required to evaluate, develop, and produce a field.The purpose of this course is to provide a broad understanding of various geophysical logging techniques used for the determination of lithology, porosity, fluid content, saturation, permeability, etc., and applications of these results in formation evaluation.This course is both conceptual and analytical in nature and requires knowledge of basic science and engineering. The students will learn how to interpret well log data through exercises and assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Fundamentals of Geophysical Logging Techniques and attain **Skill Development** through **Participative Learning**T**echniques**.					
Course Outcomes:	Upon successful completion of the course the students shall be able to:					

	CO1: Illustrate the fundamental principles of logging to interpret basic log responses, CO2: Apply fundamental logging concepts to interpret rock properties, CO3: Demonstratelogging measurement techniques to evaluate formation responses, CO4: Analyzethe principles, tool types, limitations, and applications of basic logging tools, CO5: Distinguish special and advanced logging tools used for evaluating well integrity and reservoir performance, CO6: Comparevarious cross-plotting techniques for lithology and porosity identification.			
Course Content:				
Module 1:	An Overview of Well Logging	e-resource Review / Report Writing	Writing Communication / Analytical Skills Development	08 Periods
Topics: Well Logging: Definition, Objectives and Principles of Log Interpretation, Applications of Well Logging; Well Log Analysts / Petrophysicists – Job Description; Basic Log Types – Logging While Drilling, Wireline Open Hole Logging, Wireline Cased Hole Logging, Pipe-Conveyed Logging; Operational Decisions – Tool Failure, Stuck Tools. *Related Exercise No.: 1.1 through 1.4.*				
Module 2:	Basic Concepts of Well Logging and Measurement Techniques	Interpretation of Oil Field Charts	Exercises	19 Periods
Topics: Basic Concepts of Well Logging: Properties of Rocks – Composition, Texture and Structure; Relationship between Porosity and Resistivity (Formation Factor), Relationship between Saturation and Resistivity (Archie's Equation), Effect of Shaliness on the Resistivity, Effect of Shale distribution, Permeability, Thickness and internal structure of strata. Measurement Techniques: Classification of Log Measurements - Natural Phenomena, Physical properties measured by inducing responses from the formation; Problems specific to Well Log Measurements - Borehole Effects (Invasion), Effect of Tool Geometry, Logging Speed, Hostile Environments; Logging Equipment (Surface and Downhole) - Logging Truck and Offshore Units, Cable, Logging Tool, Recording Equipment, Tool Combinations, Memorization; Log Presentation; Repeatability and Calibrations. *Related Exercise No.: 2.1 through 2.7.*				
Module 3:	Basic Logging Tools	Analysis of Well Log Data	Exercises	21 Periods
Topics: Resistivity Log, Induction Log, Spontaneous Potential (SP) Log, Gamma Ray (GR) Log, Sonic Log, Density Log, and Neutron Log - Principle, Types of Tools used, Limitations, and Applications; Caliper Log; Temperature Log. *Related Exercise No.: 3.1 through 3.6.*				
Module 4:	Special and Advanced Logging Tools	Poster Designing and Presentation	Verbal Communication Skill Development	08 Periods
Topics: Principles, Limitations, and Applications of Production Logging; CBL / VDL, USIT, SFT, and RFT; NMR Log, and FMS Log. *Related Exercise No.: 4.1 through 4.2.*				
Module 5:	Cross-plots and their Applications	Analysis of Cross-Plots	Exercises	04 Periods
Topics: Cross-plots and their applications, Neutron – Density, Sonic – Neutron, Sonic – Density. *Related Exercise No.: 5.1 through 5.4.*				
Targeted Application and Tools that can be used: **Applications:** Well Log Analyst / Petrophysicist in Petroleum / Mineral Exploration industry **Tools:** Microsoft Excel (Basics), Python, MatLab, Grapher, DecisionSpace G1 Edition (Halliburton Software)				
Textbooks:				

T1. Darling, Toby, "Well Logging and Formation Evaluation", 1st Edition, Elsevier, Gulf Professional Publishing, 2005.
T2. Serra, Oberto, "Fundamentals of Well Log Interpretation - 1. The Acquisition of Logging Data", 1st Edition, Elsevier Science Publisher B V, 1984.

References:

R1. Rider, M., "The Geological Interpretation of Well Logs", Rider-French Consulting Ltd., 2004
R2. Ellis, Darwin V., and Singer, Julian M., "Well Logging for Earth Scientists", 2nd Edition, Springer, 2007.
R3.Bateman, Richard M., "Openhole Log Analysis and Formation Evaluation", 2nd Edition, Society of Petroleum Engineers, 1986.

e-resources:

1. Link for PU e-resources: https: / / puniversity.informaticsglobal.com / login
2. Reservoir Petrophysics: https: / / www.youtube.com / watch?v=iubNxQLKcow
3. An Overview of Well Logging: https: / / www.youtube.com / watch?v=A5MEEX_pwys
4. Cross-plots and their Applications: https: / / www.youtube.com / watch?v=IkRygF3MORw&t=2243s
5. Research Article: https: / / www.sciencedirect.com / topics / earth-and-planetary-sciences / formation-evaluation

Skill Sets:

Topics relevant to **"SKILL DEVELOPMENT":**Resistivity Log, Induction Log, Spontaneous Potential (SP) Log, Gamma Ray (GR) Log and Sonic Logfor **Skill Development** through **Participative Learning Techniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Mr. Bhairab Jyoti Gogoi, and Dr. Rohit Kumar Saw
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2114**	**Course Title:Reservoir Fluid Mechanics** **Type of Course:1] Professional Core Course** **2] Theory Only**	**L-T-P-C**	2	0	0	2
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course introduces fundamental principles of fluid mechanics, including fluid statics, kinematics, dynamics, and compressible flow. Topics cover pressure measurement, fluid motion analysis, Bernoulli's equation, flow through nozzles and pipes, and compressible flow phenomena. Emphasis is placed on theoretical understanding, practical applications in pipeline and reservoir systems, and experimental data analysis for fluid property estimation and flow behavior prediction in petroleum and process engineering industries.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Reservoir Fluid Mechanics and attain **Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of this course the students shall be able to: CO1: Explain the concepts of fluid pressure, Pascal's law, and pressure measurement using manometers and surface analysis, CO2: Classify types of fluid flow using continuity equations and evaluate fluid velocity fields using stream functions and flow nets, CO3: Apply Euler's and Bernoulli's equations to solve fluid flow problems and analyze flow measurement devices such as Venturimeters, Pitot tubes, and notches, CO4: Analyze isentropic and compressible flows, shock waves, and flow through nozzles and pipes, incorporating concepts of thermodynamics					

	and flow resistance.			
Course Content:				
Module 1	Fluid Statics	Assignment	Data Collection	05 Periods
Topics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmosphere and vacuum pressure. Manometers, simple and differential manometers, total pressure and location of center of pressure on horizontal /vertical / inclined plane surfaces and curved surfaces submerged in a liquid.				
Module 2	Fluid Kinematics	Assignment	Data Collection	05 Periods
Topics: Types of fluid flow-introduction, continuity equation in three dimensions (Cartesian co-ordinate system only), velocity and acceleration, velocity potential function and stream function and flow nets.				
Module 3	Fluid Dynamics	Assignment	Literature Survey and Presentation	08 Periods
Topics: Fluid Dynamics: Introduction, equations of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, limitation of Bernoulli's equation, fluid flow measurements: Venturimeter, vertical orifice & orifice meter, Pitot tube, v-notch and rectangular notch, rotameter. Laminar flow and viscous effects: Reynolds number, laminar and turbulent flows, critical Reynolds number, laminar flow between parallel plates, steady state flow, unsteady state flow.				
Module 4	Compressible Flow	Assignment	Coding	07 Periods
Topics: Compressible Flow- Introduction: Review of Thermodynamics, The Speed of Sound, Adiabatic and Isentropic Steady Flow, Isentropic Flow with Area Changes, The Normal Shock Wave, Operation of Converging and Diverging Nozzles, Compressible Duct Flow with Friction. Flow through pipes: Frictional loss in pipe flow, Darcy's-equation and Chezy's equation for loss of head due to friction in pipes, hydraulic gradient line and total energy line, hydrate formation pipeline, Darcy's equation of fluid flow through porous media.				
Targeted Application & Tools that can be used: **Applications:** Process Engineer, Pipeline Engineer, Reservoir Engineer in Oil and Gas Industry **Tools:** MS Excel, Grapher				
Textbooks: T1: White, Frank M., "Fluid Mechanics," 7th Edition, 2011, McGraw Hill Education (India) T2: Modi P.N., Seth S.M., Hydraulics and Fluid Mechanics Including Hydraulics Machines, 21st Edition, 2017, Raispns Publications Pvt. Ltd.				
References: R1:Çengel, Yunus A., and John M. Cimbala. Fluid mechanics: Fundamentals and applications, 15th Edition. 2006, Boston: McGraw-HillHigher Education R2: Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell, "Fluid Mechanics: SI Version," Wiley India. R3:Tarek Ahmed, Elsevier, "Reservoir Engineering Handbook". **e- References:** 1.Link for Knimbus remote login: https: / / presiuniv.knimbus.com 2.https: / / byjus.com / physics / fluid-dynamics / 3. https: / / www.youtube.com / watch?v=djx9jlkYAt4 4. https: / / www.youtube.com / watch?v=Cdpoo2XM6Hg				
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Fluid Statics, Fluid Kinematics, Fluid Dynamics, and Compressible Flow are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Niladri Shekhar Samanta, Ms. Amolina Doley, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Council:	

Course Code: **PET2115**	**Course Title:Reservoir Fluid Mechanics Lab** **Type of Course:1] Professional Core Course** **2] Laboratory Only**	**L-T-P-C**	0	0	2	1

Version No.:	1.0
Course Pre-requisites:	NIL
Anti-requisites:	NIL
Course Description:	The course is designed to discuss the fundamental laws relating to the static and dynamic behavior of fluids. It enables the need for analyze the fluid flow behavior and its applications in porous media. The course is both conceptual and analytical in nature. It needs fair knowledge of Physics and Mathematics. The course develops the critical thinking and analytical skills. The associated laboratory experiments provide an opportunity to validate the concepts taught and enhances the ability to visualize the real system performance. Knowledge gained from this course can be applied for analyzing fluid flow through hydrocarbon reservoir.
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Reservoir Fluid Mechanics and attain **Skill Development** through **Experiential Learning Techniques**.
Course Outcomes:	On successful completion of this course the students shall be able to CO1: Apply the principles of fluid mechanics to determine fluid viscosity, CO2: Employ the concept of hydrostatics to pressure measuring devices, and determine the pressure drop of fluid flow through a pipe by using simple manometer and U-tube manometer, CO3: Apply the principle of energy conservation to flow measuring devices, and calculate energy conservation by applying Bernoulli's Theorem, CO4:Calculate different parameters for compressible fluid flow, and interpret the viscosity of fluids, type of flow by applying Reynolds number, and determine the variation of coefficient of discharge using Venturimeter, CO5: Interpret the fluid dynamics theoretical knowledge with lab experiments, and examine the rate of flow using Rotameter, loss of head due to bend, enlargement and contraction in pipes, the friction losses in pipes using Darcy - Weisbach equation, and predict the force developed by impact of jet of water on plates of different configurations and compare with the theoretical value.
Course Content:	

Module 1	Fundamentals of Reservoir Fluid Mechanics	Conduction of Experiment	Presentation	02 Sessions
Topics: Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmosphere and vacuum pressure. Manometers, simple and differential manometers, total pressure and location of center of pressure on horizontal /vertical / inclined plane surfaces and curved surfaces submerged in a liquid. **Related Experiment No:** 1				
Module 2	Fluid Kinematics	Assignment	Data Collection	04 Sessions
Topics: Types of fluid flow-introduction, continuity equation in three dimensions (Cartesian co-ordinate system only), velocity and acceleration, velocity potential function and stream function and flow nets. **Related Experiment No:** 2, 3, 4				
Module 3	Fluid Dynamics	Assignment	Literature Survey and Presentation	03Sessions
Topics: Fluid Dynamics: Introduction, equations of motion, Euler's equation of motion, Bernoulli's equation from				

Euler's equation, limitation of Bernoulli's equation, fluid flow measurements: Venturimeter, vertical orifice & orifice meter, Pitot tube, v-notch and rectangular notch, rotameter. Laminar flow and viscous effects: Reynolds number, laminar and turbulent flows, critical Reynolds number, laminar flow between parallel plates, steady state flow, unsteady state flow.
Related Experiment No: 5, 6

Module 4	Compressible Flow	Assignment	Coding	06 Sessions

Topics:
Compressible Flow- Introduction: Review of Thermodynamics, The Speed of Sound, Adiabatic and Isentropic Steady Flow, Isentropic Flow with Area Changes, The Normal Shock Wave, Operation of Converging and Diverging Nozzles, Compressible Duct Flow with Friction.
Flow through pipes: Frictional loss in pipe flow, Darcy's-equation and Chezy's equation for loss of head due to friction in pipes, hydraulic gradient line and total energy line, hydrate formation pipeline, Darcy's equation of fluid flow through porous media.
Related Experiment No: 7, 8, 9, and 10

Topics:
Fluid pressure at a point, Pascal's law, pressure variation in a static fluid, absolute, gauge, atmosphere and vacuum pressure. Manometers, simple and differential manometers, total pressure and location of center of pressure on horizontal /vertical / inclined plane surfaces and curved surfaces submerged in a liquid.
Related Experiment No: 1

List of Laboratory Tasks:

Experiment No. 1: To measure the viscosity of fluids
Level 1: To determine the viscosity at room temperature
Level 2: To find the viscosity variation with respect to temperature (Students will learn to plot the graphs on normal graph paper manually and also using free available software / tool)

Experiment No. 2: Verification of Bernoulli's Theorem
Level 1: To calculate the total energy at different cross section of pipe
Level 2: To plot the graph between total energy versus distance and prove the Theorem (Students will learn to plot the graphs on normal graph paper manually and also using free available software / tool)

Experiment No. 3: To determine flow regime from Reynolds number
Level 1: To determine the type of flow
Level 2: To study transition zone

Experiment No. 4: To study the variation of coefficient of discharge
Level 1: To demonstrate the use of Venturimeter for fluid flow measurement
Level 2: To determine the coefficient of discharge for a given input

Experiment No. 5: To study the variation of coefficient of discharge
Level 1: To demonstrate the use of Orifice meter for fluid flow measurement
Level 2: To determine the coefficient of discharge for a given input

Experiment No. 6: To calculate the rate of flow
Level 1: To calculate the rate of flow using Rotameter
Level 2: To calibrate the rotameter

Experiment No. 7: To determine loss of head due to bend, enlargement and contraction in pipes
Level 1: To determine loss of head due to bend, enlargement and contraction in pipes using minor loss
Level 2: To compare the head losses in the presence of different sections of pipes

Experiment No. 8: To evaluate the friction losses in pipes
Level 1: To determine the friction factor for Darcy - Weisbach equation using major loss
Level 2: To determine the reason for friction loss

Experiment No. 9: To measure the force developed by impact of jet of water on plates of different configurations and compare with the theoretical value
Level 1: To determine the impact forces of jet on flat vane
Level 2: To plot the performance characteristics

Experiment No. 10: To measure the force developed by impact of jet of water on plates of different configurations and compare with the theoretical value
Level 1: To determine the impact forces of jet on V-notch
Level 2: To plot the performance characteristics

Targeted Application & Tools that can be used: **Applications:** Process Engineer, Pipeline Engineer, Reservoir Engineer in Oil and Gas Industry **Tools:** MS Excel, Grapher	
Textbooks: T1: White, Frank M., "Fluid Mechanics," 7th Edition, 2011, McGraw Hill Education (India) T2: Modi P.N., Seth S.M., Hydraulics and Fluid Mechanics Including Hydraulics Machines, 21st Edition, 2017, Raispns Publications Pvt. Ltd.	
References: R1: Fluid Mechanics Lab Manual, Presidency University, Bengaluru. R2: Çengel, Yunus A., and John M. Cimbala. Fluid mechanics: Fundamentals and applications, 15th Edition. 2006, Boston: McGraw-HillHigher Education R3: Robert W. Fox, Alan T. McDonald, Philip J. Pritchard, John W. Mitchell, "Fluid Mechanics: SI Version," Wiley India. R4:Tarek Ahmed, Elsevier, "Reservoir Engineering Handbook". **e- References:** 1.Link for Knimbus remote login: https: / / presiuniv.knimbus.com 2.https: / / byjus.com / physics / fluid-dynamics / 3. https: / / www.youtube.com / watch?v=djx9jlkYAt4 4. https: / / www.youtube.com / watch?v=Cdpoo2XM6Hg	
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": All the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course plan.	
Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Niladri Shekhar Samanta, Ms. Amolina Doley, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2116**	**Course Title: Oil and Gas Surface Facility Design** **Type of Course: 1] Professional Core Course** **2] Theory Only**	**L-T-P-C**	2	0	0	2
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course offers a comprehensive understanding of surface production operations in the oil and gas industry. Students learn about subsurface equipment, reservoir fluid behavior, and the design of surface facilities. Key topics include two-phase and three-phase separation, crude oil treatment techniques, and produced water handling. Emphasis is placed on the function, design, and operation of separators, treaters, and heaters, with practical assessments in simulation, data analysis, and case-based learning.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Oil and Gas Surface Facility Design and attain **Skill Development** through **Participative learning Techniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Describe the subsurface production process, reservoir fluid properties, phase behavior, and the configuration and selection of surface production facilities, CO2: Apply the principles of phase separation to select and size two-phase					

	separation equipment for oil and gas production, CO3: Apply the principles of three-phase separation to select and operate separators for efficient oil, gas, and water separation, CO4: Examine the working principles of crude oil treating equipment, emulsion treatment methods, and field optimization techniques used in crude oil processing, CO5: Illustrate produced water treatment principles to select appropriate treatment methods and equipment for efficient water management in petroleum production.			
Course Content:				
Module 1:	Basic Facilities of Surface Production	Assessment 1: Assignment	Quiz	05 Periods
Topics: Subsurface Process and Equipment, Properties of Reservoir fluids and Phase behavior studies Surface Production facilities: Various types of facilities - Basic system configuration design & selection of facilities: Wellhead and manifold – Separation - Initial separation pressure - Stage Separation, Selection of Stages.				
Module 2:	Phase Separation	Assessment 2: Assignment / Quiz	Simulation	11 Periods
Topics: Two phase liquid and gas separation: Functional sections of a gas-liquid separator – Sizing of two phase separators- Equipment description of different separators. 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.				
Module 3:	Crude Oil Treatment	Assessment 3: Assignment / Quiz	Data Collection and Analysis	07 Periods
Topics: Equipment description of various treaters and heaters - Indirect & Direct fired heaters - Vertical heater-treaters - Horizontal heater treaters - Electrostatic heater-treaters - Emulsion treating theory – Agitation - Field optimization - Emulsion treating methods - Bottle test considerations.				
Module 4:	Produced Water Treatment	Assessment 4: Case Study	Poster Presentation	07 Periods
Topics: Oil desalting systems - Produced water treating systems: Characteristics of produced water - Sand and other suspended solids - Dissolved gases - Oil in water emulsions - Dissolved oil concentrations - Dispersed oil - Gravity separation – Coalescence – Dispersion – Miscellaneous Equipments.				
Targeted Application and Tools that can be used: **Applications:** Process Engineer, Surface facilities engineer, Plant Design. **Professional Software:** UNISIM Design, ASPEN HYSYS				
Textbooks: T1: Ken Arnold and Maurice Stewart, “Surface Production Operations”, Vol. 1, 2nd Edition, Gulf Professional Publishing, 1999. T2: W.L. Mc Cab and J.C. Smith and Peter Harriott, Unit operations in Chemical Engineering, 5th Edition, Mc Graw Hill, 1993.				
References: R1: Petroleum and Gas Field Processing, H.K.Abdel-Aal and Mohamed Aggour and M.A. Fahim, 1st Edition, Marcel Dekkar Inc., 2003. **e-resources:** 1. https://cheguide.com/flash_raoult.html 2. https://ifsolutions.com/two-phase-separator-vs-three-phase-separator-differences/ 3. https://www.youtube.com/watch?v=J_9b69F-Seg 4. https://www.netsolwater.com/what-is-effluent-treatment-plant-and-etp-working-process.php?blog=107				
Skill Sets: Topics relevant to “**SKILL DEVELOPMENT**”: Phase Separation, Crude Oil Treatment, and Produced Water Treatment are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Niladri Shekhar Samanta, Ms. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul			

Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET2117**	**Course Title: Oil and Gas Surface Facility Design Lab** **Type of Course: 1] Professional Core Course 2] Laboratory Only**	**L-T-P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to enable the students to appreciate the need for surface production facilities. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to visualize the real system performance.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Oil and Gas Surface Facility Design and attain **Skill Development** through **Experiential Learning Techniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Identify various types of phase separators suitable for managing different fluid compositions and operating environments, CO2: Explain the working principles of produced water treatment systems used in hydrocarbon processing and water purification.					
Course Content:						
Module 1:	Introduction to Surface Facility and Phase Separation	Conduction of Experiment	Presentation	15 Sessions		

Topics:
Various Types of Surface Facility, Basic system configuration design and selection of facilities, Three phase oil, gas and water separation, Functional sections of a gas-liquid separator – Sizing of two phase separators- Equipment description of different separators, Vertical heater-treaters - Horizontal heater treaters - Electrostatic heater-treaters Sand and other suspended solids - Dissolved gases - Oil in water emulsions - Dissolved oil concentrations - Dispersed oil - Gravity separation – Coalescence – Dispersion,

List of Laboratory Tasks:

Experiment No. 1: Introduction to Basic Environment of UNISIM Design Software
Level 1: Construct a basic UNISIM case by selecting a property package, adding components, and defining a material stream
Level 2: Define multiple material streams with different compositions and analyze phase behavior under varying temperature and pressure conditions

Experiment No. 2: Uses and Functions of various tools in UNISIM Design
Level 1: Use basic UNISIM tools to view stream properties and perform simple flash calculations
Level 2: Apply advanced utilities such as phase envelope, property tables, and case studies to analyze stream behavior and compare results

Experiment No. 3: Flash Calculation and Phase Envelope
Level 1: Perform Flash calculation for a crude oil using Peng Robinson Equation of state
Level 2: Demonstrate Flash calculation for a crude oil and draw the phase envelope using Peng Robinson Equation of state

Experiment No. 4: Simulation of Separation Process
Level 1: Find the concentration of components of crude oil leaving a separator at a given Temperature and Pressure Condition
Level 2: Predict the concentration of components of crude oil leaving a stage separator at a given Temperature and Pressure condition

Experiment No. 5: Propane Refrigeration Loop
Level 1: Simulate a basic propane refrigeration loop and determine operating pressures and temperatures of each stream
Level 2: Analyze the effect of compressor efficiency and condenser pressure drop on refrigeration performance and energy requirement

Experiment No. 6: Two Stage Compression
Level 1: Simulate a two-stage gas compression system and determine outlet pressure and temperature
Level 2: Compare discharge temperatures with and without interstage cooling

Experiment No. 7: Refrigerated Gas Plant
Level 1: Simulate a refrigerated gas plant and determine hydrocarbon dew point of the treated gas
Level 2: Analyze the effect of chiller outlet temperature on liquid recovery and sales gas dew point specification

Experiment No. 8: NGL Fractionation
Level 1: Simulate an NGL fractionation column and determine composition of overhead and bottom products
Level 2: Analyze the effect of reflux ratio and number of stages on NGL recovery and product purity

Experiment No. 9: Air Cooled Heat Exchanger
Level 1: Simulate an air-cooled heat exchanger and determine outlet temperature for a given duty
Level 2: Analyze the effect of ambient temperature and air flow rate on heat exchanger performance

Experiment No. 10:Simulation of Crude Oil Heater-Treater and Emulsion Breaking
Level 1: Simulate a crude oil heater–treater and determine separation of oil, water, and gas phases
Level 2: Analyze the effect of heating temperature on emulsion breaking efficiency

Experiment No. 11: Natural Gas Dehydration with TEG
Level 1: Simulate a TEG dehydration unit and determine water content of dry gas
Level 2: Analyze the effect of glycol circulation rate and reboiler temperature on dehydration efficiency

Experiment No. 12: Acid Gas Sweetening with DEA
Level 1: Simulate an acid gas sweetening unit using DEA and determine H_2S and CO_2 removal efficiency
Level 2: Analyze the effect of amine concentration and contactor stages on sweet gas quality

Any 10 Experiments must be conducted.

Targeted Application and Tools that can be used:
Applications: Process Engineer, Surface facilities engineer, Plant Design.
Professional Software: UNISIM Design, ASPEN HYSYS

Textbooks:
T1: Ken Arnold and Maurice Stewart, “Surface Production Operations”, Vol. 1, 2nd Edition, Gulf Professional Publishing, 1999.
T2: W.L. Mc Cab and J.C. Smith and Peter Harriott, Unit operations in Chemical Engineering, 5th Edition, Mc Graw Hill, 1993.

References:
R1: Oil and Gas Surface Facility Design Lab Manual, Presidency University, Bengaluru.
R2: Petroleum and Gas Field Processing, H.K.Abdel-Aal and Mohamed Aggour and M.A. Fahim, 1st Edition, Marcel Dekkar Inc., 2003.

e-resources:
1. https://cheguide.com/flash_raoult.html
2. https://ifsolutions.com/two-phase-separator-vs-three-phase-separator-differences/
3. https://www.youtube.com/watch?v=J_9b69F-Seg
4. https://www.netsolwater.com/what-is-effluent-treatment-plant-and-etp-working-process.php?blog=107

Skill Sets:
Topics relevant to “**SKILL DEVELOPMENT**”: All the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Niladri Shekhar Samanta, Ms. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2118**	**Course Title:** **Methods for Oil and Gas Exploration** **Type of Course:** **1] Professional Core Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The aim of this Course is to understand different Oil and Gas exploration techniques used in industry. It is a theory-based course where an overview of petroleum exploration methods will be discussed. Global Oil and Gas Exploration Scenario with Role of Sedimentology, Biostratigraphy, Geochemistry and Microfossils in Oil and Gas Exploration will be discussed. Basic concepts, principles and limitations different Geophysical Methods like Gravity Survey, Magnetic Survey, Electromagnetic Survey and Seismic Survey will be discussed along with their applications in Oil and Gas Exploration.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Geophysical Methods for Oil and Gas Exploration and attain **Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Explain petroleum generation, migration, and accumulation processes, and the role of kerogen characteristics and source rock evaluation in hydrocarbon exploration, CO2: Describe the role of fossils, palynology, and micropaleontology in hydrocarbon exploration and geological interpretation, CO3: Interpret geochemical exploration data by considering seepage phenomena, prospecting methods, and machine learning techniques for anomaly detection and seepage mapping, CO4: Illustrate the principles of gravity surveying, gravimeters, gravity corrections, and the applications of gravity measurements in petroleum exploration, CO5: Compare magnetic survey techniques, magnetic field instruments, and magnetic anomaly correction methods used in petroleum exploration, CO6: Demonstrate the principles of seismic surveying, seismic wave propagation, seismic data acquisition and processing, seismic survey equipment, and seismic reflection data for petroleum exploration.					
Course Content:						
Module 1:	Geological Exploration Methods	Assessment 1: Assignment / Quiz	Literature Survey	11 Periods		
Topics: Formation, migration, and accumulation of petroleum; surface indications; basic geological mapping techniques. Formation of kerogen; Kerogen types, maturity stages; Van Krevelen diagram; its use in source rock evaluation. Uses of fossils, especially foraminifera, ostracods, calcareous nanofossils; Calcareous nanofossils, Nanoliths and Ostracods. Importance of palynology and micropaleontology in oil and gas exploration.						
Module 2:	Geochemical Exploration Methods	Assessment 2: Assignment / Quiz	Data Collection	08 Periods		
Topics:						

Fundamentals of Geochemical Exploration - Definition, objectives, and classification of geochemical exploration. Seepage Phenomena in Geochemical Prospecting - Mechanisms and Indicators; Types of seepages (gas, oil, water) and their origin; Geochemical signatures of seepage and their interpretation; Seepage Activity and its Role in Identifying Hydrocarbon Accumulations; Correlation of seepage anomalies with subsurface reservoirs. Direct Geochemical Methods - Sampling, Analysis, and Interpretation; Detection of light hydrocarbons and trace elements. Indirect Geochemical Methods - Remote Sensing and Geobotanical Indicators; Use of spectral imaging and vegetation stress mapping. Benefits of Geochemical Prospecting - Enhancing Exploration Efficiency and Reducing Risk, Cost-effectiveness, rapid assessment, integration with geological and geophysical data. Limitations and Uncertainties in Geochemical Exploration - Causes, Mitigation, and Case Studies, Sampling errors, environmental effects, data interpretation challenges. Machine learning in anomaly detection and seepage mapping.

Module 3:	Gravity Survey and Magnetic Survey	Assessment 3: Assignment / Quiz	Programming Task	13 Periods

Topics:

Gravity Survey: Principles, Concepts, Objectives, and Exploration Significance; Basic physical principles and relation to subsurface density contrasts. Gravimeters - Types, Working Principles, and Field Operations. Gravity Corrections - Theory, Calculation, and Importance in Data Processing; Drift, latitude, free-air, Bouguer, terrain, and tidal corrections; Impact of corrections on anomaly interpretation. Applications of Gravity Measurements in Petroleum Exploration.

Magnetic Survey: Understanding the Earth's Geomagnetic Field; Components of the geomagnetic field (declination, inclination, total intensity); Diurnal and secular variations. Magnetic Field Instruments - Principles, Types, and Data Collection Methods; Fluxgate, proton precession, optically pumped magnetometers. Airborne and ground magnetic survey techniques. Magnetic Response of Simple Geometric Shapes, Rock Magnetism - Properties, Origin, and Exploration Relevance; Types of Magnetism in Rocks and Minerals - Ferromagnetism, Paramagnetism, and Diamagnetism; Magnetic Anomalies - Causes, Corrections, and Geological Interpretation, Applications of Magnetic Surveys in Petroleum Exploration.

Module 4:	Seismic Survey	Assessment 4: Case Study	Data Collection and Analysis	13 Periods

Topics:

Seismic Survey: Principles, Scope, and Role in Exploration, Overview of seismic methods in petroleum, mineral, and engineering applications. Theory of Seismic Reflectance and Wave Propagation in Subsurface Media - Reflection and refraction principles; Influence of acoustic impedance contrasts. Seismic Wave Velocity of Rocks - Factors, Measurement, and Exploration Relevance; P-wave and S-wave velocities in different lithologies; Effect of porosity, fluid content, and temperature. Reflection Seismograms - Generation, Characteristics, and Interpretation. Shot Gathers and CMP (Common Midpoint) Gathers - Data Acquisition and Processing Concepts. Attenuation of Seismic Energy Along Ray Paths - Causes and Mitigation. Equipment Used in Seismic Surveys - Sources, Receivers, and Recording Systems; Vibroseis trucks, dynamite shots, air guns; Geophones, hydrophones, and digital recorders. Interpretation of Seismic Reflection Data: Structural and Stratigraphic Applications.

Targeted Application and Tools that can be used:

Applications: Exploration Geochemist / Geologist / Geophysicist in Oil and Gas / Mineral Exploration companies

Tools: MS Excel, Grapher, Decision Space G1 Edition (Professionally used Landmark Halliburton Software)

Textbooks:

T1. Philip Kearey, Michael Brooks and Ian Hill, 2002. An Introduction to Geophysical Exploration, 3rd Edition, Blackwell Science.

T2: W.M. Telford, L.P. Geldart and R.E. Sheriff, 1990. Applied Geophysics, 2nd Edition, Cambridge University Press.

References

R1. R1: Milton B. Dobrin, and Carl H. Savit, 1988. Introduction to Geophysical Prospecting, 4th Edition, McGraw Hill.

R2: M.B. Ramachandra Rao, 1993. Outlines of Geophysical Prospecting: A Manual for Geologists, EBD Educational Pvt Ltd.

Class Note (CN) / Materials / Other materials

e-resources

1. E-remote access portal: https: / / presiuniv.knimbus.com / user# / home
2. Basics of Hydrocarbon exploration: https: / / www.youtube.com / watch?v=eT9bXXKBtTk

3. Technical Guidance to Exploration & Production Plans: http: / / dx.doi.org / 10.1007 / 978-3-030-45250-6_1 4. HELP (Hydrocarbon Exploration and Licensing Policy: https: / / www.youtube.com / watch?v=xvdetYz7UIA 5. Using 3D Seismic Exploration to Find and Drill for Oil and Natural Gas Sources: https: / / www.youtube.com / watch?v=8h35KsRD0c0
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Gravity surveying, gravimeters, gravity corrections, applications of gravity measurements for **Skill Development** through **Participative Learning Techniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Niladri Shekhar Samanta
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2119**	**Course Title:** **Oil and Gas Well Test Analysis** **Type of Course:** **1] Professional Core Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course aims to improve the knowledge of the students about fluid flow through porous media, solutions of diffusivity equations, pressure transient analysis, and gas well testing. To excel in this course, students should be well versed in the numerical solving and reservoir engineering. The course is mathematically rich with modelling and derivations of complex flow through porous media phenomena, pressure and flow rate relationship for different conditions, and the flow in non-circular reservoirs. This course will enhance programming knowledge of the students through assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Oil and Gas Well Test Analysis and attain **Skill Development** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the fundamentals of well test analysis and ideal reservoir models, CO2: Demonstrate the diffusivity equation and apply Horner's approximation in pressure analysis, CO3: Distinguish pressure build-up test data to find reservoir parameters such as permeability and skin factor, CO4: Illustrate the pressure drawdown test and multirate test in real reservoir data, CO5: Breakdown gas well testing techniques, including isochronal and modified isochronal tests.					
Course Content:						
Module 1:	Introduction to Well Test Analysis	Assignment	Programming	10 Periods		
Topics: Ideal reservoir model, mathematical preparation for well test analysis, derivation for diffusivity equation, radius of investigation, Principle of superposition, Horner's approximation**.**						
Module 2:	Pressure Build-up tests	Assignment	Programming	13 Periods		
Topics:						

Ideal buildup test, Actual buildup test, derivation from assumptions in ideal test theory, Qualitative behaviours of field test, Effect and duration of after flow, Permeability determination, skin factor, Well damage and stimulation, Reservoir limit tests.				
Module 3:	Flow Test	Assignment	Programming	10 Periods
Topics: Introduction, Pressure draw down test, Multirate tests, Application of Flow tests.				
Module 4:	Gas Well Testing	Assignment	Programming	12 Periods
Topics: Basic theory of Gas flow in reservoirs, Flow after flow tests, Isochronal test, Modified Isochronal tests.				
Targeted Application and Tools that can be used: **Applications:** Well Testing Engineer, Reservoir Engineer in companies like Schlumberger, ONGC, Baker Hughes, etc. **Tools:** Schlumberger – KAPPA software				
Textbooks: T1: Lee, J., 1982. Well Testing. T2: Lee, J., Rollins, J.B. and Spivey, J.P., 2003. Pressure transient testing (eBook). SPE textbook series, 9.				
References: R1: Bourdet, Dominique. Well Test Analysis: The Use of Advanced Interpretation Models. Netherlands, Elsevier Science, 2002. R2: McAleese, S. Operational Aspects of Oil and Gas Well Testing. Netherlands, Elsevier Science, 2000. **e-resources:** 1. Presidency University e-access portal :https: / / presiuniv.knimbus.com / user# / home 2. YouTube Well Test Analysis: https: / / www.youtube.com / watch?v=kQvQtU0n1YQ 3. SPE Well Test Series: https: / / www.youtube.com / watch?v=3R3JV-zzHJU				
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Pressure draw down test and Multirate tests for **Skill Development** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **PET2120**	**Course Title: Advanced Petroleum Reservoir Engineering** **Type of Course: 1] Professional Core Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to provide the practical application of the concepts like MBE and GOR equations in predicting the oil reservoir performance under different scenarios of drive mechanisms as well as in depth study of water influx models, immiscible displacement and reservoir management concepts. This course is both conceptual and analytical in nature and requires good knowledge of mathematics and programming. The course also enhances the programming skills of the students through different assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Advanced Petroleum Reservoir Engineering and attain **Skill Development**					

	through **Problem Solving Methodologies**.			
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Classify aquifer systems based on boundary conditions, flow geometry, and pressure maintenance, CO2: Apply water influx models to assess aquifer behavior and reservoir pressure support, CO3: Examine water flooding performance for factors affecting secondary recovery, CO4: Predict reservoir performance using saturation equations, CO5: Compute inflow performance relationships to evaluate well productivity over time, CO6: Describe the process and economic principles involved in reservoir management.			
Course Content:				
Module 1:	Water Influx	Assignment	Programming	11 Periods
Topics: Classification of Aquifers: Degree of Pressure Maintenance, Aquifer Boundary, Flow Regimes, Flow Geometry, Water Influx Models: Steady state models – Pot Aquifer, Schilthuis; Pseudo steady State model – Fetkovich; Unsteady State Models – van Everdingen and Hurst.				
Module 2:	Improved Oil Recovery and Immiscible Displacement	Case Study	Simulation	11 Periods
Topics: Secondary Recovery Techniques, Water Flooding: Factors, Procedure, Patterns. Recovery Efficiencies, Frontal Displacement and Advancement Theories.				
Module 3:	Oil Reservoir Performance	Assignment	Programming	11 Periods
Topics: Reservoir Performance Prediction: Instantaneous GOR, Reservoir Saturation Equations, Undersaturated Oil Reservoir, Saturated Oil Reservoir, Tracy's Method. Oil Well Performance: Inflow Performance Relationship, Vogel's Equation. Relating Reservoir Performance with Time.				
Module 4:	Introduction to Reservoir Management	Term Paper	Class Presentation	12 Periods
Topics: Reservoir Management: Definition, History, Concept. Reservoir Management Process: Setting Goals, Developing Plans, Economic Implementation. Reservoir Management Economics: Time Value of Money, NPV, IRR				
Targeted Application and Tools that can be used: **Applications:** Waterflooding, Reservoir performance prediction **Tools:**MBal (Software package), CMG – IMEX (Software Package)				
Textbooks: T1:Dake L. P. "Fundamentals of Reservoir Engineering", 17th Impression, Elsevier. T2: Ahmed, T., "Reservoir Engineering Handbook", Elsevier.				
References: R1: Ahmed, T., "Advanced Reservoir Engineering and Management" Elsevier. R2: Archer, J.S., Wall, C.G., "Petroleum Engineering Principles and Practice" Graham and Trotman Inc. **e-resources:** 1. Presidency University e-access portal:https: / / presiuniv.knimbus.com / user# / home 2. Reservoir Engineering Analyses :https: / / www.youtube.com / watch?v=NBJC_KVo4Ug 3. Advanced Petroleum Reservoir Engineering https: / / www.youtube.com / watch?v=m9PLxDOu5WI				
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Water Influx Models: Steady state models – Pot Aquifer, Schilthuis for **Skill Development** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: PET2121	**Course Title:** Oil and Gas Downstream Operations **Type of Course:** 1] Professional Core Course 2] Theory Only			**L-T- P-C**	3	0	0	3
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	This course offers an in-depth understanding of refinery operations and the Indian petrochemical industry. It covers crude oil classification, petroleum product specifications, and their industrial applications. Students explore key processes like distillation, catalytic reforming, cracking, and hydro processing. Emphasis is placed on feedstocks, process variables, and product yields, along with the production of fuels, petrochemicals, and polymers, providing a comprehensive insight into modern refining and downstream operations.							
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Oil and Gas Downstream Operations and attain **Skill Development** through **Participative LearningTechniques**.							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Compare the different product specification in downstream, CO2: Illustrate the different gas properties, CO3: Apply the knowledge of various crude distillation and catalytic reforming processes, CO4: Solve the thermal and catalytic cracking related numerical problems.							
Course Content:								
Module 1:	Overall Refinery Operations and Indian Scenario	Assignment	Data Collection	10 Periods				
Topics: Overall refinery operations. Refinery feed stocks: Crude oil Classification-Composition and Properties-Composition of petroleum crude suitable for asphalt/coke manufacture – Evaluation of crude oils. Indian Petrochemical Industry- Feed stocks – Process description and Process variables-Naphtha cracking-Gas cracking and Gas reforming.								
Module 2:	Petroleum Products and their Specifications	Assignment	Data Collection	10 Periods				
Topics: 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. 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.								
Module 3:	Crude Distillation	Poster Presentation	Programming	10 Periods				
Topics: Atmospheric and Vacuum distillation units, Auxiliary equipment such as desalters, pipe-still heaters and heat exchanger trains etc. Catalytic reforming processes for petroleum and petrochemical feed stocks, Isomerization Processes -Feed stocks-Feed preparation – Yields								
Module 4:	Thermal and Catalytic Cracking Processes	Assignment	Data Collection	10 Periods				
Topics: Visbreaking- Delayed Coking, Fluid Catalytic cracking and Hydrocracking, Feed stocks Catalysts - Process variables, Product Recoveries Yield estimation, Naphtha, Kerosene, Diesel, VGO &Resid, Hydrotreating / Hydroprocessing – Feed stocks – Process description and Process variables.								
Targeted Application and Tools that can be used: **Applications:** Process Engineering Industries in operation such as Distillation column, Solvent Adsorption and extraction and fuel testing services. **Tools:** Petroleum Testing Lab equipment and related software								
Textbooks: T1: Roychoudhury, U, “Fundamental of Petrochemical Engineering”, PHI Learning								

T2: Robert A. Meyers, “Handbook of Petroleum Refining Processes”, McGraw-Hill Education, 2003.	
References: R1: Margo Andy, “Petroleum and Petrochemical Industry”, Willey. R2: James G. Speight, “Refinery Feedstocks, CRC Press, 2020.	
Skill Sets: Topics relevant to “**SKILL DEVELOPMENT**”: Refinery Operations and Indian Scenario,Petroleum Products and their Specifications, Crude Distillation, and Thermal and Catalytic Cracking Processes are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.	
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Ms. Amolina Doley, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2122**	**Course Title: Oil and Gas Downstream Operations Lab** **Type of Course: 1] Professional Core Course** **2] Laboratory Only**	**L-T- P-C**	0	0	2	1
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course provides practical insights into petroleum product properties and refining processes. Topics include crude oil classification, distillation, catalytic reforming, cracking, hydroprocessing, and fuel specifications. Laboratory experiments focus on fuel characterization, calorific value, viscosity, and distillation techniques. Students gain hands-on experience with industry-relevant tools and equipment, enhancing their understanding of petroleum refining operations and product testing used in modern process engineering industries.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Oil and Gas Downstream Operations and attain **Skill Development** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Apply fundamental knowledge of petroleum product specifications, crude oil classification, and refining processes to analyze and interpret the operational principles of distillation, catalytic cracking, and hydroprocessing units in refining and petrochemical industries, CO2: Choose standard laboratory experiments and evaluate key fuel properties—such as viscosity, calorific value, flash point, and refractive index—using appropriate testing equipment, and interpret data for product quality assessment and process optimization in petroleum refining.					
Course Content:						
Module 1:	Petroleum Products, Crude Distillation and Cracking Process	Conduction of Experiment	Presentation	15 Sessions		
Topics: Crude oil Classification-Composition and Properties-Composition of petroleum crude suitable for asphalt/coke manufacture – Evaluation of crude oils. Feed stocks - Process description and Process variables-Naphtha cracking-Gas cracking and Gas reforming. 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. Atmospheric and Vacuum distillation units, Catalytic reforming processes						

for petroleum and petrochemical feed stocks, Isomerization Processes.Fluid Catalytic cracking and Hydrocracking, Feed stocks Catalysts - Process variables, Product Recoveries Yield estimation, Naphtha, Kerosene, Diesel, VGO &Resid, Hydrotreating / Hydroprocessing.

List of Laboratory Tasks:

Experiment No. 1: Determine the refractive index of different petroleum product
Level 1: Determine the refractive index of petrol diesel at different temperature,
Level 2: Determine the refractive index of blended petrol diesel at different temperature.

Experiment No. 2: Determine the flash and fire point of bio-fuel
Level 1: Determine the flash and fire point of bio-fuel by Pensky Martin,
Level 2: Determine flash and fire point of blended biofuel.

Experiment No. 3: Extraction of different product from crude oil using distillation column
Level 1: Extraction of different product from crude oil using distillation column
Level 2: Determination of class of crude, characterization index and correlation factor using distillation colomn.

Experiment No. 4: Measurement of strength consistency using penetrometer
Level 1: Determine strength consistency of different grades of bitumen,
Level 2: Determine strength consistency of different grades of bitumen at different temperature.

Experiment No. 5: Determine the calorific value of given fuel
Level 1: Determine the calorific value of given fuel
Level 2: Determine the calorific value of blended fuel

Experiment No. 6: Determine the viscosity of high density products using redwood II viscometer
Level 1: Determine the viscosity of grease naptha by redwood II at different temperature,
Level 2: Compare the viscosity of these products at different temperaure.

Experiment No. 7: To study of Characteristics of Diaphragm actuated pneumatic Linear control valve and Equal percentage valve
Level 1: To find the flow rate for the valve Characteristics,
Level 2: To plot the valve trip characteristics graph.

Targeted Application and Tools that can be used:
Applications: Process Engineering Industries in operation such as Distillation column, Solvent Adsorption and extraction and fuel testing services.
Tools: Petroleum Testing Lab equipment and related software

Textbooks:
T1: Roychoudhury, U, “Fundamental of Petrochemical Engineering”, PHI Learning
T2: Robert A. Meyers, “Handbook of Petroleum Refining Processes”, McGraw-Hill Education, 2003.

References:
R1: Petroleum Testing Lab Manual, Presidency University, Bengaluru.
R2: Margo Andy, “Petroleum and Petrochemical Industry”, Willey.
R3: James G. Speight, “Refinery Feedstocks, CRC Press, 2020.

Skill Sets:
Topics relevant to “**SKILL DEVELOPMENT**”: All the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Ms. Amolina Doley, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: PET2123	**Course Title: Petroleum Reservoir Modelling and Simulation** **Type of Course: 1] Professional Core Course 2] Theory Only**			**L-T-P-C**	2	0	0	2
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	This course introduces the fundamentals and advanced techniques of reservoir modeling and simulation. It covers geological and petrophysical modeling, numerical discretization, and multiphase flow equations. Students will learn static and dynamic modeling, history matching, forecasting, and software applications. Emphasis is placed on model validation, uncertainty quantification, and sensitivity analysis, preparing students to interpret and construct accurate reservoir models for enhanced decision-making in reservoir management.							
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Petroleum Reservoir Modelling and Simulation and attain **Skill Development** through **Participative LearningTechniques**.							
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Classify various data types for constructing reservoir models, CO2: Apply the fundamental principles and equations governing reservoir simulation.							
Course Content								
Module 1:	Fundamentals of Reservoir Modelling	Assignment / Quiz	Literature Review / Group Discussion	12 Periods				
Topics: Introduction to Reservoir Modelling, Types of Reservoir Models and its Applications, Geological Modelling Techniques, Petrophysical Properties and their impact on Reservoir Modelling, Modelling of Reservoir geometry and Continuity, Uncertainty in reservoir model description; Numerical Discretization, Grids, Numerical Techniques and approaches, Equations of Multiphase Flow, Implicit and Explicit Formulation, Comparative study of Black Oil and Compositional Model, Fundamentals - IMPES, Data Integration and Quality Control, Building and Validating Static Reservoir Models.								
Module 2:	Advanced Reservoir Simulation Techniques	Assignment / Quiz	Poster Presentation / Case Study	13 Periods				
Topics: Introduction to Reservoir Simulation, Governing Equations in Reservoir Simulation, Numerical Methods in Reservoir Simulation, Dynamic Modelling: History Matching and Forecasting, Simulation Software and Tools, Case Studies in Reservoir Simulation, Sensitivity Analysis and Uncertainty Quantification.								
Targeted Application and Tools that can be used: **Applications:** Production and Design Engineer in the Oil and Gas Industry **Tools:** CMG, Eclipse								
Textbooks: T1: Computer Modelling Group (CMG), CMG-GEM User's Guide, Computer Modelling Group Ltd., 2022. T2: J.H. Abou-Kassem, M. Rafiqul Islam, and S.M. Farouq-Ali, Petroleum Reservoir Simulation - The Engineering Approach, 2nd Edition, Elsevier Science, 2020. T3: John R. Fanchi, Principles of Applied Reservoir Simulation, 4th Edition, Elsevier Science, 2018.								
References: R1: Tarek Ahmed, and Paul McKinney, Advanced Reservoir Engineering, 1st Edition, Elsevier Science, 2011. R2: Abdullah Alajmi, and Ridha Gharbi, Handbook of Applied Petroleum Reservoir Simulation, 1st Edition, Auris Reference, 2016. R3: Computer Modelling Group (CMG), GEM Technical Manual, General Adaptive Implicit Equation of State Compositional Model, Computer Modelling Group, 1993. **e-resources:**								

1. Presidency University official ID: https://presiuniv.knimbus.com/user#/home 2. PGE 323M Reservoir Engineering III (Simulation): https://www.youtube.com/channel/UCkCwNnLZnRoaHYFyKTdySDw 3. A collection of Case Studies for verification of Reservoir Simulators: https://repositories.lib.utexas.edu/handle/2152/23014
Skill Sets: Topics relevant to "**SKILLDEVELOPMENT**": Types of Reservoir Models and its Applications, Geological Modelling Techniques, Petrophysical Properties and their impact on Reservoir Modelling, Modelling of Reservoir geometry and Continuity, Uncertainty in reservoir model description; Numerical Discretization, Grids, Numerical Techniques and approaches, Equations of Multiphase Flow, Governing Equations in Reservoir Simulation, Numerical Methods in Reservoir Simulation, Dynamic Modelling: History Matching and Forecasting, Simulation Software and Tools are designed for **Skill Development** through **Participative Learning Techniques**. The course attainment will be assessed through the assessment component(s) mentioned in the course handout.

Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Ms. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET2124**	**Course Title: Petroleum Reservoir Modelling and Simulation Lab** **Type of Course: 1] Professional Core Course 2] Laboratory Only**	**L-T-P-C**	0	0	4	2
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This laboratory-based course is designed to develop practical skills in reservoir modelling and simulation using industry-standard software tools. Students will engage in constructing static and dynamic reservoir models, analysing fluid and rock properties, and applying simulation techniques to both conventional and unconventional reservoirs. Emphasis is placed on phase behavior analysis, compositional modelling, and the evaluation of reservoir performance through real-world data. Through hands-on experiments, students will gain the ability to build, run, and interpret reservoir simulation models for effective production forecasting and reservoir management.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Petroleum Reservoir Modelling and Simulation and attain **Skill Development** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Produce a basic black oil reservoir model using simulation software by defining model dimensions and generating appropriate grid systems CO2: Predict reservoir fluid behavior using fluid property and PVT data modeling techniques under specified conditions CO3: Analyze reservoir fluid behavior through compositional modeling, plus-fraction splitting, regression-based data matching, and phase envelope evaluation CO4: Examine reservoir and natural gas behavior using PVT modeling, minimum miscibility pressure estimation, and thermodynamic property calculations under varying pressure–temperature conditions CO5: Experiment with Coal Bed Methane (CBM) reservoir models using dual-porosity simulation to evaluate production performance					

Course Content				
Module 1:	Introduction to Reservoir Simulation and Static Modelling	Conduction of Experiment	Presentation	11 Sessions
Topics: Overview and working environment of CMG software, Building Black Oil Simulation Models (Geometric modelling and grid properties), Fluid property modelling in simulators, PVT data modelling and basic well setup, Fundamentals of Plus Fraction Splitting and Experimental Data Matching Experiment Included: Experiment No.: 1, 2, 3, 4, 5				
Module 2:	Phase Behavior and Compositional Modelling	Conduction of Experiment	Presentation	14 Sessions
Topics: Phase behavior prediction using Winprop, Phase diagram generation and critical property identification, Compositional oil modelling using GEM simulator, P-T envelope development, Miscibility and molecular weight analysis Experiment No.: 6, 7, 8, 9, 10, 11, 12				
Module 3:	Unconventional Reservoir Modelling (CBM Focus)	Conduction of Experiment	Presentation	05 Sessions
Topics: Static and dynamic modeling of Coal Bed Methane reservoirs, Dual porosity modelling, Reservoir performance, prediction in CBM systems Experiment No.: 13, 14				

List of Laboratory Tasks:

Experiment 1: Overview of CMG Software
Level 1: Basic understanding of available Reservoir Simulator
Level 2: Working Environment of Simulator

Experiment 2:Basic Steps of Building Black Oil Simulation Model using IMEX-CMG Simulator
Level 1: Input and modify model dimensions as per given conditions for Geometric modelling
Level 2: Create and import grid along with grid properties for Geometric modelling

Experiment 3: Modelling of Fluid Properties using IMEX-CMG Simulator
Level 1: Understand fluid properties that can be quantified in a given simulator
Level 2: Apply fluid properties that can be quantified in a given simulator

Experiment 4: Modelling ofPVT Data using IMEX-CMG Simulator
Level 1: Enter the PVT data for fluids into a basic model
Level 2: Create or import fluid models, locate wells, and import well production data and rock-fluid properties.

Experiment 5: Prediction of Phase Behavior of Reservoir Fluid using Winprop Simulator
Level 1: Introduction to Winprop Simulator
Level 2: Create a compositional model using the provided data

Experiment 6: Modelling of Phase Diagram using CMG-GEM Simulator
Level 1: Determine the saturation pressure at temperatures both above and below the critical temperature
Level 2: Create a phase envelope diagram and identify the Cricondenbar, Cricondentherm, critical temperature, and critical pressure

Experiment 7: Fundamental Analysis of Plus Fraction Splitting and Experimental Data matching using Regression Techniques
Level 1: Develop a Reservoir Fluid Model using Plus Fraction Splitting
Level 2: Match Experimental data through Regression by Lumping

Experiment 8: Basic Steps of creating Compositional Oil Simulation Model using the CMG-GEM Simulator
Level 1: Develop a Fluid Model using the Winprop Simulator
Level 2: Predict and evaluate Reservoir Performance by importing the Fluid Model into the CMG-GEM Simulator

Experiment 9: Developing P-T envelope of reservoir Fluid using given fluid data.

Level 1: Calculation of vapor pressure or saturation pressure using CMG-winprop software.
Level 2: Generate phase envelope diagram and note down Cricondenbar, Cricondentherm, critical temperature and critical pressure.

Experiment 10: Developing reservoir fluid model by matching minimum miscibility pressure.
Level 1: To develop reservoir fluid model using PVT simulator.
Level 2: Calculation of minimum miscibility pressure of given reservoir fluid data.

Experiment 11: Determination of average molecular weight of given natural gas data.
Level 1: Determination of pseudocritical pressure, pseudocritical temperature of given natural gas data.
Level 2: Determination of average molecular weight of given natural gas data.

Experiment 12: Determination of Gas viscosity of given natural gas data.
Level 1: Determination of Z factor of given natural gas data.
Level 2: Determination of Gas viscosity of given natural gas data.

Experiment 13:Basic Steps of Building Coal Bed Methane (CBM) Reservoir Static Model using CMG-GEM Simulator
Level 1: Introduction to the CMG-GEM Simulator
Level 2: Create a Dual Porosity Reservoir Model using CMG-GEM Simulator

Experiment 14: Performance Evaluation of Coal Bed Methane (CBM) Reservoir using CMG-GEM Simulator
Level 1: Utilize CMG-GEM to create a Coal Bed Methane (CBM) Reservoir Model
Level 2: Predict the Performance of the Coal Bed Methane (CBM) Reservoir using the CMG-GEM model

Any 10 Experiments must be conducted.

Targeted Application and Tools that can be used:
Applications: Production and Design Engineer in the Oil and Gas Industry
Tools: CMG, Eclipse

Textbooks:
T1: Computer Modelling Group (CMG), CMG-GEM User's Guide, Computer Modelling Group Ltd., 2022.
T2: J.H. Abou-Kassem, M. Rafiqul Islam, and S.M. Farouq-Ali, Petroleum Reservoir Simulation - The Engineering Approach, 2nd Edition, Elsevier Science, 2020.
T3: John R. Fanchi, Principles of Applied Reservoir Simulation, 4th Edition, Elsevier Science, 2018.

References:
R1: Reservoir Modelling and Simulation Lab Manual, Presidency University, Bengaluru.
R2: Tarek Ahmed, and Paul McKinney, Advanced Reservoir Engineering, 1st Edition, Elsevier Science, 2011.
R3: Abdullah Alajmi, and Ridha Gharbi, Handbook of Applied Petroleum Reservoir Simulation, 1st Edition, Auris Reference, 2016.
R4: Computer Modelling Group (CMG), GEM Technical Manual, General Adaptive Implicit Equation of State Compositional Model, Computer Modelling Group, 1993.

e-resources:
4. Presidency University official ID: https://presiuniv.knimbus.com/user#/home
5. PGE 323M Reservoir Engineering III (Simulation): https://www.youtube.com/channel/UCkCwNnLZnRoaHYFyKTdySDw
6. A collection of Case Studies for verification of Reservoir Simulators: https://repositories.lib.utexas.edu/handle/2152/23014

Skill Sets:
Topics relevant to "**SKILLDEVELOPMENT**": As it is a laboratory-integrated course, all the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through the assessment component(s) mentioned in the course handout.

Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Ms. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: PET2125	**Course Title: Enhanced Oil and Gas Recovery Techniques** **Type of Course: 1] Professional Core Course 2] Theory only**			**L-T-P-C**	3	0	0	3
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	Nil							
Course Description:	The purpose of this course is to enable to understand the oil recovery concepts using different methods, and performance analysis and to develop the basic abilities of modelling and analyzing the reservoir simulation software. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments.							
Course objective	The objective of the course is to familiarize the learners with the concepts of Enhanced Oil and Gas Recovery Techniques and attain **Employability Skills** through **Problem Solving Methodologies**.							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Compare oil recovery principles and geological considerations to select and implement suitable polymer and alkaline EOR methods, CO2:Demonstrate the application of surfactant flooding principles to enhance oil recovery by selecting appropriate EOR surfactants, achieving ultra-low interfacial tension, CO3: Interpret steam flooding performance by examining reservoir properties, heat losses, steam quality, recovery efficiency, and economic viability, CO4:Categorize in-situ combustion processes by comparing reservoir characteristics, ignition methods, and combustion behavior to predict oil recovery response, CO5: Compare gas injection, miscible flooding, and CO_2 flooding techniques based on their recovery mechanisms, reservoir suitability, and operational performance, CO6: Appraise the role of MEOR and nanoparticle-based EOR techniques in improving oil recovery through wettability alteration, IFT reduction, and mobility control.							
Course Content:								
Module 1:	Chemical Flooding	Term paper	Programming / Simulation	12 Periods				
Topics: Introduction: Oil recovery processes, Geological factors in EOR, EOR Methods Polymer flooding: Introduction- Planning polymer flood projects - Application of PAM / AA in enhanced oil recovery- Factors affecting flow in porous media- Field considerations- Site factors- Field operation Alkaline Flooding - Types of alkali used - Entrapment of residue oil - Displacement mechanisms in alkaline flooding - Reservoir selection. Use of surfactants in oil recovery: 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 - Mechanism of surfactant loss in porous media								
Module 2:	Thermal Flooding for Enhanced Oil Recovery	Assignment	Data Collection	11 Periods				
Topics: 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 - Water treatment for steam generation- Steam generators- Determination of steam quality. **In-situ combustion technology:** Introduction-Reservoir characteristics- Ignition- Ignition methods, Process In-situ Combustion- Use of In-situ Combustion- conclusions								

Module 3:	Gas Injection	Assignment	Seminar	11 Periods
Topics: Predictive techniques, Reservoir performance, Gas injection in carbonate reservoirs, Inert gas injection, Candidates for gas injection, Immiscible gas injection **Miscible flooding:** Introduction- Difference between miscible and immiscible flooding, Sweep efficiency- High pressure gas injection- Enriched gas drive- LPG slug drive- Predictive technique- Field applications. **Carbon dioxide flooding:** Process description- Field projects- CO_2 sources- problem areas- designing a CO_2 flood- Guidelines for selection of miscible CO_2 projects- Immiscible CO_2 flooding Conclusions				
Module 4:	MEOR and Nano Particles in Enhanced Oil Recovery	Assignment	Data Collection	11 Periods
Topics: MEOR, Types of NP used in EOR, Effects of Nanoparticles on Oil Recovery, Effects of Nanoparticles on IFT Stability of nano particles, Surfactant-NPs Combined Flooding, Field Applications, Challenges, and Perspective.				
Targeted Application and Tools that can be used: **Applications:** Upstream oil and gas companies **Tools:** CMG, Eclipse				
Textbooks: T1: E. C. Donaldson, G. V. Chilingarian, T. F. Yew, "Enhanced Oil Recovery: Processes and Operations", Elsevier. T2: Larry W. Lake, "Enhanced Oil Recovery", Prentice Hall.				
References: R1: H. R. Van Pollew and Associates, "Fundamentals of Enhanced Oil Recovery", PennWell. R2: Gogoi S.B., "Advances in Petroleum Technology" Pan Stanford Publishing. 1st edition **e-resources:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / www.youtube.com / watch?v=azLVjYij5U4 3.https: / / www.youtube.com / playlist?list=PLXpyHm2f8CTdq4GYer8Wh9RtPnVFq7_Mj (Video Tutorials on Reservoir Engineering) 4. https: / / www.youtube.com / watch?v=RtPdFsyqbrw 5. https: / / www.youtube.com / watch?v=BBk2pN4L2Kg				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Oil Recovery calculations for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: PET2126	**Course Title:** Well Intervention Technologies **Type of Course:** 1] Professional Core Course 2] Theory Only		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NA						
Anti-requisites:	NA						
Course Description:	This course looks at the workover operations that are done because the well is not performing up to expectations. In addition, it sheds the lights on the equipment used while performing the workover operations. Main concepts of this course will be delivered through lectures, and readings. After every lesson, learners will take short quizzes to test their newly acquired knowledge.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Well Intervention Technologies and attain **Employability Skills** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Explain the principles of workover operations by describing workover systems, workover rig selection, rigless workover techniques, and the diagnosis of minor and major workover jobs, CO2:Determine appropriate remedial treatments, workover and completion fluids, wireline operations, and workover plans for controlling formation damage and optimizing well performance, CO3: Analyze well problems by evaluating acid types, acid–rock interactions, acidizing design, acid volume requirements, acid fracturing, and acid diversion techniques for effective well stimulation, CO4: Demonstrate the fundamentals of hydraulic fracturing by describing rock fracture mechanisms, effective stresses, fracture geometry, fracturing materials, fluids, proppants, equipment, and treatment design, CO5: Determine appropriate sand control methods by considering rock strength, wellbore stresses, sand production mechanisms, and control techniques for effective well performance, CO6: Apply sand control design principles by selecting suitable gravel packing methods, screens, liners, resin consolidation techniques, and placing methods for open-hole and cased-hole completions.						
Course Content:							
Module 1:	Well Servicing and Workover	Term Paper / Assignment	Data Collection	10 Periods			
Topics: Workover system, workover rigs and selection, rig less workover including Endless / Coiled tubing Module, minor & major workover jobs-diagnosis & remedial measures water shut off and gas shut off- Chemical treatment and conformance control. Wire-line operations, Workover & completion fluids - types & selection, Formation damage, Workover planning & economics.							
Module 2:	Well Stimulation: Acidizing	Assignment	Programming	13 Periods			
Topics: Well problem identification; Types of Acids; Acid-Rock interaction; Sandstone acidizing design; Carbonate acidizing design; Acid volume requirement; Acid fracturing; Acid diversion							
Module 3:	Hydro Fracturing	Assignment / Case Study	Data Collection	11 Periods			
Topics: Basic rock mechanism; fracture plane, effective stresses, fracture geometry; fracturing materials; fracturing fluids, proppants; fracturing equipment; fracturing treatment design.							
Module 4:	Sand Control	Quiz / Seminar / Assignment / Case Study	Group Discussion	11 Periods			
Topics: Definition and control mechanism, Rock strength, Well bore stresses, Gravel packing, Screen and Liner consideration, Placing techniques, Screen types, Resin consolidation methods, Screen less methods, Coping with sand production, Gravel and screen selection, Open / Cased hole gravel packing, choosing the							

sand control method.

Targeted Application and Tools that can be used:

Applications: Oil Field Applications of working over sick wells, Stimulation Techniques

Tools: Petrel, Kinetix

Textbooks:

T1. D Perrin, Michel Caron, Georges Gaillot, "Well completion and Servicing", Paris: Editions Technip; Rueil-Malmaison: Institut français du pétrole, c1999, https: / / searchworks.stanford.edu / view / 4273875

T2. Jonathan Bellarby, "Well Completion Design", 1st Edition - February 20, 2009, https: / / www.elsevier.com / books / well-completion-design / bellarby / 978-0-444-53210-7

References:

R1. Thomas O. Allen and Alan P. Roberts, "Production Operation Volume 1", Oil and Gas International Inc, https: / / petroleumpdf.com / production-operations-volume-1-pdf /

R2. Thomas O. Allen and Alan P. Roberts, "Production Operation Volume 2", Oil and Gas International Inc.

R3. Wan Renpu, Advanced Well Completion Engineering, Third Edition, 2011
https: / / www.sciencedirect.com / book / 9780123858689 / advanced-well-completion-engineering

R4. Ding Zhu; Kenji Furui, Modern Completion Technology for Oil and Gas Wells, New York, N.Y.: McGraw-Hill Education, [2019]. ©2019
https: / / www.worldcat.org / title / modern-completion-technology-for-oil-and-gas-wells / oclc / 1046074889

R5. Boyun Guo, PhD, Xinghui Lou Liu and Xuehao Tan (Auth.), "Petroleum Production Engineering", 2017, Gulf Professional Publishing, https: / / www.elsevier.com / books / petroleum-production-engineering / guo-phd / 978-0-12-809374-0

Case Study:

1. A Case Study of Open and Cased Hole Well Completions in More than 400 Wells in On-Shore Block in India, https: / / doi.org / 10.2118 / 181660-MS
2. Case Studies for Improving Completion Design through Comprehensive Well Performance Modeling, https: / / doi.org / 10.2118 / 104078-MS
3. Determination of Dynamic Limits for Rig Heave and Running Speed Based on Drilling Parameters, Well Data and Completion Tool Limitations, https: / / doi.org / 10.2118 / 204023-MS

Online course on Well Completion:

1. Society of Petroleum Engineers, "Well Stimulation and Sand Control"
2. Society of Petroleum Engineers, "Well Completion Operations"
3. Petroleum Extension, Course on Well Completion
https: / / petex.utexas.edu / index.php / training / online-learning / e-learning / production-elearning / 356-well-completion
4. Petroleum Extension, Course on Well Servicing and Workover
https: / / petex.utexas.edu / index.php / training / online-learning / e-learning / production-elearning / 354

e-Resource:

1. Presidency University e-Resource: https: / / puniversity.informaticsglobal.com / login
2. Lecture on Well servicing and Workover, https: / / youtu.be / 443BNVOfpRs
3. Well intervention & workover IWCF, https: / / youtu.be / MSePDLpUPEg
4. Matrix Acidizing | Acid Fracking | acid stimulation, https: / / youtu.be / DizZHX0td1w

Skill Sets:

Topics relevant to **"EMPLOYABILITY SKILLS":** Fracturing treatment design for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: PET2127	**Course Title:** Offshore Drilling and Petroleum Production Practices **Type of Course:** 1] Professional Core Course 2] Theory only			**L-T-P-C**	3	0	0	3
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	This course is theory course. The main objective of this course is to focus on the sea behavior and the platforms used for drilling & production operation. It also helps to understand drilling and production practices used in offshore environment and problems associated with offshore operation. This course is both conceptual and analytical in nature. With the knowledge of basic sciences are preferable to register in this course.							
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Offshore Drilling and Petroleum Production Practices and attain **Skill Development** through **Problem SolvingMethodologies**.							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Discuss the offshore sea environment and station keeping mechanism of offshore structures, CO2: Explain various fixed offshore drilling and production structures, CO3: Summarize various floating offshore platforms, CO4: Distinguish between the offshore production facilities.							
Course Content:								
Module 1:	Introduction to Offshore and Sea Environment	Assignment	Literature Survey and Group Discussion	06 Periods				
Topics: Introduction, Historical development of offshore Structures, Deep water challenges and offshore disasters, Functions of offshore structures, Water Depth classification, Offshore India. Classification Societies and Industry Standard Groups Buoyancy and Gravity Principals, Metacenter, Station keeping, Motions of floating vessel.								
Module 2:	Fixed Offshore Drilling and Production Platform	Quiz	Model Making	10 Periods				
Topics: Bottom Supported structures- Minimal platforms, Jacket structures, Gravity based structures, Jack ups, Subsea templates and pipelines; Complaint structures- Articulated Platforms, Complaint tower, Guyed tower.								
Module 3:	Floating Offshore Drilling and Production Platforms	Quiz	Data Collection and Programming	15 Periods				
Topics: Floating offshore drilling units- introduction to Mobile offshore drilling units, semisubmersible, Drill ships; Floating offshore production units: Floating production systems (FPS) structures- Semisubmersibles, SPARS, Conventional TLP, Mini TLP; Floating storage and offloading (FSO) systems- Ship shaped vessels; Floating production systems (FPS)- Ship / barge;, Mooring systems, Dynamic positioning system.								
Module 4:	Offshore Production Facilities	Assignment	Literature Survey and Group Discussion	09 Periods				
Topics: Oil and Gas Separation, Treatment of Oil, Treatment of Gas, Treatment of Produced, Water, Storage of Oil and, Gas, Transportation of Oil and Gas .								
Targeted Application and Tools that can be used: **Applications:** Offshore Drilling /Production /Structural / Pipeline Engineer in Oil and Gas Industry **Tools:** Marine Riser, Riser Tensioner, Engineer's Desktop (Landmark Halliburton software), Petrel								
Textbooks: T1. S. Chakrabarti, "Handbook of Offshore Engineering", Volume 1 and 2, Elsevier (2005) T2. S. Laik "Offshore Petroleum Drilling and Production" CRC Press, Taylor and Francis, 2018								
References: R1. The Technology of Offshore Drilling: Completion and Production ETA Offshore Seminars, Inc								

R2. Dr. Ignatius Louis Prashanth , Onshore Gas Drilling Hardcover – 1 January 2022 **e-resources:** 1. Presidency University e-Resource: https: / / puniversity.informaticsglobal.com / login 2. Basics of Soil Mechanics I https: / / nptel.ac.in / courses / 114 / 106 / 114106015 / 3. Offshore Structures Under Special Loads Including Fire Resistance https: / / nptel.ac.in / courses / 114 / 106 / 114106043 /	
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": Bottom Supported structures- Minimal platforms and Jacket structures for **Skill Development** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

PRACTICE WORK (PRW) COURSES

Course Code: **PET7001**	**Course Title: Internship**(Industry) **Type of Course: 1] Project Work Course** **2] Project-based – Experiential Learning**	**L-T-P-C**	-	-	-	2
Version No.:	1.0					
Course Pre-requisites:	Knowledge and Skills related to all the courses studied in previous semesters.					
Anti-requisites:	NIL					
Course Description:	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Internship and attain **Employability Skills** through **Experiential Learning** techniques.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recognize real-time engineering challenges in industrial or research environments at local, national, or global level, CO2: Apply theoretical knowledge and domain-specific tools to solve practical problems encountered during the internship, CO3:Develop and demonstrate technical skills by working on tasks adhering to professional and safety standards, CO4:Analyze the processes, outcomes, and challenges faced during the internship to draw meaningful insights, CO5: Evaluate the learning outcomes and effectively present the internship					

	experience through technical reports or seminars. scholarly publications.
Course Content:	
Module 1:	
Topics: Not Applicable – Depends on the Supervisor.	
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** MS Excel, and others (Specific equipment / apparatus / tool and software as prescribed by the Supervisor)	
Textbooks: Not Applicable – Depends on the Supervisor.	
References: Not Applicable – Depends on the Supervisor. **e-resources:** Not Applicable – Depends on the Supervisor.	
Skill Sets: Topics relevant to "**EMPLOYABILITY SKILL**": Specific equipment / apparatus / tool and software as prescribed by the Supervisor for enhancing **Employability Skills** through **Experiential LearningTechniques**.	
Catalogue prepared by:	All Supervisors
Recommended by the Board of Studies on:	18th Meeting of the Board of Studies held on 4th July, 2024
Date of Approval by the Academic Council:	24th Meeting of the Academic Council held on 3rd August, 2024

Course Code: **PET7001**	**Course Title: Internship**(In-House) **Type of Course: 1] Project Work Course** **2] Project-based – Experiential Learning**	**L-T-P-C**	-	-	-	2
Version No.:	1.0					
Course Pre-requisites:	Knowledge and Skills related to all the courses studied in previous semesters.					
Anti-requisites:	NIL					
Course Description:	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Internship and attain **Employability Skills** through **Experiential Learning** techniques.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Identify the engineering problems related to local, regional, national or global needs, CO2: Apply appropriate techniques or modern tools for solving the intended problem,					

	CO3:Design the experiments as per the standards and specifications, CO4:Interpret the events and results for meaningful conclusions, CO5: Appraise project findings and communicate effectively through scholarly publications.
Course Content:	
Module 1:	
Topics: Not Applicable – Depends on the Supervisor.	
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** MS Excel, and others (Specific equipment / apparatus / tool and software as prescribed by the Supervisor)	
Textbooks: Not Applicable – Depends on the Supervisor.	
References: Not Applicable – Depends on the Supervisor. **e-resources:** Not Applicable – Depends on the Supervisor.	
Skill Sets: Topics relevant to "**EMPLOYABILITY SKILL**": Specific equipment / apparatus / tool and software as prescribed by the Supervisor for enhancing **Employability Skills** through **Experiential LearningTechniques**.	
Catalogue prepared by:	All Supervisors
Recommended by the Board of Studies on:	18th Meeting of the Board of Studies held on 4th July, 2024
Date of Approval by the Academic Council:	24th Meeting of the Academic Council held on 3rd August, 2024

Course Code: **PET7101**	**Course Title: Mini Project** **Type of Course: 1] Project Work Course** **2] Project-based – Experiential Learning**	**L-T-P-C**	-	-	-	4
Version No.:	1.0					
Course Pre-requisites:	Knowledge and Skills related to all the courses studied in previous semesters.					
Anti-requisites:	NIL					
Course Description:	The Mini Project is a 100% project-based experiential learning opportunity that immerses students in real-world industry or research settings. It bridges academic concepts with practical applications, allowing students to work on domain-specific projects under professional supervision. The course fosters technical competency, problem-solving, teamwork, and professional ethics. Students document progress, submit reports, and deliver final presentations, reinforcing industry readiness and lifelong learning attitudes essential for professional success.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Mini Project and attain **Employability Skills** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Identify the engineering problems related to local, regional, national or global needs, CO2: Apply appropriate techniques or modern tools for solving the intended					

	problem, CO3: Design the experiments as per the standards and specifications, CO4: Interpret the events and results for meaningful conclusions, CO5: Appraise project findings and communicate effectively through scholarly publications.
Course Content:	
Module 1:	
Topics: Not Applicable – Depends on the Supervisor.	
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** MS Excel, and others (Specific equipment / apparatus / tool and software as prescribed by the Supervisor)	
Textbooks: Not Applicable – Depends on the Supervisor.	
References: Not Applicable – Depends on the Supervisor. **e-resources:** Not Applicable – Depends on the Supervisor.	
Skill Sets: Topics relevant to "**EMPLOYABILITY SKILL**": Specific equipment / apparatus / tool and software as prescribed by the Supervisor for enhancing **Employability Skills** through **Experiential LearningTechniques**.	
Catalogue prepared by:	All Supervisors
Recommended by the Board of Studies on:	18th Meeting of the Board of Studies held on 4th July, 2024
Date of Approval by the Academic Council:	24th Meeting of the Academic Council held on 3rd August, 2024

Course Code: **PET7301**	**Course Title: Capstone Project** **Type of Course: 1] Project Work Course** **2] Project-based – Experiential Learning**	**L-T-P-C**	-	-	-	10
Version No.:	1.0					
Course Pre-requisites:	Knowledge and Skills related to all the courses studied in previous semesters.					
Anti-requisites:	NIL					
Course Description:	Students observe science and technology in action, develop an awareness of the method of scientific experimentation, and often get an opportunity to see, study and operate sophisticated and costly equipment. They also learn about the implementation of the principles of management they have learnt in class, when they observe multidisciplinary teams of experts from engineering, science, economics, operations research, and management deal with techno-economic problems at the micro and macro levels. Finally, it enables them to develop and refine their language, communication and inter-personal skills, both by its very nature, and by the various evaluation components, such as seminar, group discussion, project report preparation, etc. The broad-based core education, strong in mathematics and science and rich in analytical tools, provides the foundation necessary for the student to understand properly the nature of real-life problems. The students have options to pursue this course as either Project Work and Dissertation at the university, or Project Work in an Industry/ Company/ Research Laboratory, or Internship Program in an Industry/Company.					

Course Objective:	The objective of the course is to familiarize the learners with the concepts of Capstone Project and attain **Employability Skills** through **Experiential Learning** techniques.
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Identify the engineering problems related to local, regional, national or global needs, CO2: Apply appropriate techniques or modern tools for solving the intended problem, CO3:Design the experiments as per the standards and specifications, CO4: Interpret the events and results for meaningful conclusions, CO5: Appraise project findings and communicate effectively through scholarly publications.
Course Content:	
Module 1:	
Topics: Not Applicable – Depends on the Supervisor.	
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** MS Excel, and others (Specific equipment / apparatus / tool and software as prescribed by the Supervisor)	
Textbooks: Not Applicable – Depends on the Supervisor.	
References: Not Applicable – Depends on the Supervisor. **e-resources:** Not Applicable – Depends on the Supervisor.	
Skill Sets: Topics relevant to "**EMPLOYABILITY SKILL**": Specific equipment / apparatus / tool and software as prescribed by the Supervisor for enhancing **Employability Skills** through **Experiential LearningTechniques**.	
Catalogue prepared by:	All Supervisors
Recommended by the Board of Studies on:	18th Meeting of the Board of Studies held on 4th July, 2024
Date of Approval by the Academic Council:	24th Meeting of the Academic Council held on 3rd August, 2024

MANDATORY COURSES (MAC)

Course Code: **APT4002**	**Course Title: Introduction to Aptitude** **Type of Course: 1] Mandatory Course (Audited)** **2] Practical only**	**L-T-P-C**	0	0	2	0
Version No.:	1.0					
Course Pre-requisites:	Students should know the basic Mathematics & aptitude along with understanding of English					
Anti-requisites:	NIL					
Course Description:	The objective of this course is to prepare the trainees to tackle the questions on various topics and various difficulty levels based on Quantitative Ability, and Logical Reasoning asked during the placement drives. There will be sufficient focus on building the fundamentals of all the topics, as well as on solving the higher order thinking questions. The focus of this course is to teach the students to not only get to the correct answers, but to get there faster than ever before, which will improve their employability factor.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain **Skill Development** through **Problem Solving Techniques**.					

Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recall all the basic mathematical concepts they learnt in high school. CO2: Identify the principle concept needed in a question, CO3: Solve the quantitative and logical ability questions with the appropriate concept, CO4: Analyze the data given in complex problems, CO5: Rearrange the information to simplify the question			
Course Content:				
Module 1:	Quantitative Ability	Assignment	Bloom'sLevel: Application	12 Hours
Topics: Introduction to Aptitude, working of Tables, Squares, Cubes				
Module 2:	Logical Reasoning	Assignment	Bloom'sLevel: Application	18 Hours
Topics: Linear & Circular Arrangement Puzzle, Coding & Decoding, Blood Relations, Directions, Ordering and Ranking, Clocks and Calendars, Number Series, Wrong number series, Visual Reasoning				
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				
Textbooks: T1: Quantitative Aptitude by R S Aggarwal T2: Verbal & Non-Verbal Reasoning by R S Aggarwal				
References: 1. www.indiabix.com 2. www.youtube.com/c/TheAptitudeGuy/videos				
Skill Sets: Topics relevant to **Skill Development**: Quantitative and reasoning aptitude for Skill Development through **Problem solving Techniques**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by:	Faculty Members of the Department of Learning and Development			
Recommended by the Board of Studies on:				
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **APT4004**	**Course Title: Aptitude Training - Intermediate** **Type of Course: 1] Mandatory Course (Audited)** **2] Practical only**	**L-T-P-C**	0	0	2	0
Version No.:	1.0					
Course Pre-requisites:	Students should have the basic concepts of Quantitative aptitude along with its applications in real life problems.					
Anti-requisites:	NIL					
Course Description:	This is a skill-based training program for the students. This course is designed to enable the students to enhance their skills in Quantitative Aptitude.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Aptitude and attain **Skill Development** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recall all the basic mathematical concepts, CO2: Identify the principle concept needed in a question, CO3: Solve the quantitative and logical ability questions with the appropriate concept, CO4: Analyze the data given in complex problems.					
Course Content:						
Module 1:	Quantitative Ability 1	Assignment				16

				Hours
Topics: Number System, Percentage, Ratio and Proportion, Average, Mixture and Allegation, Time and Work, Profit and Loss.				
Module 2:	Quantitative Ability 2	Assignment		14 Hours
Topics: Time Speed and Distance, Boats and Streams, Simple Interest, Compound Interest, Probability, Permutation and Combination.				
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				
Continuous Evaluation: CA1 – Online Test CA2 – Online Test CA3 – Online Test Assignment				
Text Books: 1. Fast track objective by Rajesh Verma 2. R S Aggarwal 3. Rakesh Yadav				
Reference Book(s) 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos				
Skill Sets: Topics relevant to **Skill Development**: Quantitative aptitude for Skill Development through **Problem Solving Methodologies**. This is attained through components mentioned in course handout.				
Catalogue prepared by:	Faculty Members of the Department of Learning and Development			
Recommended by the Board of Studies on:				
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **APT4006**	**Course Title: Logical and Critical Thinking** **Type of Course: 1] Mandatory Course (Audited)** **2] Practical only**	**L-T-P-C**	0	0	2	0
Version No.:	1.0					
Course Pre-requisites:	Students should have the basic concepts of Logical reasoning and Critical thinking, along with its applications in real life problems.					
Anti-requisites:	NIL					
Course Description:	This is a skill-based training program for the engineering students (Undergraduate). This course is designed to enable the students to enhance their skills in Logical reasoning and Critical thinking.					
Course Objective:	The objective of the course is to familiarize the learners with concepts in Logical reasoning and Critical thinking through **Problem Solving Methodologies**suitable for their **Career Development**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Understand all the concepts, CO2: Apply the concepts in problem solving, CO3: Analyze and structure the reasoning techniques and spatial visualization skills.					
Course Content:						

Module 1:	Logical Thinking	Assignment		16 Hours
Topics: Syllogisms, Cubes and Dices, Mirror and Water images, Paper cutting and Folding, Embedded figures & Completion of figures, Data Interpretation, Data sufficiency.				
Module 2:	Critical Thinking	Assignment		14 Hours
Topics: Analogy, Symbol and Notations, Statement and assumption, Cause of action, Statement and conclusion, Puzzles.				
Targeted Application & Tools that can be used: Application area: Placement activities and Competitive examinations. Tools: LMS				
Continuous Evaluation: • Topic wise Evaluation • Internal Assessment				
Text Books: 1. A new approach to reasoning verbal, non-verbal & analytical by BS Sijwali 2. R S Aggarwal 3. Kiran Publications				
Reference Book(s) 1. www.indiabix.com 2. www.testbook.com 3. www.youtube.com/c/TheAptitudeGuy/videos				
Skill Sets: Topics relevant to **Skill Development**: Logical reasoning and Critical thinking for **Skill Development** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by:	Faculty Members of the Department of Learning and Development			
Recommended by the Board of Studies on:				
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **CHE7601**	**Course Title: Environmental Studies** **Type of Course: 1] Mandatory Course (MOOC Course)** **2] Theory only**	**L-T-P-C**	-	-	-	-
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamental environmental concepts and their relevance to business operations, preparing them to address forthcoming sustainability challenges. It is designed to equip students with the knowledge and skills needed to make decisions that account for environmental consequences, fostering environmentally sensitive and responsible future managers. **This course is designed to cater to Environment and Sustainability.**					
Course Objective:	The objective of the course is **Skill Development** of the student by using **Participative Learning Techniques.**					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the issues related to natural resources, ecosystems and biodiversity, CO2: Identify environmental hazards affecting air, water and soil quality,					

	CO3: Recognize the importance of healthy environment and finding the sustainable methods to protect the environment, CO4: Convert skills to address immediate environmental concerns through changes in environmental processes, policies, and decisions			
Course Content:				
Module 1:	Understanding Environment, Natural Resources, and Sustainability			
Topics: Classification of natural resources, issues related to Population growth and their overutilization, and strategies for their conservation. Water, air, soil, mineral, energy and food source. Effect of human activities on natural resources. Concept of sustainability- Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs; Sustainable practices in managing resources, including deforestation, water conservation, Desalination – types, energy security, and food security issues, Life Cycle thinking and Circular Economy.				
Module 2:	Ecosystems, Biodiversity, and Sustainable Practices			
Topics: Ecosystems and ecosystem services: Various natural ecosystems, Major ecosystem types in India and their basic characteristics; forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance. The importance of biodiversity, Types of biodiversity, Biodiversity and Climate Change, the threats it faces, hotspots, and the methods used for its conservation. Strategies for in situ and ex situ conservation, mega diverse nation.				
Module 3:	Environmental Pollution, Waste Management, and Sustainable Development			
Topics: Types of pollution- Chemical, - Biological, Biomedical, noise, air, water, soil, thermal, radioactive and marine pollution, and their impacts on society. Urbanization and Urban environmental problems; effects, and mitigation. Causes of pollution, such as global climate change, ozone layer depletion, the greenhouse effect, and acid rain, with a particular focus on pollution episodes in India. Importance of adopting cleaner technologies; Solid waste management. Sustainable Materials and Technologies: Biodegradable and compostable materials, Recycled and reclaimed materials (E-waste management), Sustainable manufacturing processes.				
Module 4:	Social Issues, Legislation, and Practical Applications			
Topics: Overview of key environmental legislation and the judiciary's role in environmental protection, including the Water (Prevention and Control of Pollution) Act of 1974, the Environment (Protection) Act of 1986, and the Air (Prevention and Control of Pollution) Act of 1981. Hazardous waste Rule 1989, Biomedical Waste handling 1998, Fly Ash Rule 1999, Municipal Solid Waste Rule 2000, Battery Rules 2001, E- Waste Rules 2011, Plastic waste management Rules 2016, Construction Demolition waste Rules 2016 National Biodiversity Action Plan (NBAP) Major International Environmental Agreements: Convention on Biological Diversity (CBD), The Biological Diversity (Amendment) Act, 2023, United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement. Major International organisations and initiatives: United Nations Environment Programme (UNEP), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC).				
Targeted Application & Tools that can be used: Application Areas: Energy, Environment and sustainability Tools: Online Tools – NPTEL and Swayam				
Project Work / Assignment: **Assessment Type:** • Online Exams (MCQs) will be conducted by the Department of Chemistry through Linways.				
Online Link*: 1) Lecture by Dr. Samik Chowdhury, Dr. Sudha Goel, NPTEL course: Environmental Science, https://nptel.ac.in/courses/109105203, 2024				

2) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights, https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Textbooks:

T1: G. Tyler Miller and Scott Spoolman (2020), Living in the Environment, 20th Edition, Cengage Learning, USA
T2: Poonia, M.P. Environmental Studies (3rd ed.), Khanna Book Publishing Co.
T3: Bharucha, E. Textbook of Environmental Studies (3rd ed.) Orient Blackswan Private Ltd.
T4: Dave, D., &Katewa, S. S. Text Book of Environmental Studies. Cengage Learning India Pvt Ltd.
T5: Rajagopalan, R. Environmental studies: from crisis to cure (4th ed.). Oxford University Press.
T6: Basu, M., & Xavier Savarimuthu, S. J. Fundamentals of environmental studies. Cambridge University Press.
T7: Roy, M. G. Sustainable Development: Environment, Energy and Water Resources. Ane Books.
T8: Pritwani, K. Sustainability of business in the context of environmental management. CRC Press.
T9: Wright, R.T. & Boorse, D.F. Environmental Science: Toward A Sustainable Future (13th ed,). Pearson.

References:

R1: Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors) (2022), Conservation through Sustainable Use: Lessons from India. Routledge.
R2: William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.
R3: Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.
R4: Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238.
R5: Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press

e-resource:

1. https://nptel.ac.in/courses/109105203
2. https://archive.nptel.ac.in/courses/120/108/120108004/
3. https://nptel.ac.in/courses/127105018
4. https://onlinecourses.nptel.ac.in/noc23_lw06/preview
5. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
6. https://archive.nptel.ac.in/courses/120/108/120108002/
7. https://onlinecourses.swayam2.ac.in/ini25_bt02/preview
8. https://nptel.ac.in/courses/102104088
9. https://nptel.ac.in/courses/124107165
10. https://nptel.ac.in/courses/109106200
11. https://archive.nptel.ac.in/content/storage2/courses/120108004/module1/lecture1.pdf
12. https://onlinecourses.swayam2.ac.in/nou25_ge19/preview
13. https://onlinecourses.swayam2.ac.in/ini25_hs01/preview
14. http://kcl.digimat.in/nptel/courses/video/105105184/L32.html
15. https://nptel.ac.in/courses/105105169

Skill Sets:

Topics relevant to **Skill Development**: An attitude of enquiry. Write reports
Topics related to **Environment and Sustainability**: All topics in theory component are relevant to Environment and Sustainability.

Catalogue prepared by:	Faculty Members of the Department of Chemistry
Recommended by the Board of Studies on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **CIV7601**	**Course Title:** **Universal Human Values and Ethics** **Type of Course:** **1] Mandatory Course** **2] Theory only**			**L-T-P-C**	-	-	-	0
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	The purpose of the course is to develop a holistic perspective in students' life. The course adopts a self-reflective methodology of teaching and is designed to equip the students to explore their role in all aspects of living as a part of the society. It presents a universal approach to value education by developing the right understanding of reality through the process of self-exploration. This self-exploration develops more confidence and commitment in students enabling them to critically evaluate their pre-conditioning and present beliefs. As an outcome of the holistic approach, the students will be able to practice the ethical conduct in the social and professional life. The prime focus throughout the course is toward affecting a qualitative transformation in the life of the student rather than just a transfer of information. **This course is designed to cater to Human Values and Professional Ethics.**							
Course Objective:	The objective of the course is **Skill Development** of the student by using **Self Learning Techniques.**							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recognize the importance of Value Education through the process of self-exploration, CO2: Explain the human being as the co-existence of the self and the body in harmony, CO3: Describe the role of foundational values in building harmonious relationships, CO4: Summarize the importance of a holistic perspective in developing ethical professional behavior.							
Course Content:								
Module 1:	Introduction to Value Education	Online Assessment	MCQ Quiz	5 Sessions				
Topics: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations.								
Module 2:	Harmony in the Human Being	Online Assessment	MCQ Quiz	5 Sessions				
Topics: Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.								
Module 3:	Harmony in the Family and Society	Online Assessment	MCQ Quiz	5 Sessions				
Topics: Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.								
Module 4:	Implications of the Holistic Understanding – A Look at Professional Ethics	Online Assessment	MCQ Quiz	5 Sessions				
Topics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic								

Technologies, Strategies for Transition towards Value-based Life and Profession.

Targeted Application & Tools that can be used:

Application Areas: Personal life, Education and Career, Workplace, Society and Environmental Responsibility

Tools: Online Tools – NPTEL and Swayam

Project Work / Assignment:

Assessment Type:

• Online Exams (MCQs) will be conducted by the Department of Civil Engineering through Linways.

Online Link*:

1. UHV II:
https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1KyqteziTbTjN1So&pp=0gcJCWMEOCosWNin

2) Lecture by Dr. Kumar Sambhav, NPTEL course: Universal Human Values,
https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

3) Lecture by Dr. Padmavati, Dr Narendran Thiruthy, NPTEL Course: Biodiversity Protection, Farmers and Breeders Rights,
https://nptel.ac.in/courses/129105008, 2024.

* Other source links are available in below Resources link.

Textbooks:

T1: A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
T2: Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2019.
T3: Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.

References:

R1: E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
R2: Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986.
R3: Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
R4: A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
R5: P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
R6: A N Tripathy, 2003, Human Values, New Age International Publishers.
R7: E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
R8: M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
R9: B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
R10: William P. Cunningham and Mary Ann Cunningham (2020), Principles of Environmental Science: Inquiry & Applications, 9th Edition, McGraw-Hill Education, USA.

e-resource:

1. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
2. https://onlinecourses.nptel.ac.in/noc25_mg141/preview
3. https://onlinecourses.swayam2.ac.in/ini25_hs52/preview
4. https://onlinecourses.nptel.ac.in/noc25_hs219/preview
5. https://onlinecourses.swayam2.ac.in/cec25_mg14/preview
6. https://onlinecourses.swayam2.ac.in/imb25_mg195/preview
7. https://onlinecourses.swayam2.ac.in/imb25_mg196/preview

Skill Sets:

Topics relevant to **Skill Development**: An attitude of enquiry. Write reports

Topics related to **Human Values and Professional Ethics**: All topics in are relevant to Human values and Professional ethics.

Catalogue prepared by:	Mrs. Divya Nair, Department of Civil Engineering
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **LAW7601**	**Course Title:** **Indian Constitution** **Type of Course:** **1] Mandatory Course (MOOC Course)** **2] Theory only**	**L-T-P-C**	-	-	-	0
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course is designed to improve the learners' SKILL DEVELOPMENT by using PATICIPATIVE LEARNING techniques. This course aims to familiarize students with fundamentals of Indian Constitution concepts and their relevance to 75+ Years of Republic of India (https://constitution75.com/) as well as **#AzaadiKaAmrutMahotsav / Azadi Ka Amrit Mahotsav** (https://amritmahotsav.nic.in). It is designed to equip students with the knowledge about the Constitution of India. This course aims to introduce the constitutional law of India to students from all walks of life and help them understand the constitutional principles as applied and understood in everyday life. The objective of making the Constitution of India, familiar to all students, and not only to law students, this course aims and objectifies legal understanding in the simplest of forms. **This course is designed to cater to Constitutional Studies.**					
Course Objective:	The objective of the course is **Skill Development** of the student by using **Participative Learning Techniques.**					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the basic understanding of the Indian Constitution and the concepts and issues relevant to day-to-day life of the nation and to equip the Citizen with the zeal of capacity building. Recognizing and identify the values of the Constitution of India, CO2: Enabling the Citizen-centric Awareness of Rights and Responsibilities of the State, CO3: Explain the role of the State actors in building India, CO4: Understanding the Gandhian vision over the power of the LSG (Local Self-Governance)					
Course Content:						
Module 1:	Understanding the Making of the Constitution: The Constituent Assembly & The Constitution of India					
Topics: Historical Context of Constituent Assembly - Compositions & Functions of Constituent Assembly What is a Constitution? – Why have a Constitution? – Constitutional Change - Features of Indian Constitution – Preamble of Indian Constitution						
Module 2:	Citizen's Fundamental Rights and State's Responsibilities (Directive Principles)					
Topics: Introduction to Fundamental Rights - Right to Equality – Facets of Right to Equality - Right to Freedom - Constitutional Position of Some Democratic Rights - Right Against Exploitation - Right to Freedom of Religion - Right to Constitutional Remedies Directive Principles of the State Policy						
Module 3:	Organs Of the Government					
Topics: **Executive:** The President of India - Powers and Functions of President of India - Emergency Powers and the Position of the President **Legislature:** Union Council of Ministers - Prime Minister - The Rajya Sabha - The Lok Sabha - Relation between the Lok Sabha & Rajya Sabha - Office of the Speaker – Important Parliamentary Committees **Judiciary:** The Structure and Organization of the Judiciary & the High Court - The Supreme Court - Role of The Supreme Court - Judicial Activism in India - Basic Structure Doctrine & PIL						
Module 4:	Federalism & Decentralization					

Topics:
What is Federalism? - Centre-State Legislative Relations - Centre-State Administrative Relations - Centre-State Financial Relations
The 5th& 6th Schedules - Municipality- (History of Indian Municipality, Organization & Functions) – Panchayat 1 (Idea of Panchayat, Organization and Powers of Panchayats in India)

Targeted Application & Tools that can be used:
Application Areas: To familiarize students with fundamentals of Indian Constitutional concepts
Tools: Online Tools – NPTEL and Swayam

Project Work / Assignment:
Assessment Type:
• Online End Term Exam (MCQs) will be conducted as notified by the Presidency University.

Online Link*:
1) Prof. Amitabha Ray, SWAYAM Course: "Constitutional Government & Democracy in India"
https://onlinecourses.swayam2.ac.in/cec19_hs13/preview

* Other source links are available in below Resources link.

Textbooks:
T1: Durga Das Basu --- Introduction to the Constitution of India, 23rd Edition (Gurgaon; LexisNexis, 2018).
T2: MP Jain's Constitutional Law of India, Lexis Nexis
T3: V.N Shukla's Indian Constitutional Law, M.P Singh 13th Edition
T4: MV Pylee's Constitution of India
T5: J.C.Johari -- The Constitution of India: A Politico-Legal Study (Greater Noida: Sterling Publishers Pvt. Ltd. 2013).
T6: Himangshu Roy and M.P.Singh – Indian Political System, 4th Edition (Bengaluru; Pearson Education, 2018)
T7: Vidya Bhushan &Vishnoo Bhagwan--- Indian Administration (S. Chand, 2011)
T8: S.R.Maheswari --- Indian Administration (Orient Blackswan, 2001)
T9: Dr. A.Avasthi& A.P. Avasthi --- Indian Administration (L.N. Agarwal Educational Publishing, 2017).
T10: B. L. Fadia --- Indian Government and Politics (Sahitya a. Bhawan, 13th Revised Edition, 2017).
T11: P.M.Bakshi – The Constitution of India (Prayagraj, UP; a. Universal Law Publishing, January, 2018)

References:
R1: HM Seervai, Constitutional Law of India, 4th Ed. Vol I, II, & III
R2: Uday Raj Rai, Constitutional Law-I
R3: Democracy and Constitutionalism in India, Oxford University Press 2009

e-resource:
1.https://onlinecourses.nptel.ac.in/noc20_lw03/course?&force_user=true
2.https://onlinecourses.swayam2.ac.in/cec19_hs13/course?&force_user=true
3.https://nptel.ac.in/courses/129106003
4.https://nptel.ac.in/courses/129106411
5. https://nptel.ac.in/courses/129105608
6.https://nptel.ac.in/courses/129106002

Skill Sets:
Topics relevant to **SkillDevelopment**: An attitude of enquiry. Write reports.
Topics related to **Constitutional Studies and its Application**: All topics in theory component are relevant to Indian Constitution.

Catalogue prepared by:	Faculty Members of the Presidency School of Law
Recommended by the Board of Studies on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: PPS1025	**Course Title:** **Industry Readiness Program - I** **Type of Course:** **1] Mandatory Course (Audited)** **2] Practical only**		**L-T-P-C**	0	0	2	0
Version No.:	1.0						
Course Pre-requisites:	• Students are expected to understand Basic English. • Students should have desire and enthusiasm to involve, participate and learn.						
Anti-requisites:	NIL						
Course Description:	This course is designed to enable students to set SMART goals, form professional & personal ethics for success and learn various email writing techniques. The course will benefit learners in presenting themselves effectively through various activities and learning methodologies.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of "Employability for Young Professionals" and attain **Skill Development** through **Participative Learning Techniques**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Define their career goals, CO2: Practice ethical habits for better career success, CO3: Demonstrate effective email writing techniques.						
Course Content:							
Module 1:	Goal Setting & Grooming	Classroom Activities					10 Hours
Topics: SMART Goals, formal grooming through self-introduction activity **Activity:** Real world scenarios							
Module 2:	Habit Formation	RolePlays					10 Hours
Topics: Professional and Personal ethics for success and activity-based practice **Activity:** Students to present 2 min video on building professional ethics							
Module 3:	Email Etiquettes	IndividualandGroup Presentation					10 Hours
Topics: Types of prompts to generate effective or desired results for email etiquettes **Activity:** Individual student presenting various search prompts							
Targeted Application & Tools that can be used: 1. TED Talks 2. YouTube Links 3. Activities							
Assignment proposed for this course: Assignment 1: SMART Goal Assignment 2: AI tools for prompt search							
Continuous Individual Assessment: Module 1: Presentation Module 2: Activity based Assessment Module 3: Class Assessment							
Textbooks:							
References:							
Skill Sets: Topics relevant to **Skill Development**: Students acquire knowledge on SMART goals, implement grooming standards, practice ethical behavior in class and campus, acquire hands-on experience to use AI tools to get search prompts for desired email etiquettes.							
Catalogue prepared by:	Faculty Members of the Department of Learning and Development						
Recommended by the Board of Studies on:							
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025						

<table>
<tr><td>Course Code:
PPS1026</td><td colspan="4">Course Title: Industry Readiness Program - II
Type of Course: 1] Mandatory Course (Audited)
2] Practical only</td><td>L-T-P-C</td><td>0</td><td>0</td><td>2</td><td>0</td></tr>
<tr><td>Version No.:</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites:</td><td colspan="9">• Students are expected to understand Basic English.
• Students should have desire and enthusiasm to involve, participate and learn.</td></tr>
<tr><td>Anti-requisites:</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description:</td><td colspan="9">This course is designed to enable students learn styles of communication; team building and use empathy in leadership. The course will benefit learners in preparing themselves effectively through various activities and learning methodologies.</td></tr>
<tr><td>Course Objective:</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of “Industry Readiness for Young Professionals” and attain Skill Development through Participative Learning Techniques.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="9">On successful completion of the course the students shall be able to:
CO1: Apply different communication skills for success in workplace,
CO2: Practice team building skills for career success,
CO3: Demonstrate ethical leadership skills in workplace.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1:</td><td colspan="3">Effective Communication</td><td colspan="3">Classroom Activities</td><td colspan="2"></td><td>10 Hours</td></tr>
<tr><td colspan="10">Topics: Practice effective communication skills (Verbal, Non-verbal, Written and Visual)
Activity: Use social media prompts to prepare self-introduction videos</td></tr>
<tr><td>Module 2:</td><td colspan="3">Team Building</td><td colspan="3">Group Activity</td><td colspan="2"></td><td>10 Hours</td></tr>
<tr><td colspan="10">Topics: Skills of an effective team player
Activity: Student group activity to build class networking</td></tr>
<tr><td>Module 3:</td><td colspan="3">Leadership</td><td colspan="3">Case Study</td><td colspan="2"></td><td>10 Hours</td></tr>
<tr><td colspan="10">Topics: Types of leadership, using empathy in leadership
Activity: Individual presentation by students on corporate leaders.</td></tr>
<tr><td colspan="10">Targeted Application & Tools that can be used:
1. TED Talks
2. YouTube Links
3. Activities</td></tr>
<tr><td colspan="10">Assignment proposed for this course:
Assignment 1: One Minute Reel
Assignment 2: Team Building Assignment</td></tr>
<tr><td colspan="10">Continuous Individual Assessment:
Module 1: L-S-R-W Class Assessment
Module 2: Team Presentation
Module 3: Individual Assessment</td></tr>
<tr><td colspan="10">Textbooks:</td></tr>
<tr><td colspan="10">References:</td></tr>
<tr><td colspan="10">Skill Sets:
Topics relevant to Skill Development: Students acquire knowledge on effective communication skills, team building skills and how to prepare themselves to be leaders in workplace using empathy and implement various skill sets during the course of their time in the university.</td></tr>
<tr><td>Catalogue prepared by:</td><td colspan="9">Faculty Members of the Department of Learning and Development</td></tr>
<tr><td>Recommended by the Board of Studies on:</td><td colspan="9"></td></tr>
<tr><td>Date of Approval by the Academic Council:</td><td colspan="9">26th Meeting of the Academic Council held on 25th July, 2025</td></tr>
</table>

DISCIPLINE ELECTIVE COURSES (DEC)

Specialization Basket 1: General Petroleum Engineering Basket

Course Code: PET1701	**Course Title:** Petroleum Data Analysis **Type of Course:** 1] Professional Elective Course 2] Laboratory Integrated	**L-T-P-C**	2	0	2	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of the course is to enable the students to appreciate the need to understand the significance of data analytics in the oil and gas industry. The course is conceptual in nature, and is intended to develop understanding of data analytics concepts, problems, and implementation. The course develops critical and analytical thinking skills through various case studies. The course also enhances programming abilities through assignments. The course will also include team exercises and numerical solving activities, which will help to improve employability skills. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The associated laboratory provides an opportunity to validate the concepts taught and enhances the ability to correlate with the real time field experiment.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Petroleum Data Analysis and attain **Employability** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: explain the basics of data analytics in the oil and gas industries, CO2: identify the importance of data management in oil and gas industry, CO3: describe different attributes in reservoir characterization, CO4: discuss various factors to optimize drilling.					
Course Content:						
Module 1:	Fundamentals of Soft Computing	Assignment	Data Collection	07 Periods		
Topics: Introduction to Data Analytics, Digital Oilfields, Fundamentals of Regression and Correlation, Soft Computing Techniques, Three Tenets of Upstream Data, Basic concepts of Statistics, Big data Analytics, Data Analysis, Application of data analytics in oil and gas. Analysis of oil and gas field data Univariate Data, Bivariate Data, Multivariate Data.						
Module 2:	Data Management	Assignment	Programming Task	06 Periods		
Topics: Data Management Platform, Subsurface Data Types, Hard Data and Soft Data, Sampling and Sampling Distribution, Standard Data Sources, Essential Probability and Statistics concepts for Oil and Gas. Parametric models, Normal and Log-Normal Distributions, Fitting distributions to data.						
Module 3:	Reservoir Characterization and Simulation	Assignment	Simulation Task	06 Periods		
Topics: Exploratory Data Analysis, Reservoir characterization Cycle, Traditional Data Analysis, Reservoir Simulation Models, Role of Machine Learning in Reservoir Engineering, Reservoir Modelling Using Fast Predictive Machine Learning Algorithms for Geological Carbon Storage						
Module 4:	Drilling and Completion Optimization	Case Study	Programming Task	06 Periods		
Topics: Mitigation of Non-Productive Time, Drilling Parameter Optimization, Real-Time Drilling and Completion Analytics, Case studies						
Module 5:	Analysis of Petroleum Data	Conduction of Experiment	Presentation	15 Sessions		
List of Laboratory Experiments:						
Experiment 1: Equation of state modelling of pure component data using MS Excel / Fortran programming. Level 1: To determine saturation pressure of pure component.						

Level 2: To determine the liquid phase density and vapor phase density of pure component.

Experiment 2:
Flash calculation of reservoir fluid data using MS Excel.
Level 1: To determine bubble point and dew point of reservoir fluid data.
Level 2: To determine the liquid phase density and vapor phase density of reservoir fluid data.

Experiment 3:
Estimation of original oil in place using Monte Carlo method.
Level 1: Implementation of Monte Carlo method in oil and gas data.
Level 2: Determination of original oil in place using Monte Carlo method using MS Excel.

Experiment 4:
Analysis of Material Balance Equation using MS Excel.
Level 1: Determine total cumulative production of given data.
Level 2: To Plot total cumulative production vs time.

Experiment 5:
Generating IPR and TPR curve of well data using MS Excel / PYTHON
Level 1: Determine well flowing bottom hole pressure and production rate of given data.
Level 2: Determine tubing-head pressure and the flow performance of production string.

Experiment 6:
Determination of abnormal pressure by modelling of Dc exponent.
Level 1: Determine abnormal pressure of given well data using MS Excel
Level 2: Comparative study of abnormal pressure using Rehm-Mclendon method, Eaton method and Zamora method.

Experiment 7:
Generating relative permeability curve using given data.
Level 1: To determine the relative permeability of given reservoir data.
Level 2: To generate relative permeability curve of given reservoir data.

Experiment 8:
Generating Klinkerberg effect curve for gas permeability using Python.
Level 1: To determine the gas permeability.
Level 2: To determine water permeability from the measurement of gas permeability.

Targeted Application and Tools that can be used:
Application: Oil and Gas Data Analyst, Data Scientist, Market Research Analyst in O&G industry
Tools: MS Excel, Tableau, PowerBI, Code blocks, Curve Expert

Textbooks:
T1. Holdaway, Keith; Harness Oil and Gas Big Data with Data Analytics; 1st Edition; Wiley; 2014.
T2. Sanskaran, Sathish; Data Analytics in Reservoir Engineering; 1st Edition; SPE; 2020.

References:
R1. Xue, Qilong; Data analytics for drilling engineering: theory, algorithms, experiments, software; 1st Edition; Springer Nature; 2019
R2. Belyadi, Hoss; Machine Learning Guide for Oil and Gas using Python; 1st Edition; Gulf Professional Publishing; 2021
R3. Mohammadpoor, Mehdi, and Farshid Torabi. "Big Data analytics in oil and gas industry: An emerging trend." Petroleum 6, no. 4 (2020): 321-328.
R4. Desai, Jas Nitesh, Sivakumar Pandian, and Rakesh Kumar Vij. "Big data analytics in upstream oil and gas industries for sustainable exploration and development: A review." Environmental Technology & Innovation 21 (2021): 101186.

e-resources:
1. Presidency University e-resource library:
2. Data Analytics with Python-NPTEL Online Course: https: / / nptel.ac.in / courses / 106 / 107 / 106107220 /
3. Petroleum from Scratch YouTube Channel: https: / / www.youtube.com / c / PetroleumFromScratch / videos
4. Google Cloud Platform YouTube Channel: https: / / www.youtube.com / user / googlecloudplatform

Skill Sets:
Topics relevant to "**SKILLDEVELOPMENT**": All the experiments are designed for **Skill Development** through **Experiential Learning Techniques**. The course attainment will be assessed through the assessment component(s) mentioned in the course plan.

Catalogue prepared by:	Dr. Suman Paul, Ms. Bidisha Borah, Ms. Amolina Doley, Dr. Rohit Kumar Saw, and Mr. Bhairab Jyoti Gogoi
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET1702**	**Course Title:** **Carbon Capture and Utilization for Sustainability** **Type of Course:** **1] Professional Elective Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to introduce climate change and how to assess and explore CO_2 capture and utilization technologies and assess geologic utilization and sub-surface storage options.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Carbon Capture and Utilization for Sustainability and attain **Employability** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Explain basic concepts of Carbon capture, utilization, and storage, and their role in sustainability, CO2: Interpret Carbon Capture and storage technology status for their feasibility in real-world scenarios, CO3: Demonstrate methods for CO_2 sources, capture technologies, and low-emission solutions in petroleum production, CO4: Describe the health, safety, and environmental risks of CO_2 storage for safe implementation. CO5: Analyze geological and ocean storage options for their suitability for CO_2 sequestration.					
Course Content:						
Module 1:	Introduction to CCUS	Quiz / Assignment	Data Collection and Review Paper	09 Periods		
Topics: Introduction to carbon capture, utilization, and storage; legal and regulatory issues for implementing CO_2 storage; role of carbon capture and utilization in sustainability.						
Module 2:	CCS Technology	Assignment / Poster Presentation	Poster Designing and Presentation	12 Periods		
Topics: Applications for CCUS, characteristics of CCS, current status of CCS technology, costs for CCS and technical and economic potential						
Module 3:	CO_2 Transport and Emission	Assignment	Numerical Solving	12 Periods		
Topics: Sources of CO_2, capture of CO_2, transport of CO_2, Low emission solutions when using CO_2 in petroleum production						
Module 4:	CO_2 Storage	Case Study	Group Discussion	12 Periods		
Topics: Carbon storage: geological storage, ocean storage, geographical relationship between the sources						

and storage opportunities for CO_2, health, safety and environment risks of CCS.
Targeted Application and Tools that can be used: **Application Area:** Project Planning and Management Analyst, Management trainee **Tools:** Kato, MS-Excel
Textbooks: T1. Metz, B., Davidson, O., Coninck, H.D., Loos, M., Meyer, L. 2005. Carbon dioxide capture and storage. Intergovernmental Panel on Climate Change, Cambridge University Press. T2. Feng, D., Sun, J., Zhou, Z., 2023. Carbon Dioxide Capture, Utilization and Storage (CCUS), MDPI.
References: R4. Goel, M., 2008. Carbon capture and storage: R&D technologies for sustainable energy future. Alpha Science. R5. Shah, Y.T., 2021 CO_2 Capture, Utilization, and Sequestration Strategies, CRC Press. **e-resources:** 2. Link for Knimbus remote login: https: / / presiuniv.knimbus.com 3. SWAYAM Course - Introduction to Climate Change, By Dr V. Venkat Ramanan,https: / / www.classcentral.com / course / swayam-introduction-to-climate-change-58478
Skill Sets: Topics relevant to "**SKILL DEVELOPMENT**": CCS Technology for developing **Employability Skills** through **Participative LearningTechniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET1703**	**Course Title: Hydrogen Energy Systems and Technologies** **Type of Course: 1] Professional Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3

Version No.:	1.0
Course Pre-requisites:	Thermodynamics, Fluid Mechanics, Engineering Chemistry, Fundamentals of Petroleum Engineering
Anti-requisites:	NIL
Course Description:	This course provides a comprehensive understanding of hydrogen as a clean energy carrier and its role in the global energy transition. The course covers hydrogen properties, production technologies, transportation, storage, utilization pathways, economics, sustainability assessment, and future prospects. Students gain exposure to industrial applications of hydrogen in petroleum, chemical, refining, transportation, and power sectors. The laboratory component introduces industry-standard software for process simulation, hydrogen production modelling, underground hydrogen storage assessment, and techno-economic evaluation.
Course Objective:	The objective of the course is to familiarize learners withHydrogen Energy Systems and Technologies and attain **Skill Development** through **Participative LearningTechniques**.
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Demonstrate hydrogen behaviour and operational scenarios using engineering simulation tools by applying the principles of hydrogen properties, thermodynamics, and safety engineering, CO2: Interpret conventional, low-carbon, and green hydrogen generation systems with the knowledge of hydrogen production technologies and

	process simulation techniques, CO3: Determine hydrogen quality and production performance using engineering simulation tools with the concept of hydrogen purification and emerging production technologies, CO4: Appraise the technical feasibility and performance of integrated hydrogen infrastructure using engineering and reservoir simulation tools with the concept of hydrogen transportation, storage, and utilization systems, CO5: Calculate the economic, distribution, and sustainability aspects of hydrogen energy systems to assess their technical viability and environmental performance, CO6: Relate hydrogen policies, emerging technologies, and integrated hydrogen infrastructure to assess their role in sustainable energy transition and long-term deployment strategies. .			
Course Content:				
Module 1:	Hydrogen Fundamentals, Thermodynamics and Safety	e-resource Review / Technical Report Writing	Technical Writing and Engineering Analysis	11 Periods
Topics: **Introduction to Hydrogen:**Definition and Historical Development of Hydrogen; Hydrogen Economy Concept; Hydrogen in Global Energy Transition; Classification of Hydrogen (Grey, Blue, Green, Turquoise, Pink and White Hydrogen). **Physical and Chemical Properties of Hydrogen:**Atomic Structure; Molecular Characteristics; Physical Properties; Chemical Properties; Pressure–Temperature Behaviour; Hydrogen Phase Diagram; Material Compatibility; Hydrogen Diffusion and Permeation. **Thermodynamics of Hydrogen:**Thermodynamic Systems; Thermodynamic Properties; First Law of Thermodynamics; Second Law of Thermodynamics; Phase Boundaries; Joule-Thomson Effect; Thermal Conductivity; Energy Efficiency Considerations. **Hydrogen Safety Engineering:**Hydrogen Embrittlement; Hydrogen-Induced Fracture; Flammability Characteristics; Combustion Dynamics; Explosion Limits; Hazard Identification; Risk Assessment; Hydrogen Safety Standards and Mitigation Measures.				
Module 2:	Hydrogen Production Technologies and Process Simulation	Case Study Presentation	Process Design and Simulation	11 Periods
Topics: **Conventional Hydrogen Production:**Steam Methane Reforming (SMR); Partial Oxidation; Autothermal Reforming; Coal Gasification; Biomass Gasification. **Low-Carbon Hydrogen Production:**Carbon Capture, Utilization and Storage (CCUS); Blue Hydrogen; Carbon Storage Facilities; Monitoring and Verification. **Green Hydrogen Production:**Electrolysis Fundamentals; Alkaline Electrolysis (AEL); Proton Exchange Membrane (PEM) Electrolysis; Solid Oxide Electrolysis (SOEC); High-Temperature Electrolysis. **Hydrogen Purification Technologies:**Pressure Swing Adsorption; Membrane Separation; Cryogenic Separation; Hydrogen Quality Specifications. **Emerging Production Technologies:**Photocatalytic Hydrogen Production; Biological Hydrogen Production; Fermentation Processes; Future Production Pathways.				
Module 3:	Hydrogen Transportation, Storage and Utilization	Industrial Case Study and Technical Presentation	Engineering Design and Decision Making	11 Periods
Topics: **Hydrogen Transportation Systems:**Pipeline Transportation; Hydrogen Blending in Natural Gas Networks; Tube Trailer Transportation; Cryogenic Transportation; Hydrogen Distribution Networks. **Hydrogen Compression and Liquefaction:**Hydrogen Compressors; Compression Technologies; Liquefaction Processes; Cryogenic Systems; Energy Balance; Gravimetric and Volumetric Energy Density. **Hydrogen Storage Technologies:**Compressed Gas Storage; Liquid Hydrogen Storage; Metal Hydrides; Chemical Storage Methods. **Underground Hydrogen Storage:**Salt Caverns; Depleted Oil and Gas Reservoirs; Saline Aquifers; Reservoir Screening; Geomechanical Considerations; Well Integrity. **Hydrogen Utilization:**Fuel Cells (PEMFC, AFC, PAFC, MCFC, SOFC); Hydrogen Refuelling Stations; Hydrogen in Refining; Ammonia Production; Methanol Production; Transportation Applications.				
Module 4:	Hydrogen Economics,	Techno-Economic	Strategic Thinking	12

	Sustainability and Future Energy Systems	Assessment Project	and Sustainability Assessment	Periods

Topics:

Hydrogen Economics: Hydrogen Supply Chain Economics; Capital Costs; Operating Costs; Levelized Cost of Hydrogen (LCOH); Infrastructure Development.

Hydrogen Networks and Distribution: Hydrogen Hubs; Hydrogen Microgrids; Grid Integration; Hydrogen Network Capacity and Pressure Management.

Sustainability Assessment: Life Cycle Assessment (LCA); Carbon Footprint Assessment; Environmental Impact Assessment; ESG Considerations; Circular Economy Principles.

Hydrogen Policy and Energy Transition: National Green Hydrogen Mission; Global Hydrogen Roadmaps; Carbon Markets; Carbon Pricing Mechanisms.

Future Prospects: Natural Hydrogen; Offshore Hydrogen Production; Renewable Energy Integration; Sector Coupling; AI and Digital Technologies in Hydrogen Systems.

Targeted Application and Tools that can be used:

Applications: Hydrogen Engineer, Process Engineer, Energy Transition Engineer, Reservoir Engineer, CCUS Engineer, Sustainability Analyst, Carbon Management Specialist, Hydrogen Storage Engineer

Tools: Honeywell UniSim Design, Aspen HYSYS, Aspen Plus, Aspen Process Economic Analyzer, CMG, Nexus, DecisionSpace, Microsoft Excel, Python

Textbooks:

T1: Amin, M., and Cloete, S., Hydrogen Technologies for Energy Transition, Elsevier, 2024.

T2: Dincer, I., and Acar, C., Hydrogen Energy Systems and Technologies, Springer Nature, 2024 Edition.

References:

R1: Gupta, R.B., Hydrogen Fuel: Production, Transport and Storage, CRC Press, 2023 Edition.

R2: Sørensen, B., Hydrogen and Fuel Cells: Emerging Technologies and Applications, Academic Press, 2024 Edition.

R3: IEA, Global Hydrogen Review, Latest Edition.

R4: IRENA, Green Hydrogen Cost Reduction and Deployment Reports, Latest Edition.

e-resources:

1. International Energy Agency (IEA) Hydrogen Hub
2. International Renewable Energy Agency (IRENA) Hydrogen Resources
3. U.S. Department of Energy Hydrogen Program
4. National Green Hydrogen Mission (MNRE)
5. NPTEL – Hydrogen Energy Technologies
6. Hydrogen Europe Knowledge Centre

Skill Sets:

Topics relevant to "**SKILL DEVELOPMENT**": Hydrogen Production Technologies, Hydrogen Transportation Systems, Underground Hydrogen Storage, Fuel Cells, Sustainability Assessment, and Techno-Economic Evaluation are designed for skill development through simulation-based learning, industrial case studies, and project-based activities using industry-standard software for **Skill Development** through **Participative Learning Techniques**.The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Suman Paul, Dr. Niladri Shekhar Saanta,Dr. Amolina Doley, Ms. Bidisha Borah, Mr. Hamid Hassan, and Mr. BhaskarjyotiKhaniakr
Recommended by the Board of Studies on:	22nd Meeting of the Board of Studies held on 5th June, 2026
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Course Code: **PET1704**	**Course Title: Geothermal Engineering and Energy Systems** **Type of Course: 1] Professional Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	Thermodynamics, Fluid Mechanics, Heat Transfer, Reservoir Engineering, Petroleum Geology, Well Logging, Fundamentals of Petroleum Engineering					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive understanding of geothermal energy resources, geothermal reservoir characterization, reservoir engineering principles, drilling and completion practices, production engineering, geothermal power generation systems, economics, sustainability assessment, and future energy applications. The course emphasizes the integration of petroleum engineering concepts with geothermal energy development, enabling students to apply subsurface characterization, reservoir simulation, production forecasting, and process engineering techniques to geothermal systems. Students gain exposure to industry-standard software tools for reservoir modelling, geological interpretation, geothermal fluid processing, power plant optimization, and techno-economic evaluation.					
Course Objective:	The objective of the course is to familiarize learners with Geothermal Engineering and Energy Systemsand attain**Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Demonstrate geothermal reservoir behaviour and heat extraction mechanisms using the principles of thermodynamics, geology, and reservoir engineering, CO2: Interpret geothermal resource exploration and reservoir characterization data using geological, geophysical, and petrophysical evaluation techniques, CO3: Determine geothermal reservoir performance and sustainable production strategies using reservoir simulation and forecasting tools, CO4: Appraise geothermal drilling, completion, production, and reinjection systems using engineering design principles and operational considerations, CO5:Calculate geothermal power generation efficiency, project economics, and sustainability indicators using process simulation and techno-economic assessment tools, CO6: Relate emerging geothermal technologies, integrated energy systems, and energy transition strategies to future low-carbon energy development.					
Course Content:						
Module 1:	Geothermal Fundamentals, Resource Assessment and Reservoir Characterization	e-resource Review / Technical Report Writing	Technical Writing and Engineering Analysis	11 Periods		

Topics:

Introduction to Geothermal Energy: Definition and Historical Development of Geothermal Energy; Global and Indian Geothermal Energy Scenario; Role of Geothermal Energy in Sustainable Development; Geothermal Energy and Energy Transition Pathways; Classification of Geothermal Resources; Hydrothermal Systems; Petrothermal Systems; Enhanced Geothermal Systems (EGS); Estimation of Carbon Reduction during Geothermal Energy Production.

Earth Heat Flow and Geothermal Systems: Structure of the Earth; Sources of Earth's Internal Heat; Heat Flow Mechanisms; Geothermal Gradient; Heat Flux and Controlling Parameters; Use of Nano-particles and other Additives; Thermal Regimes; Tectonic Settings of Geothermal Resources.

Geothermal Exploration Techniques: Geological Mapping; Structural Geology; Fault and Fracture Systems; Surface Manifestations; Geochemical Methods; Geophysical Methods; Gravity Surveys; Magnetic Surveys; Electrical Resistivity Surveys; Seismic Methods.

Reservoir Characterization: Reservoir Rocks; Porosity and Permeability; Fracture Networks; Reservoir Temperature Distribution; Reservoir Pressure Conditions; Fluid Properties; Resource Classification

Systems; Geothermal Resource Estimation.				
Module 2:	Geothermal Reservoir Engineering and Simulation	Case Study Presentation	Reservoir Engineering and Numerical Simulation	11 Periods
Topics: **Fundamentals of Geothermal Reservoir Engineering:**Geothermal Reservoir Types; Fluid Flow Mechanisms; Single-Phase Flow; Two-Phase Flow; Steam-Water Systems; Reservoir Energy Balance. **Heat Transfer in Geothermal Reservoirs:**Conduction; Convection; Advection; Heat Transport in Porous Media; Heat Recovery Mechanisms; Thermal Breakthrough Analysis. **Reservoir Performance Analysis:**Bottom Hole Pressure Measurements; Pressure Transient Analysis; Temperature Monitoring; Interference Testing; Reservoir Monitoring Techniques. **Reservoir Management and Optimization:** Production Forecasting; Sustainable Production Strategies; Reservoir Depletion; Reinjection Systems; Reinjection Optimization; Reservoir Surveillance; Digital Reservoir Management. **Geothermal Reservoir Simulation:** Conceptual Models; Static Models; Dynamic Models; Numerical and Statistical Simulation Techniques; Calibration and Uncertainty Assessment; Prediction of Energy Production.				
Module 3:	Geothermal Drilling, Production Engineering and Power Generation Systems	Industrial Case Study and Technical Presentation	Engineering Design and Decision Making	11 Periods
Topics: **Geothermal Drilling Engineering:**Drilling Challenges; High Temperature Drilling Systems; Drilling Fluids; Well Design; Well Integrity; Casing Design; Cementing Considerations. **Geothermal Well Completion and Testing:**Completion Techniques; Well Stimulation Methods; Hydraulic Stimulation; Acidizing; Production Testing; Injection Testing. **Geothermal Production Engineering:**Production Systems; Steam Gathering Systems; Surface Production Facilities; Scaling and Corrosion Issues; Flow Assurance Considerations. **Geothermal Power Generation Technologies:**Dry Steam Power Plants; Flash Steam Power Plants; Binary Cycle Power Plants; Organic Rankine Cycle (ORC); Kalina Cycle Systems. **Integrated Geothermal Energy Systems:**Combined Heat and Power Systems; District Heating Systems; Geothermal Heat Pumps; Geothermal Hydrogen Production; Hybrid Renewable Energy Systems.				
Module 4:	Geothermal Economics, Sustainability and Future Energy Systems	Techno-Economic Assessment Project	Strategic Thinking and Sustainability Assessment	12 Periods
Topics: **Geothermal Project Economics:**Capital Expenditure (CAPEX) Estimation; Operating Expenditure (OPEX) Estimation; Time Value of Money; Net Present Value (NPV); Economic Indicators; Internal Rate of Return (IRR); Payback Period; Levelized Cost of Energy (LCOE). **Environmental and Sustainability Assessment:** Life Cycle Assessment (LCA); Carbon Footprint Assessment; Environmental Impact Assessment; ESG Principles; Sustainable Resource Development. **Geothermal Policy and Energy Transition:**Global Geothermal Roadmaps; Renewable Energy Policies; Carbon Neutrality Targets; Energy Security; Regulatory Frameworks. **Emerging Technologies and Future Prospects:**Enhanced Geothermal Systems (EGS); Closed-Loop Geothermal Systems; Supercritical Geothermal Systems; Geothermal Energy Storage; AI Applications in Geothermal Engineering; Digital Twins; Integrated Low-Carbon Energy Systems.				
Targeted Application and Tools that can be used: **Applications:**Geothermal Reservoir Engineer, Reservoir Simulation Engineer, Geothermal Production Engineer, Drilling Engineer, Geoscientist, Energy Transition Engineer, Renewable Energy Consultant, Sustainability Analyst, Carbon Management Specialist, Integrated Energy Systems Engineer. **Tools:**CMG, Honeywell UniSim Design, DecisionSpace, Nexus, AspenTech, Aspen Plus, Aspen Process Economic Analyzer, Microsoft Excel, Python				
Textbooks: T1: Grant, M.A., Donaldson, I.G., and Bixley, P.F., Geothermal Reservoir Engineering, Academic Press, 2013. T2: Glassley, W.E., Geothermal Energy: Renewable Energy and the Environment, CRC Press, 2nd Edition, 2014.				
References: R1: DiPippo, R., Geothermal Power Generation: Developments and Innovation, Elsevier, 2016				

R2: Huenges, E., Geothermal Energy Systems: Exploration, Development and Utilization, Wiley-VCH, 2011.
R3: Dickson, M.H., and Fanelli, M., Geothermal Energy: Utilization and Technology, Routledge, 2013.
R4: Zarrouk, S.J., and McLean, K., Geothermal Well Test Analysis: Fundamentals, Applications and Advanced Techniques, Academic Press, 2019.
R5.Sanyal, S.K., and Morrow, J.W., Geothermal Reservoir Characterization and Modelling, 1977.

e-resources:

1. International Energy Agency (IEA) – Geothermal Energy Resources
2. International Renewable Energy Agency (IRENA) – Renewable Energy Knowledge Hub
3. U.S. Department of Energy – Geothermal Technologies Office
4. International Geothermal Association (IGA) Knowledge Centre
5. NPTEL – Renewable Energy and Geothermal Energy Courses
6. OnePetro Technical Papers on Geothermal Reservoir Engineering
7. Geothermal Rising (Formerly Geothermal Resources Council)

Skill Sets:

Topics relevant to "**SKILL DEVELOPMENT**":Geothermal Resource Assessment, Geological and Geophysical Interpretation, Reservoir Characterization, Reservoir Simulation, Heat Recovery Analysis, Geothermal Drilling Engineering, Production Optimization, Surface Facility Design, Power Plant Performance Analysis, Techno-Economic Evaluation, Sustainability Assessment, and Integrated Energy Systems are designed for **Skill Development** through **Participative Learning Techniques**.The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Suman Paul, Dr. Niladri Shekhar Saanta,Dr. Amolina Doley, Ms. Bidisha Borah, Mr. Hamid Hassan, and Mr. BhaskarjyotiKhaniakr
Recommended by the Board of Studies on:	22nd Meeting of the Board of Studies held on 5th June, 2026
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Course Code: **PET1705**	**Course Title:Energy Transition Towards Net-Zero** **Type of Course: 1] Professional Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	Thermodynamics, Fluid Mechanics, Heat Transfer, Reservoir Engineering, Fundamentals of Petroleum Engineering, Energy Engineering, Environmental Engineering					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive understanding of Net-Zero Energy Systems and the global Energy Transition. The course covers climate change science, decarbonization pathways, renewable energy integration, hydrogen economy, carbon capture utilization and storage (CCUS), carbon management, energy storage systems, sustainable energy policies, and emerging low-carbon technologies. The course emphasizes the application of petroleum engineering knowledge in energy transition projects, particularly in subsurface carbon storage, hydrogen systems, integrated energy systems, and sustainability assessment. Students gain exposure to industry-standard software tools used for process simulation, carbon storage modelling, subsurface characterization, energy system optimization, and techno-economic evaluation.					
Course Objective:	The objective of the course is to familiarize learners with Energy Transition Towards Net-Zero and attain **Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Demonstrate the principles of climate change mitigation, decarbonization pathways, and net-zero energy systems using engineering and sustainability concepts, CO2: Interpret renewable energy technologies, energy storage systems, and					

	integrated energy infrastructure using energy system analysis techniques, CO3:Determine hydrogen production, transportation, storage, and utilization performance using process simulation and engineering tools, CO4:Appraise carbon capture, utilization, and geological storage systems using subsurface characterization and reservoir simulation workflows, CO5: Calculate techno-economic, environmental, and sustainability indicators for net-zero energy projects using engineering assessment methodologies, CO6: Relate emerging energy transition technologies, carbon management strategies, and policy frameworks to future low-carbon energy systems.			
Course Content:				
Module 1:	Fundamentals of Net-Zero Energy Systems and Climate Transition	e-resource Review / Technical Report Writing	Technical Writing and Engineering Analysis	11 Periods
Topics: **Climate Change and Global Energy Transition:** Climate Change Science; Greenhouse Gas Emissions; Global Carbon Budget; Paris Agreement; Net-Zero Emission Targets; Energy Security; Sustainable Development Goals (SDGs); Energy Transition Pathways. **Fundamentals of Net-Zero Energy Systems:**Decarbonization Strategies; Carbon Neutrality; Scope 1, Scope 2, and Scope 3 Emissions; Carbon Accounting; Emission Inventories; Carbon Footprint Assessment. **Renewable Energy Technologies:**Solar Energy Systems; Wind Energy Systems; Hydropower; Bioenergy; Ocean Energy; Renewable Energy Integration Challenges. **Energy Storage Technologies:**Battery Energy Storage Systems; Pumped Hydro Storage; Thermal Energy Storage; Hydrogen Energy Storage; Grid Stability and Reliability; Dependency on Critical Minerals.				
Module 2:	Carbon Capture, Utilization, Storage, and Sequestration	Industrial Case Study and Technical Presentation	Engineering Design and Decision Making	11 Periods
Topics: **Carbon Capture Technologies:** Post-Combustion Capture; Pre-Combustion Capture; Oxy-Fuel Combustion; Direct Air Capture; Carbon Separation Technologies. **Carbon Utilization Pathways:**Enhanced Oil Recovery (CO_2 -EOR); Chemical Conversion; Synthetic Fuels; Carbon Mineralization; Industrial Applications. **Geological Carbon Storage:**Storage Mechanisms; Depleted Oil and Gas Reservoirs; Saline Aquifers; Basalt Formations; Reservoir Screening Criteria; Site Selection. **Monitoring and Verification:**Reservoir Monitoring; Risk Assessment; Leakage Detection; Regulatory Frameworks; Long-Term Storage Integrity.				
Module 3:	Hydrogen Economy and Low-Carbon Energy Systems	Case Study Presentation	Process Design and Simulation	11 Periods
Topics: **Hydrogen as an Energy Carrier:** Hydrogen Economy Concept; Classification of Hydrogen (Grey, Blue, Green, Turquoise, Pink and White Hydrogen); Hydrogen Value Chain. **Hydrogen Production Technologies:** Steam Methane Reforming; Autothermal Reforming; Biomass Gasification; Electrolysis Technologies (AEL, PEM, SOEC); Emerging Hydrogen Production Technologies. **Hydrogen Transportation and Storage:** Pipeline Transportation; Hydrogen Blending; Liquefied Hydrogen; Underground Hydrogen Storage; Salt Caverns; Depleted Hydrocarbon Reservoirs; Saline Aquifers. **Hydrogen Utilization:** Fuel Cells; Hydrogen Refuelling Infrastructure; Industrial Applications; Green Ammonia; Sustainable Aviation Fuels; Synthetic Fuels.				
Module 4:	Energy Transition Economics, Sustainability and Future Energy Systems	Techno-Economic Assessment Project	Strategic Thinking and Sustainability Assessment	12 Periods
Topics: **Techno-Economic Evaluation:**Options and Scenarios; Technical and Commercial Feasibility; Priority for Adoption of Greener Options; Economics of Energy Transition. **Sustainability Assessment:** Life Cycle Assessment (LCA); Carbon Footprint Assessment; Environmental Impact Assessment; ESG Frameworks; Circular Economy Principles, Linking Energy Transition to SDGs. **Energy Policy and Carbon Markets:**Carbon Pricing Mechanisms; Carbon Credits; Carbon Markets; National Green Hydrogen Mission; Global Net-Zero Roadmaps; Energy Policy Frameworks.				

Emerging Technologies and Future Energy Systems: Sector Coupling; Digital Energy Systems; Artificial Intelligence in Energy Systems; Digital Twins; Smart Energy Networks; Integrated Low-Carbon Energy Systems.

Targeted Application and Tools that can be used:

Applications: Energy Transition Engineer, Hydrogen Engineer, CCUS Engineer, Carbon Management Specialist, Reservoir Engineer, Sustainability Analyst, Renewable Energy Consultant, Process Engineer, Net-Zero Strategy Consultant, Integrated Energy Systems Engineer

Tools:CMG, Honeywell UniSim Design, DecisionSpace, Nexus, AspenTech, Aspen Plus, Aspen HYSYS, Aspen Process Economic Analyzer, Microsoft Excel, Python

Textbooks:

T1: Dincer, I., and Acar, C., Net-Zero Energy Systems and Sustainable Energy Transition, Springer Nature, Latest Edition

T2: Amin, M., and Cloete, S., Energy Transition Technologies and Decarbonization Pathways, Elsevier, Latest Edition.

References:

R1: Rosen, M.A., and Dincer, I., Exergy Analysis and Sustainable Energy Systems, Academic Press, Latest Edition.

R2: Rackley, S.A., Carbon Capture and Storage, Butterworth-Heinemann, Latest Edition.

R3: Bui, M., et al., CCUS Technologies and Applications, Elsevier, Latest Edition.

R4: MacKay, D.J.C., Sustainable Energy – Without the Hot Air, UIT Cambridge, Latest Edition.

R5: IEA, Net Zero by 2050: A Roadmap for the Global Energy Sector, Latest Edition.

e-resources:

1. International Energy Agency (IEA) – Net Zero Emissions Hub
2. International Renewable Energy Agency (IRENA) Knowledge Centre
3. U.S. Department of Energy – Office of Clean Energy Demonstrations
4. Global CCS Institute Knowledge Centre
5. National Green Hydrogen Mission (MNRE)
6. NPTEL – Energy Transition and Sustainable Energy Courses
7. OnePetro Technical Papers on CCUS and Energy Transition
8. International Energy Forum (IEF) Energy Transition Resources

Skill Sets:

Topics relevant to "**SKILL DEVELOPMENT**": Renewable Energy Integration, Hydrogen Production and Infrastructure, Carbon Capture Utilization and Storage (CCUS), Geological Carbon Storage Assessment, Energy Storage Systems, Carbon Accounting, Sustainability Assessment, Techno-Economic Evaluation, Energy Policy Analysis, and Integrated Energy System Optimization are designed for **Skill Development** through **Participative Learning Techniques**.The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Suman Paul, Dr. Niladri Shekhar Saanta,Dr. Amolina Doley, Ms. Bidisha Borah, Mr. Hamid Hassan, and Mr. BhaskarjyotiKhanikar
Recommended by the Board of Studies on:	22nd Meeting of the Board of Studies held on 5th June, 2026
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Course Code: **PET1706**	**Course Title: Nuclear Energy Systems for Energy Transition** **Type of Course: 1] Professional Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	Engineering Physics, Thermodynamics, Heat Transfer, Fluid Mechanics, Energy Engineering, Fundamentals of Petroleum Engineering					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive understanding of advanced nuclear energy technologies and their role in achieving clean energy transition and global decarbonization goals. The course covers nuclear reactor fundamentals, advanced reactor technologies, nuclear fuel cycles, reactor safety systems, waste management, nuclear-assisted hydrogen production, small modular reactors (SMRs), techno-economic assessment, and integration of nuclear energy with future low-carbon energy systems. The course emphasizes the application of petroleum engineering principles in subsurface characterization for nuclear waste disposal, underground energy storage, integrated hydrogen systems, and sustainable energy planning. Students gain exposure to industry-standard software tools for process simulation, energy system optimization, geological characterization, and techno-economic evaluation.					
Course Objective:	The objective of the course is to familiarize learners with Nuclear Energy Systems for Energy Transitionand attain **Skill Development** through **Participative LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1:Demonstrate the principles of nuclear reactions, reactor physics, and energy conversion systems using engineering fundamentals, CO2:Interpret advanced nuclear reactor technologies, fuel cycles, and reactor operational characteristics using energy engineering concepts, CO3:Determine reactor thermal performance, hydrogen production efficiency, and integrated energy system behaviour using simulation tools, CO4: Appraise nuclear safety systems, radioactive waste management strategies, and geological disposal concepts using engineering and subsurface evaluation techniques, CO5:Calculate techno-economic, environmental, and sustainability indicators associated with advanced nuclear energy projects, CO6: Relate emerging nuclear technologies, hydrogen economy pathways, and clean energy transition strategies to future low-carbon energy systems.					
Course Content:						
Module 1:	Nuclear Energy Fundamentals and Reactor Physics	e-resource Review / Technical Report Writing	Technical Writing and Engineering Analysis	11 Periods		
Topics: **Introduction to Nuclear Energy:** Historical Development of Nuclear Energy; Global Nuclear Energy Scenario; Role of Nuclear Energy in Clean Energy Transition; Nuclear Energy and Net-Zero Goals; Nuclear Power Generation Systems, Dependency on Critical Minerals. **Fundamentals of Nuclear Physics:** Atomic Structure; Nuclear Structure; Radioactivity; Radioactive Decay Mechanisms; Nuclear Reactions; Nuclear Fission; Nuclear Fusion; Binding Energy; Mass-Energy Equivalence. **Reactor Physics:** Neutron Life Cycle; Neutron Moderation; Neutron Multiplication Factor; Reactor Criticality; Reactor Kinetics; Reactivity Control Systems. **Nuclear Fuel Cycle:**Uranium Exploration and Mining; Fuel Fabrication; Fuel Utilization; Spent Fuel Management; Closed and Open Fuel Cycles.					
Module 2:	Nuclear Reactor Technologies	Case Study Presentation	Process Design and Simulation	11 Periods		
Topics: **Conventional Nuclear Reactor Systems:**Pressurized Water Reactors (PWR); Boiling Water Reactors (BWR); Pressurized Heavy Water Reactors (PHWR); CANDU Reactors. **Nuclear Reactor Technologies:**Generation III+ Reactors; Generation IV Reactors; Thorium-powered Fast Breeder Reactors; Sodium-Cooled Fast Reactors; Molten Salt Reactors (MSR); High Temperature Gas-						

Cooled Reactors (HTGR).
Small Modular Reactors (SMRs):SMR Technologies; Design Principles; Safety Advantages; Remote Power Applications; Industrial Heat Applications.
Nuclear-Assisted Hydrogen Production: High Temperature Electrolysis; Thermochemical Water Splitting; Nuclear Hydrogen Economy; Nuclear-Renewable Hybrid Systems.

Module 3:	Nuclear Safety, Waste Management and Geological Systems	Industrial Case Study and Technical Presentation	Engineering Design and Decision Making	11 Periods

Topics:
Nuclear Safety Engineering: Defense-in-Depth Philosophy; Reactor Safety Systems; Risk Assessment; Probabilistic Safety Analysis; Severe Accident Management; Regulatory Frameworks.
Radiation Protection: Radiation Sources; Radiation Exposure Pathways; Radiation Shielding; Occupational Safety; Environmental Monitoring.
Nuclear Waste Management: Waste Classification; Low-Level Waste; Intermediate-Level Waste; High-Level Waste; Spent Nuclear Fuel Management.
Geological Disposal Systems: Deep Geological Repositories; Salt Formations; Clay Formations; Crystalline Rock Systems; Site Selection Criteria; Geomechanical Considerations; Long-Term Repository Performance.

Module 4:	Nuclear Economics, Sustainability and Future Energy Transition	Techno-Economic Assessment Project	Strategic Thinking and Sustainability Assessment	12 Periods

Topics:
Nuclear Project Economics: Capital Cost Estimation; Operating Cost Analysis; Fuel Cycle Economics; Levelized Cost of Electricity (LCOE); Financing Mechanisms.
Sustainability Assessment: Life Cycle Assessment (LCA); Carbon Footprint Assessment; Environmental Impact Assessment; ESG Considerations; Sustainable Energy Development.
Nuclear Energy and Decarbonization: Nuclear Energy for Net-Zero Targets; Industrial Decarbonization; Nuclear-Renewable Hybrid Systems; Energy Security.
Emerging Technologies and Future Prospects: Fusion Energy Systems; Advanced Fuel Technologies; Digital Nuclear Plants; Artificial Intelligence Applications; Digital Twins; Future Energy Scenarios.

Targeted Application and Tools that can be used:
Applications: Nuclear Energy Engineer, Energy Transition Engineer, Nuclear Safety Engineer, Hydrogen Engineer, Sustainability Analyst, Carbon Management Specialist, Energy Systems Analyst, Process Engineer, Geological Disposal Engineer, Integrated Energy Systems Engineer
Tools:CMG, Honeywell UniSim Design, DecisionSpace, Nexus, AspenTech, Aspen Plus, Aspen HYSYS, Aspen Process Economic Analyzer, Microsoft Excel, Python

Textbooks:
T1: Stacey, W.M., Nuclear Energy: Principles, Practices and Prospects, Wiley, Latest Edition.
T2: Lamarsh, J.R., and Baratta, A.J., Introduction to Nuclear Engineering, Pearson, Latest Edition.

References:
R1: Glasstone, S., and Sesonske, A., Nuclear Reactor Engineering, Springer, Latest Edition.
R2: Todreas, N.E., and Kazimi, M.S., Nuclear Systems Volume I: Thermal Hydraulic Fundamentals, CRC Press, Latest Edition.
R3: Dincer, I., and Rosen, M.A., Clean Energy Systems and Experiences, Wiley, Latest Edition.
R4: World Nuclear Association, Advanced Nuclear Reactor Technology Reports, Latest Edition.
R5: OECD Nuclear Energy Agency, Generation IV Nuclear Energy Systems Reports, Latest Edition.

e-resources:
1. International Atomic Energy Agency (IAEA) Knowledge Hub
2. World Nuclear Association (WNA) Information Library
3. OECD Nuclear Energy Agency (NEA) Publications
4. U.S. Department of Energy – Office of Nuclear Energy
5. International Energy Agency (IEA) Nuclear Energy Resources
6. NPTEL – Nuclear Energy and Reactor Engineering Courses
7. Nuclear Energy Institute (NEI) Resources
8. OnePetro Technical Papers on Energy Transition and Nuclear Energy

Skill Sets:
Topics relevant to "**SKILL DEVELOPMENT**": Nuclear Reactor Analysis, Nuclear Fuel Cycle Assessment, Advanced Reactor Technologies, Nuclear-Assisted Hydrogen Production, Geological Repository Evaluation,

Risk and Safety Assessment, Techno-Economic Evaluation, Sustainability Assessment, Integrated Energy Systems, and Energy Transition Planning are designed **Skill Development** through **Participative Learning Techniques**.The course attainment will be assessed through assessment component mentioned in course handout.	
Catalogue prepared by:	Dr. Suman Paul, Dr. Niladri Shekhar Saanta,Dr. Amolina Doley, Ms. Bidisha Borah, Mr. Hamid Hassan, and Mr. BhaskarjyotiKhanikar
Recommended by the Board of Studies on:	22nd Meeting of the Board of Studies held on 5th June, 2026
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Course Code: PET3101	**Course Title: Quality Management Practices in Oil and Gas Industry** **Type of Course: 1] Discipline Elective Course 2]Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of the course is to enable the students to appreciate the need for understanding the management activities related to oil and gas industry for enhancement of quality. The course is conceptual and analytical in nature and needs fair knowledge of basic engineering science and computing. The course develops the critical and analytical thinking, as well as management skills. The course also improves the programming abilities through assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Quality Management Practices in Oil and Gas Industry and attain **Employability Skills** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe project management and importance of the project life cycle, CO2: Demonstrate the Time schedule preparation and pitfalls in its planning, CO3: Illustrate the project organization with roles and responsibility of the project manager, CO4: Use knowledge of allocating human, material, financial, and technological resources effectively to meet project goals, CO5:Apply quality management principles and quality assurance/control practices during different stages and operational phases of engineering projects, CO6: Analyzethe risks associated with oil and gas projects using formal risk management frameworks, including identification, prioritization, and mitigation strategies.					
Course Content:						
Module 1:	Project Management of Oil and Gas Industry	Assignment	Data Collection	11 Periods		
Topics: The Principle of Project Management, Project Management goals and tasks, Project economic analysis, Pitfalls in time schedule planning, Time schedule preparation.						
Module 2:	Resource Hiring	Assignment / Quiz	Data collection and analyses	11 Periods		
Topics: Introduction, Project organization, Types of project organization, administrative organization for total Quality Management, Allocate resources to project plan, Tendering, Bidding and Contract Traps.						
Module 3:	New Approach in Managing Oil and Gas	Assignment / Quiz	Group discussion	11 Periods		

	Projects			
Topics: Introduction, Quality system, Quality management requirements, Quality Assurance, Project Quality control in various stages, Operational phase of the project.				
Module 4:	Practical Risk Management for Oil and Gas Projects	Assignment / Quiz / Term Paper	Presentation	12 Periods
Topics: Introduction, Risk management process, Risk Assessment, Risk identification, Methods of defining risk, Define Priorities, Methods of risk avoidance, Operations Risk.				
Targeted Application and Tools that can be used: **Applications:** Project Planning and Management Analyst, Management Trainee **Tools:** Kato, MS-Excel				
Textbooks: T1: Mohamed A; El-Reedy, Project Management in the Oil and Gas Industry, Scrivener Publications, Wiley, 2016. T2: Dale H.Besterfiled, et al., "Total Quality Management, Pearson Education", Inc. Third Edition, 2006; Indian Reprint.				
References: R1:Jens J. Dahlgaard. Kai Kristensen and Gopal K. Kanji, Fundamentals of Total Quality Management, First Edition, 2007, Taylor and Francis e-library. R2: A. Inkpen, M. H. Moffett, The Global Oil & Gas Industry_ Management, Strategy and Finance-PennWell Corp, 2011. **e-resources** 1. Presidency University Link: https: / / puniversity.informaticsglobal.com / login 2. Webinar on introduction on Quality management system: https: / / www.youtube.com / watch?v=HDeHcoM0eIY 3. Total Quality management - https: / / journals.sagepub.com / doi / 10.1177 / 097324701100700207 4. Application of Six Sigma - https: / / doi.org / 10.2118 / 84434-PA 5. Quality Management - https: / / www.youtube.com / watch?v=7ZDGyzqh9EY 6. Risk Assessment - https: / / www.youtube.com / watch?v=HyGb_eaT-U8				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Project Quality control for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **PET3102**	**Course Title: Occupational Health and Safety** **Type of Course: 1] Discipline Elective Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to understand the safety rules, regulations, guidelines, and accident investigations, reliability characteristics in oil and gas industry. The course is conceptual and analytical in nature, aims to provide detailed coverage of environmental laws and regulation, guidelines for safety and health programs as					

	well as accident reporting and accident investigations**.** The course develops the critical and analytical thinking skills. The course also enhances the programming abilities through assignments.			
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Occupational Health and Safety and attain **Employability** through **Problem Solving Methodologies**.			
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Explain the principles of Safety, Health, and Environment (SHE) management by describing safety terminology, environmental concepts, toxicity, and the impact of industrial activities on ecosystems, CO2: Apply risk assessment and management techniques to evaluate industrial hazards using accident modeling, chemical risk analysis, exposure assessment, fire and explosion models, and event tree and fault tree analysis, CO3:Illustrate safety practices and environmental protection measures at drilling worksites, including drill site preparation, material handling, electrical safety, equipment safety, and the use of personal protective equipment (PPE), CO4:Demonstrate the application of offshore environmental management, oil spill treatment methods, and soil remediation techniques for effective pollution control, CO5: Examine the application of wastewater treatment processes for effective wastewater management through case studies.			
Course Content:				
Module 1:	Introduction to Safety, Health, and Environment	Assignment / Quiz	Literature Survey	08 Periods
Topics: Introduction to Safety, Health, and Environment Management, History, Terms and definitions, Environment concepts, Impact on Eco system, Air, Water and Soil, Toxicity.				
Module 2:	Accident Modeling, Risk Assessment and Management	Assignment / Quiz	Data Collection	12 Periods
Topics: Dose assessment, safety regulations-Toxic releases-models and methods-Chemical risk analysis-Chemical exposure index (CEI)-Case studies in oil industries-Quantitative risk assessment-Fire and explosion models-Flammability diagrams-Exposure models-Fire and explosion: prevention methods-Event tree and fault tree analyses.				
Module 3:	Safety Practices at Work Site	Assignment / Quiz	Programming	11 Periods
Topics: Impact of Drilling on environment, Safety practices in Drilling sites: Preparation of Drill sites, Storage and Material Handling, Precautions for Drilling in landfills, Electrical safety, General equipment safety, PPE, Caselet issues related to any Industry.				
Module 4:	Oil Spill Remediation	Case Study	Data Collection	09 Periods
Topics: Offshore environmental studies, Fate and behavior of Oil spill, Response strategies and techniques, Mechanical and chemical treatments, Soil remediation. What is waste water, Waste water treatment, Case studies.				
Targeted Application and Tools that can be used: **Applications:** HSE Engineer / Officer in Oil and Gas / Process / Steel / Manufacturing Industry, Thermal / Power Plants. **Tools:** MS Excel				
Textbooks: T1. B.S. Dhillon, “Safety and Reliability in the Oil and Gas Industry: A Practical Approach”, 1st edition, CRC Press, 2019.				

T2. S. Chandrasekaran, “Health, Safety, and Environmental Management in Offshore and Petroleum Engineering”, 1st edition, Wiley, 2016.
References: R1. Charles D. Reese, Occupational Health and Safety Management: A Practical Approach, 3rdEdition, CRC Press, 2016. R2.Morten Holmager, Søren Dybdahl, “Offshore Book Oil and Gas”, 3rdEdition, Offshoreenergy.dk, 2014. **e-resources:** 1. https: / / puniversity.informaticsglobal.com / login 2.https: / / youtu.be / 7cqGjBj77Zs?list=PLbMVogVj5nJTKcMfWNwQfPkT014KEJAzE 3.https: / / youtu.be / 7CwPDiqlmv0 4. https: / / youtu.be / IJqKyBHHdI8 5.https: / / youtu.be / 0dcQcNARKOI
Skill Sets: Topics relevant to **“EMPLOYABILITY SKILLS”:** Oil Spill Control for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, Ms. Amolina Doley, Dr. Rohit Kumar Saw, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET3103**	**Course Title: Overview of Material Science** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	Materials Science is a dynamic field, which involves analysis of processing, structure, property and performance relation for engineered materials and methods of manufacturing such materials having desired applications. Material scientists working in laboratories, industries, strive to understand and manipulate the structure of materials at molecular level to gain control over their properties. All sophisticated devices like computers, aircraft, biomedical devices etc., require materials manufactured to precise specifications. The evolution of advanced products can be hobbled by the limitations of the available materials.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Overview of Material Science and attain **Entrepreneurial Skills** through **Participative Learning Techniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Explain material science and importance of the material engineering world, CO2: Solve atomic packing factor for different types of crystal lattice, and determine Atomic Packing factor for FCC, BCC, SC, and HCP, CO3: Illustrate the mechanical behavior of Ductile material and Brittle material, CO4: Distinguish between various materials with help of stress-strain diagram, and explain the Mechanical Behavior – Metals – Ceramics – Polymers, and Hardness, Property Variability, Safety Factors of these materials, CO5: Sketch the phase diagram for the different composite metals, and interpret the Equilibrium Phase Diagrams, The Phase Rules for Single Component System, Binary Phase Diagrams, Ternary Phase Diagrams, and for Typical Phase Diagrams like Magnesia–Alumina System, Copper–Zinc System, Iron–Iron-carbide System,					

	CO6: Interpret the melting and glass transition Phenomena in Polymers, and demonstrate the Phase Transformations in Metals, Multiphase Transformations, Microstructural and Property Changes in Iron–Carbon Alloys, Precipitation Hardening, Heat Treatments, Mechanism of Hardening with Miscellaneous Considerations, and illustrate the Crystallization, Melting, and Glass Transition Phenomena in Polymers.			
Course Content:				
Module 1:	Structure of Metals	Term Paper	Data Collection and Analysis	12 Periods
Topics: Classification of Materials, Structure of Metals and Ceramics, Unit cell, FCC, BCC, SC, HCP, Atomic Packing factor, Miller indices for line, plane, Polymer structures, Imperfections in Solids.				
Module 2:	Mechanical Properties	Assignment	Data Collection and Analysis	11 Periods
Topics: Introduction, Concepts of Stress and Strain, Stress-Strain Behavior, Ductile material, Brittle material, Mechanical Behavior – Metals – Ceramics – Polymers, Hardness, Property Variability, Safety Factors.				
Module 3:	Phase Diagrams	Assignment	Programming Task	12 Periods
Topics: Introduction, Equilibrium Phase Diagrams, The Phase Rules – Single Component System – Binary Phase Diagrams – Ternary Phase Diagrams, Typical Phase Diagrams – Magnesia–Alumina System – Copper–Zinc System – Iron–Iron-carbide System.				
Module 4:	Phase Transformations	Term Paper	Simulation / Data Analysis	10 Periods
Topics: Phase Transformations In Metals – Multiphase Transformations, Microstructural and Property Changes In Iron–Carbon Alloys, Precipitation Hardening – Heat Treatments – Mechanism of Hardening – Miscellaneous Considerations, Crystallization, Melting, and Glass Transition Phenomena In Polymers.				
Targeted Application and Tools that can be used: **Applications:** Engineer in Oil and Gas Industry, Steel Industry, Manufacturing Industry **Tools:** Image Analysis Software / Polarizing Microscope (Professionally used Software / Equipment)				
Textbooks: T1. Raghavan V, "Materials Science and Engineering: A First Course", 6th Revised Edition, PHI Learning Private Limited-New Delhi, 2015. T2. James F. Shackelford, William Alexander, MATERIALS SCIENCE AND ENGINEERING HANDBOOK, 3rd edition, 2001 by CRC Press, 2001				
References: R1. William Callister S., "Materials Science and Engineering", 2nd Edition, Wiley India, 2014. R2: George E. Dieter, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 1988. **e-resources:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / www.nap.edu / read / 10435 / chapter / 2 3. https: / / www.linearmotiontips.com / mechanical-properties-of-materials-stress-and-strain / 4. https: / / nptel.ac.in / content / storage2 / courses / 112108150 / pdf / PPTs / MTS_07_m.pdf				
Skill Sets: Topics relevant to **"ENTREPRENEURIAL SKILLS":** Phase transformation for developing **Entrepreneurial Skills** through **Participative LearningTechniques**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, Dr. Amolina Doley, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: **PET3104**	**Course Title:** **Petroleum Economics** **Type of Course:** **1] Discipline Elective Course** **2] Theory Only**		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The purpose of this course is to enable the student to understand the status of oil sector with respect to oil exploration. The overall theme of the course is to emphasize the process of thinking: qualitatively and quantitatively; strategically, using concrete; real-life practical examples. The course is theoretical in nature. The course develops the critical thinking and analytical skills.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Petroleum Economics and attain **Employability Skills** through **Problem SolvingMethodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Explain the concepts of time value of money, interest calculations, annuities, capitalized costs, and equivalence used in petroleum project evaluation, CO2: Apply time value of money principles, annuity techniques, and capitalized cost methods to evaluate capital expenditure decisions in petroleum projects, CO3:Describe the principles and methods of depreciation and depletion used for the valuation of petroleum assets, CO4:Apply depreciation and depletion methods to determine the value of petroleum assets and evaluate project costs, CO5: Choose financial evaluation techniques, including ROI, NPV, DCF, PVI, and payout period, to assess the profitability of petroleum projects, CO6:Apply petroleum economics principles to evaluate pricing mechanisms, cost control strategies, inventory management, logistics, and demand forecasting for decision-making in the oil and gas industry.						
Course Content:							
Module 1:	Time Value of Money (TVM) in Capital Expenditures	Assignment	Data Collection	11 Periods			
Topics: Basic Definitions- Types of Interest- Interest Calculation- Effective Interest- Annuities and Periodic Payments; Derivation of the Basic Equation (Sinking Fund Factor); Applications of the Annuity Technique- Capitalized Costs; Calculation of Capitalized Costs of an Asset to Be Replaced Perpetually; Calculation of the Capitalized Costs of a Perpetual Annual Expense- Equivalence							
Module 2:	Depreciation and Depletion in Oil Projects	Assignment	Data Collection	12 Periods			
Topics: Introduction and Basic Definitions- Valuation of Assets Using Depreciation and Depletion: General Outlook- Methods for Determining Depreciation: Straight-Line Depreciation (S.L.D.); Declining Balance Depreciation (D.B.D.); Sum-of-the-Digits Depreciation (S.D.D.); Sinking Fund Depreciation (S.F.D.)- Methods for Determining Depletion: Background-Methods							
Module 3:	Financial Measures and Profitability Analysis	Quiz	Data Collection	12 Periods			
Topics: Introduction- Mathematical Methods for Evaluating Profitability: Annual Rate of Return (Return on Investment, R.O.I.); Payout Period (P.P.), Payback Time, or Cash Recovery Period; Discounted Cash-Flow Rate of Return (D.C.F.R.) and Present Value Index (P.V.I.); Net Present Value (N.P.V.)- Techniques of Economic Analysis							
Module 4:	Risk, Uncertainty, and Decision Analysis	Poster Presentation	Programming	10 Period			

				s

Topics:
Global Distribution and Consumption of Gas, Energy Cost from Different Sources: Coal, O&G, Electricity, etc., O&G Pricing Mechanism, Pricing issues, Commercial and financial aspects of retail business, Cost Control in retail business: Cost control and Reduction, Role of Inventory Management, Product placements – Importance of logistics in Petro-refining., Costs: Demand forecasting and its Importance.

Targeted Application and Tools that can be used:
Applications: Petroleum Engineer in the decision making of the projects and also assessing the risk associated with new projects.
Tools: Excel, CMG-CMOST

Textbooks:
T1: Petroleum Engineering and Economics-Hussein K. Abdel-Aal, Mohammed A. Alsahlawi (CRC Press)

References:
R1: International Exploration Economics, Risk, and Contract Analysis, Daniel Johnston,2003, Penn Well Corporation, Tulsa, Oklahoma, USA, 401P,First Edition.
R2: An Introduction to Exploration Economics (2nd ed.), The Petroleum Publishing Company, Tuls, Oklahoma, 1977.

e-resource:
1. https: / / puniversity.informaticsglobal.com / login
2. https: / / www.sciencedirect.com / science / article / abs / pii / S0376736107000143
3. https: / / petex.utexas.edu / e-learning / 325-petroleum-economics

Skill Sets:
Topics relevant to **"EMPLOYABILITY SKILLS":** Depreciation and Depletion in Oil Projects for developing **Employability Skills** through **Problem SolvingMethodologies**. This is attained through the **Assignment** as mentioned in the course plan.

Catalogue prepared by:	Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET3105**	**Course Title: Petroleum Logistics, Marketing and Management** **Type of Course: 1] Discipline Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive understanding of the fundamentals and practical aspects of the petroleum industry's logistical, marketing, and management facets. Students will have a well-rounded understanding of the logistical, marketing, and management aspects of the petroleum industry, preparing them for careers in this dynamic and critical sector. They will develop analytical and practical skills necessary to address the industry's challenges and opportunities, with a strong emphasis on sustainability and strategic decision-making.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Petroleum Logistics, Marketing, and Management and attain **Employability Skills** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Explain the various transportation modes and infrastructure used in					

	petroleum logistics, CO2: Summarize the process of market analysis and demand forecasting, CO3: Illustrate the application of project management techniques in petroleum operations, CO4: Demonstrate the implementation of corporate social responsibility (CSR) initiatives.			
Course Content:				
Module 1:	Fundamentals of Petroleum Logistics	Team Exercise	Presentation	08 Periods
Topics: Overview of Petroleum Supply Chain, Transportation Modes and Infrastructure, Pipeline Logistics and Management, Storage Facilities and Strategies, Health, Safety, and Environmental Considerations in Logistics.				
Module 2:	Petroleum Marketing and Trading	Team Activity	Poster Designing and Presentation	09 Periods
Topics: Basics of Petroleum Marketing and Geopolitics, Market Analysis and Demand Forecasting, Crude Oil and Petroleum Product Trading, Pricing Mechanisms and Market Dynamics, Conservation of petroleum and its products, Spot and other market control mechanisms, Indian and Global supply scenario of petroleum and petroleum products, Risk Management in Petroleum Marketing.				
Module 3:	Petroleum Management and Operations	Team Activity	Poster Designing and Presentation	12 Periods
Topics: Overview of Petroleum Industry Management, Petroleum Resource Classification, Analysis of Resource Management, International and National Institutions of Oil and Gas: API, OPEC, OECD, OIDB, DGH, PNGRB, CHT, PII, PPAC, PCRA. Petroleum Contracts: NELP - Role & Background, Types of Contracts and fiscal components, Production sharing contracts in India. Strategic Reserves concepts, Operational Strategies and Best Practices, Project Management in the Petroleum Sector, Regulatory and Compliance Issues, Technology and Innovation in Petroleum Management.				
Module 4:	Strategic and Sustainable Practices in Petroleum	Exercise	Data Collection and Report submission	07 Periods
Topics: Strategic Planning and Decision Making, Sustainable Practices in Petroleum Operations, Corporate Social Responsibility (CSR) in the Petroleum Industry, Energy Transition and Future Trends, Case Studies of Successful Petroleum Companies.				
Targeted Application and Tools that can be used: **Applications:** CGD Engineer / Oil and Gas Marketing Professional in Energy Industry **Tools:** OLGA, OFM, PIPESIM (Professionally used Software)				
Textbooks: T1. "Managing Growth and Expansion Into Global Markets: Logistics, Transportation, and Distribution", Thomas A. Cook, Taylor & Francis, 2015. T2. "Trading and Pricing Financial Derivatives: A Guide to Futures, Options, and Swaps", Patrick Boyle, and Jesse Mcdougall, Createspace Independent Pub, 2015. T3. "Energy Trading and Risk Management: A Practical Approach to Hedging, Trading and Portfolio Diversification", Iris Marie Mack, Wiley, 1st Edition, 2014. T4: "Oil and Gas Production Handbook: An Introduction to Oil and Gas Production, Transport, Refining and Petrochemical Industry", Håvard Devold, ABB, 2013.				
References: R1. "Oil Transport Management", Y.H. Venus Lun, Olli-Pekka Hilmola, Alexander M. Goulielmos, Kee-hung Lai, T.C. Edwin Cheng, Springer London, 2012. R2. "Optimal Supply Chain Management in Oil, Gas, and Power Generation", David Jacoby, PennWell Corporation, 2012. R3. "Petroleum Refining: Technology and Economics", Mark J. Kaiser, James H. Gary, and Glenn E. Handwerk, CRC Press, 5th Edition, 2007. R4. "Oil, Gas and Chemical Logistics Management: Advanced Project Inbound Material Logistics Management And 5PL", Wei Li, Kogan Page, Limited, 1st Edition, 1998. R5. "Fundamentals of Petroleum", Kate Van Dyke, University of Texas at Austin Petroleum 4th Edition,				

1997.

e- References:

1. Link for PU e-resources: https://presiuniv.knimbus.com/user#/home
2. Oil and Gas Industry Downstream:https://guides.loc.gov/oil-and-gas-industry/downstream
3. Oil Transportation: https://energyeducation.ca/encyclopedia/Transportation_of_oil

Skill Sets:

Topics relevant to **"EMPLOYABILITY SKILLS"**: Risk Management in Petroleum Marketing, Operational Strategies and Best Practices, Project Management in the Petroleum Sector, Regulatory and Compliance Issues, Technology and Innovation in Petroleum Management, Strategic Planning and Decision Making, Sustainable Practices in Petroleum Operations, Corporate Social Responsibility (CSR) in the Petroleum Industry for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course handout.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, Ms. Amolina Doley, and Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET4001**	**Course Title:** **Digital Oilfield Software Laboratory** **Type of Course:** **1] Professional Elective Course 2] Laboratory Only**	**L-T-P-C**	0	0	6	3
Version No.:	1.0					
Course Pre-requisites:	Basic knowledge related to Petroleum Geology, Petrophysics, Reservoir Engineering, Production Engineering, Drilling Engineering, Fundamentals of Geomechanics, Petroleum Data Analysis					
Anti-requisites:	NIL					
Course Description:	This laboratory course provides hands-on training in digital oilfield technologies for integrated subsurface characterization, geomechanical analysis, reservoir modelling, and production engineering using industry-standard software. Students develop practical skills in well log interpretation, geological correlation, petrophysical evaluation, pore pressure prediction, wellbore stability, reservoir characterization, production surveillance, nodal analysis, and production optimization. The course emphasizes integrated digital workflows, multidisciplinary data analysis, and engineering decision-making to enhance reservoir management and prepare students for modern upstream petroleum engineering practices.					
Course Objective:	The objective of the course is to familiarize learners with Digital Oilfield Software Laboratory and attain **Skill Development** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Apply digital well log processing and petrophysical interpretation techniques to characterize reservoir formations using geological and petrophysical datasets, CO2: Apply well correlation and geological modelling techniques to construct geological cross-sections for reservoir characterization, CO3: Develop Mechanical Earth Models using geological and well log data to estimate rock mechanical properties and subsurface stress conditions, CO4: Apply geomechanical analysis techniques to evaluate wellbore stability and design safe drilling mud weight windows, CO5: Develop structural and static reservoir models using geological, petrophysical, and reservoir engineering data, CO6: Analyze reservoir volumetrics and reservoir performance using integrated reservoir characterization workflows,					

	CO7: Apply production engineering workflows to evaluate well performance using production, completion, and nodal analysis data, CO8: Optimize production system performance by evaluating artificial lift methods and integrated production engineering strategies.			
Course Content:				
Module 1:	Geosciences and Petrophysical Analysis	Practical Session	Technical Writing and Engineering Analysis	11 Sessions
Topics: Digital Oilfield Concepts and Integrated Subsurface Data Management; Well Log Data Import, Validation, and Quality Control; Well Log Editing and Data Conditioning; Lithology Identification and Formation Evaluation; Petrophysical Analysis; Shale Volume Estimation; Porosity Determination; Water Saturation Calculation; Electrofacies Classification; Reservoir Rock Characterization; Multi-Well Correlation; Stratigraphic Correlation; Geological Cross-Section Preparation; Digital Geological Interpretation **Experiment No.**: 1, 2, 3, 4, and 5				
Module 2:	Geomechanics and Wellbore Stability Analysis	Case Study Presentation	Process Design and Simulation	11 Periods
Topics: Fundamentals of Rock Mechanics; Geomechanical Data Integration; Mechanical Earth Model Development; Elastic Rock Property Estimation; Dynamic and Static Rock Properties; In-situ Stress Analysis; Pore Pressure Prediction; Fracture Pressure Estimation; Wellbore Stability Analysis; Stress Polygon Construction; Mud Weight Window Design; Drilling Risk Assessment; Geomechanical Decision Support. **Experiment No.**: 6, 7, 8, 9, and 10				
Module 3:	Reservoir Characterization and Reservoir Modelling	Industrial Case Study and Technical Presentation	Engineering Design and Decision Making	11 Periods
Topics: Reservoir Modelling Workflow; Structural Framework Development; Structural Mapping; Fault Modelling; Grid Generation; Facies Modelling; Property Modelling; Petrophysical Property Distribution; Reservoir Layering; Static Reservoir Model Construction; Volumetric Estimation; Hydrocarbon Initially in Place (HIIP); Reservoir Connectivity Analysis; Integrated Reservoir Characterization. **Experiment No.**: 11, 12, 13, 14, and 15				
Module 4:	Production Engineering and Production Optimization	Techno-Economic Assessment Project	Strategic Thinking and Sustainability Assessment	12 Periods
Topics: Production Data Management; Completion Data Integration; Production Surveillance; Production Performance Monitoring; Well Performance Analysis; Decline Curve Analysis; Nodal Analysis; Inflow and Outflow Performance Relationships; Artificial Lift Performance Evaluation; Production System Analysis; Production Optimization Techniques; Digital Asset Performance Management; Integrated Production Engineering Workflow. **Experiment No.**: 16, 17, 18, 19, and 20				
List of Experiment: **Experiment No. 1:**Import and validate LAS well log data for digital subsurface analysis **Experiment No. 2:**Interpret lithology using gamma ray, density, neutron, and sonic well logs **Experiment No. 3:**Calculate shale volume, porosity, and water saturation from petrophysical data **Experiment No. 4:**Generate electrofacies models and interpret petrophysical characteristics of reservoir formations **Experiment No. 5:**Correlate multiple wells and construct geological cross-sections for reservoir characterization **Experiment No. 6:**Develop a Mechanical Earth Model (MEM) using integrated geomechanical datasets **Experiment No. 7:**Estimate elastic rock properties from well log measurements **Experiment No. 8:**Determine pore pressure and fracture pressure gradients for drilling applications **Experiment No. 9:**Evaluate wellbore stability using in-situ stress analysis and geomechanical modelling **Experiment No. 10:**Design an optimum mud weight window for safe drilling operations **Experiment No. 11:**Construct a structural reservoir framework using geological and structural data				

Experiment No. 12: Develop static reservoir property models for reservoir characterization
Experiment No. 13: Generate facies models and populate reservoir properties using geological data
Experiment No. 14: Estimate reservoir volumetrics and Hydrocarbons InitiallyInPlace (HIIP)
Experiment No. 15: Analyze reservoir performance using integrated reservoir engineering workflows
Experiment No. 16: Import production and well completion data for production engineering analysis
Experiment No. 17: Analyze production surveillance data and production performance trends
Experiment No. 18: Perform nodal analysis to evaluate production system performance
Experiment No. 19: Evaluate artificial lift system performance for production enhancement
Experiment No. 20: Optimize production strategies using integrated digital production engineering workflows

Targeted Application and Tools that can be used:
Applications: Digital Oilfield Engineer, Petroleum Data Analyst, Petrophysicist, Reservoir Engineer, Production Engineer, Geomechanics Engineer, Reservoir Modelling Engineer, Asset Development Engineer, Integrated Operations Engineer, Subsurface Data Analyst
Tools: Halliburton DecisionSpace® Geosciences, Halliburton DecisionSpace® Petrophysics, Halliburton DecisionSpace® Geomechanics, Halliburton DecisionSpace® Reservoir, Halliburton DecisionSpace® Production, Microsoft Excel, Python

Textbooks:
T1: Halliburton Landmark. DecisionSpace User Guide Series (Geosciences, Petrophysics, Geomechanics, Reservoir and Production Modules). Latest Edition.
T2: Ahmed, T., Reservoir Engineering Handbook. Gulf Professional Publishing, Latest Edition.
T3: Dake, L.P., Fundamentals of Reservoir Engineering. Elsevier, Latest Edition.
T4: Digital Oilfield Software Laboratory Manual, Presidency University, Bengaluru

References:
R1: Tiab, D., and Donaldson, E.C., Petrophysics: Theory and Practice of Measuring Reservoir Rock and Fluid Transport Properties. Gulf Professional Publishing.
R2: Zoback, M.D., Reservoir Geomechanics. Cambridge University Press.
R3: Lyons, W.C., and Plisga, G.J., Standard Handbook of Petroleum and Natural Gas Engineering. Elsevier.
R4: Cosentino, L., Integrated Reservoir Studies. Editions Technip.
R5: Halliburton Landmark. DecisionSpace Technical Documentation and Training Manuals.

e-resources:
1. Halliburton Landmark University Grant Program Documentation
2. Halliburton DecisionSpace Online Documentation
3. Halliburton iEnergy® Knowledge Base
4. Halliburton Landmark Learning Portal
5. Society of Petroleum Engineers (SPE) OnePetro Digital Library
6. AAPG Datapages Digital Publications
7. NPTEL – Petroleum Engineering Courses
8. Schlumberger Oilfield Glossary (for Petroleum Engineering Terminology)
9. Energistics Standards for Digital Oilfield Data
10. Society of Exploration Geophysicists (SEG) Digital Library

Skill Sets:
Topics relevant to "**SKILL DEVELOPMENT**": Digital Well Log Interpretation, Geological Modelling, Petrophysical Analysis
Mechanical Earth Model Development, Wellbore Stability Analysis, Reservoir Characterization, Static Reservoir Modelling, Reservoir Volumetric Estimation, Production Surveillance, Nodal Analysis, Production Optimization, Integrated Digital Oilfield Workflows, DecisionSpace Software Proficiency, Data-driven Reservoir Management, and Digital Asset Evaluation are designed **Skill Development** through **Participative Learning Techniques**.The course attainment will be assessed through assessment component mentioned in course handout.

Catalogue prepared by:	Dr. Suman Paul, Dr. Niladri Shekhar Saanta,Dr. Amolina Doley, Ms. Bidisha Borah, Mr. Hamid Hassan, and Mr. BhaskarjyotiKhanikar
Recommended by the Board of Studies on:	22nd Meeting of the Board of Studies held on 5th June, 2026
Date of Approval by the Academic Council:	29th Meeting of the Academic Council held on 5th July, 2026

Course Code: **PET7100**	**Course Title:** **Minor Project** **Type of Course:** **1] Professional Elective Course** **2] Project-based – Experiential Learning**	**L-T-P-C**	-	-	-	3
Version No.:	1.0					
Course Pre-requisites:	Knowledge and Skills related to all the courses studied in previous semesters.					
Anti-requisites:	NIL					
Course Description:	The Minor Project is a 100% project-based experiential learning opportunity that immerses students in real-world industry or research settings. It bridges academic concepts with practical applications, allowing students to work on domain-specific projects under professional supervision. The course fosters technical competency, problem-solving, teamwork, and professional ethics. Students document progress, submit reports, and deliver final presentations, reinforcing industry readiness and lifelong learning attitudes essential for professional success.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Minor Project and attain **Employability Skills** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Identify the engineering problems related to local, regional, national or global needs, CO2: Apply appropriate techniques or modern tools for solving the intended problem, CO3: Design the experiments as per the standards and specifications, CO4: Interpret the events and results for meaningful conclusions, CO5: Appraise project findings and communicate effectively through scholarly publications.					
Course Content:						
Module 1:						
Topics: Not Applicable – Depends on the Supervisor.						
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** MS Excel, and others (Specific equipment / apparatus / tool and software as prescribed by the Supervisor)						
Textbooks: Not Applicable – Depends on the Supervisor.						
References: Not Applicable – Depends on the Supervisor. **e-resources:** Not Applicable – Depends on the Supervisor.						
Skill Sets: Topics relevant to "**EMPLOYABILITY SKILL**": Specific equipment / apparatus / tool and software as prescribed by the Supervisor for enhancing **Employability Skills** through **Experiential LearningTechniques**.						
Catalogue prepared by:	All Supervisors					
Recommended by the Board of Studies on:	18th Meeting of the Board of Studies held on 4th July, 2024					
Date of Approval by the Academic Council:	24th Meeting of the Academic Council held on 3rd August, 2024					

Course Code: **PET7102**	**Course Title: University Research Experience** **Type of Course: 1] Discipline Elective Course** **2] Project-based – Experiential Learning**	**L-T-P-C**	-	-	-	3
Version No.:	1.0					
Course Pre-requisites:	Knowledge and Skills related to all the courses studied in previous semesters.					
Anti-requisites:	NIL					
Course Description:	The University Research Experience is a 100% project-based **interdisciplinary**experiential learning opportunity that immerses students in real-world industry or research settings. It bridges academic concepts with practical applications, allowing students to work on domain-specific projects under professional supervision. The course fosters technical competency, problem-solving, teamwork, and professional ethics. Students document progress, submit reports, and deliver final presentations, reinforcing industry readiness and lifelong learning attitudes essential for professional success.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Professional Practice and attain **Employability Skills** through **Experiential LearningTechniques**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Recall core concepts and engineering principles relevant to the project, CO2: Explain the working process, technologies, or systems involved in the assigned project, CO3: Apply theoretical knowledge to practical tasks and challenges during the project, CO4: Analyze project requirements, data, and outcomes to identify gaps and propose improvements, CO5: Evaluate the effectiveness of solutions implemented during the project using industry metrics, and CO6: Design and develop a comprehensive project report and presentation that demonstrate project execution and impact. NOTE: It is not mandatory to fulfil the requirement of all the Course Outcomes as it sometimes depends on the infrastructure availability. Student must satisfy the requirements of CO1 through CO4.					
Course Content:						
Module 1:						
Topics: Not Applicable – Depends on the Supervisor.						
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** MS Excel, and others (Specific equipment / apparatus / tool and software as prescribed by the Supervisor)						
Textbooks: Not Applicable – Depends on the Supervisor.						
References: Not Applicable – Depends on the Supervisor. **e-resources:** Not Applicable – Depends on the Supervisor.						
Skill Sets: Topics relevant to "**EMPLOYABILITY SKILL**": Specific equipment / apparatus / tool and software as prescribed by the Supervisor for enhancing **Employability Skills** through **Experiential LearningTechniques**.						
Catalogue prepared by:	All Supervisors					
Recommended by the Board of Studies	20th Meeting of the Board of Studies held on 6th June, 2025					

on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Specialization Basket 2: Petroleum Exploration and Drilling Engineering Basket

Course Code: **PET3106**	**Course Title:** **Coal Bed Methane** **Type of Course:** **1] Discipline Elective Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This conceptual course is designed so that students will be able to understand the requirement for exploring unconventional energy resources that are trapped beneath the Earth's surface. A few practical approaches to solving a variety of problems common to coalbed methane reservoir analysis and development will be discussed through case studies. The processes involved in optimizing the methane recovery and economics of existing coalbed methane operations and more effectively evaluate the potential of coalbed methane prospects will be discussed. A structured approach would be taken to engage, relate and contextualize the fundamentals of Coal Bed Methane projects. The understanding level will be enhanced through the assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Coal Bed Methane and attain **Employability Skills** through **Problem Solving Methodologies**.					
Course Outcomes:	Upon successful completion of the course the students shall be able to: CO1: explain the origin of coal bed methane, CO2: illustrate the process of evaluating coal bed methane using wireline logs, CO3: demonstrate the critical factors that influence the production of coal bed methane, CO4: analyze the basic data for coal bed methane projects.					
Course Content:						
Module 1:	Coal as a Reservoir and Coal Bed Methane	Quiz / Team Exercise	Data Collection and Presentation	10 Periods		
Topics: Coal as a Reservoir: Introduction, Origin and Formation of Coal, Physical and Chemical Properties of Coal, Coal Rank, Porosity in Coal, Coal Cleat and Permeability, Influence of Coal Rank on Coal Cleat, Gas in Coal. Coal Bed Methane: Introduction, Methods for Characterizing the Origin – Biogenic Gases and Thermogenic Gases – Controls on Distribution and Producibility, Catalytic Hypothesis of Gas Generation. Coal Bed Methane Reservoir Properties: Structure of Coal, Storage Mechanisms – Gas Storage in the Coal Matrix (Langmuir Isotherm), and Gas Diffusion through the Coal Matrix, Transport Mechanisms – Gas Flow through the Natural Fracture System, Factors controlling Well Productivity, Preparing Basic Reservoir Data.						
Module 2:	Evaluation of Coal Bed Methane Reservoirs	Quiz / Team Exercise	Digital Poster Presentation	10 Periods		
Topics: Evaluation of CBM Reservoirs: Introduction, Prospect Evaluation, Production Forecasting, Enhanced CBM Recovery, Wireline Logs for CBM Evaluation – Basic Coalbed Log Evaluation, Advanced Coal Analysis, Imaging and Mechanical Properties						
Module 3:	Coal Bed Methane Wells and Emerging Practices	Quiz / Team Exercise	Data and Map Analysis	10 Periods		
Topics:						

Coal Bed Methane Wells: Vertical Well Construction and Hydraulic Fracturing – Introduction, Well Construction, Completion Processes, Hydraulic Fracturing, Horizontal Well Construction – Introduction, Critical Factors Influencing Surface CBM Wells, Directional Drilling Technology Development.
Emerging Practices: Introduction, CBM Produced Water Management and Treatment.

Module 4:	Economic Analysis of Coal Bed Methane Projects and Present Status	Quiz / Team Exercise	Literature Survey and Report Submission	10 Periods

Topics:
Economic Analysis of Coal Bed Methane Projects: Introduction, Reserve Categories, Project Area Map, Geologic Assessment, Forecasting Future Production, Economic Evaluation Model, Economic Output, Project Risk.
Present Status of Coal Bed Methane: Introduction, CMM and CBM in selected Countries; Coal Bed Methane in India: Geological Feasibility, Government Policy towards CBM, CBM Potential Assessment for Gondwana Coalfields, Economic and Environmental Aspects.

Targeted Applications and Tools that can be used:
Applications: CBM Exploration, Development, and Production Engineer in CBM Company
Tools: Data Analysis using MS Excel

Textbooks:
T1: Jerrald L. Saulsberry, Paul S. Schafer, and Ricjard A. Schraufnagel, 1996. "A Guide To Coalbed Methane Reservoir Engineering", Gas Research Institute, Chicago. [GRI Reference No.: GRI-94 / 0397]
T2: Pramod Thakur, Steve Schatzel, and Kashy Aminian, 2015. "Coal Bed Methane – From Prospect To Pipeline", 2nd Edition, Elsevier.
T3: Ajay Kumar Singh, and Partha Narayan Hajra, 2018. "Coalbed Methane in India - Opportunities, Issues and Challenges for Recovery and Utilization", 1st Edition, Springer.

References:
R1: Vicki A. Hollub and Paul S. Schafer, 1992. "A Guide to Coalbed Methane Operations", Gas Research Institute, Chicago.
R2: R. E. Rogers, 1994. "Coal Bed Methane: Principles and Practice", 3rd Edition, Prentice Hall.
R3: Promod Thakur, 2016. "Advanced Reservoir and Production Engineering for Coal Bed Methane", 1st Edition, Elsevier.

e-resources:
1. Link for PU e-resources: https: / / puniversity.informaticsglobal.com / login
2. What If Earth Released All Its Methane (YouTube Video): https: / / www.youtube.com / watch?v=FmMmgW3R3UI
3. Coal Bed Methane Engineering: https: / / www.youtube.com / watch?v=jHnIRw-iETg
4. What is Coal Bed Methane (YouTube Video): https: / / www.youtube.com / watch?v=TgeZ4WC0HEE
5. Coal Bed Methane (YouTube Video): https: / / www.youtube.com / watch?v=xcKDI0IZiBc&t=128s
6. What is Coal Seam Gas? (YouTube Video): https: / / www.youtube.com / watch?v=kNa5pvh_4tQ
7. The Journey of Natural Gas (YouTube Video): https: / / www.youtube.com / watch?v=V8EHHW-3N5Y&t=326s
8. Coal Gas Seam Drilling (YouTube Video): https: / / www.youtube.com / watch?v=o0J_Xzfo3rI&t=219s
9. Coal Bed Methane Drilling Technology (YouTube Video): https: / / www.youtube.com / watch?v=xTUe7JgzJak

Skill Sets:
Topics relevant to **"EMPLOYABILITY SKILLS":** Evaluation of CBM Reservoirs for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Ms. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: PET3107	**Course Title:** Shale Gas **Type of Course:** 1] Discipline Elective Course 2] Theory only			**L-T-P-C**	3	0	0	3
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	This conceptual course is designed so that students will be able to understand the requirement for exploring unconventional energy resources that are trapped beneath the Earth's surface. A few practical approaches for solving a variety of problems common to shale gas reservoir analysis and development will be discussed through case studies. Shale gas is seen as a major game changer for the global petroleum industry. The processes involved in optimizing the shale gas recovery and economics of existing shale gas operations and more effectively evaluating the potential of shale gas prospects will be discussed. A structured approach would be taken to engage, relate and contextualize the fundamentals of shale gas projects. The understanding level will be enhanced through the assignments.							
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Shale Gas and attain **Employability Skills** through **Participative Learning Techniques**.							
Course Outcomes:	Upon successful completion of the course the students shall be able to: CO1: discuss the properties of shale and the environments of shale deposition, CO2: explain the importance of studying the geomechanical properties of shale gas reservoirs, CO3: demonstrate the critical factors that influence the shale gas exploration technique, CO4: illustrate the environmental concerns of shale gas production.							
Course Content:								
Module 1:	Shale as a Reservoir and Shale Gas	Quiz / Team Exercise	Data Collection and Presentation	08 Periods				
Topics: Shale as a Reservoir: Introduction, Shale Composition, Environments of Shale Deposition, Physical Properties of Shale, Deposition and Diagenesis. Shale Gas: Introduction, Geochemistry of Shale Gas, Organic Matter in Gas Shales, Basin Structure, Tectonics, and Stratigraphy.								
Module 2:	Geomechanics of Gas Shales	Quiz / Team Activity	Digital Poster Presentation	08 Periods				
Topics: Geomechanics of Gas Shales: Introduction, Mechanical Properties of Gas Shale Reservoirs, Anisotropy, Wellbore Instability in Gas Shale Reservoirs.								
Module 3:	Shale Gas Exploration Technique and Hydraulic Fracturing	Quiz / Team Exercise	Data Analysis	09 Periods				
Topics: Shale Gas Exploration Technique: Introduction, Shallow Seismic, Geochemical Exploration, Petrophysics. Hydraulic Fracturing: Introduction, Hydraulic Fracturing, Hazards, Fracturing Fluids, Water Management, Transportation, Fluid Disposal, Risks in Hydraulic Fracturing, Induced Earthquakes, Hazard Management, Waste Water Disposal.								
Module 4:	Environmental Concerns of Shale Gas Production	Quiz / Team Activity	Literature Survey and Report Submission	11 Periods				
Topics: Environmental Concerns of Shale Gas Production: Introduction, Induced Seismicity, Groundwater Contamination, Atmospheric Emissions, Shale Gas Exploitation and Health Hazard, Impact on Water and								

Environment, Noise Pollution, Environmental Impact of Blowout, Guidelines for Shale Gas Development, Site Disposal after the Completion of Shale Gas Exploitation, Regulations for Shale Gas Exploration and Exploitation.

Targeted Applications and Tools that can be used:

Applications: Shale Gas Exploration, Development, and Production Engineer in Oil and Gas Company

Tools: Data Analysis using MS Excel

Textbooks:

T1: Reza Rezaee, 2015. "Fundamentals of Shale Gas Reservoirs", John Wiley & Sons, Inc., Hoboken, New Jersey.

T2: Dayal, A.M., Kalpana, M.S., Mani, D., Patil, D.J., Vadapalli, U., Varma, A.K., and Vedanti, N., 2017. "Shale Gas Exploration and Environmentaland Economic Impacts", Elsevier.

T3: JebraeelGholinezhad, John Senam Fianu, Mohamed Galal Hassan, 2018. "Challenges in Modelling and Simulation of Shale Gas Reservoirs", Springer.

References:

R1: James G. Speight, 2017. "Deep Shale Oil and Gas", Gulf Professional Publishing, Elsevier.

R2: Sohrab Zendehboud, and Alireza Bahadori, 2017. "Shale Oil and Gas Handbook - Theory, Technologies, and Challenges", Gulf Professional Publishing, Elsevier.

R3: José A. Torres, and Hector Klie, 2020. "Shale Oil and Shale Gas Resources" Multidisciplinary Digital Publishing Institute.

e-resources:

1. Link for PU Knimbus e-resources: https: / / presiuniv.knimbus.com / user# / home
2. What is Shale Gas? (YouTube Video): https: / / www.youtube.com / watch?v=1lHC74fCyeI
3. Shale Gas Risk or Opportunity? (YouTube Video): https: / / www.youtube.com / watch?v=Ag9GUogWEa0
4. Shale Gas – Hydraulic Fracturing (YouTube Video): https: / / www.youtube.com / watch?v=CM8Lh7SAm6A
5. Impact of Shale Gas and Shale OilExtraction on the Environment and onHuman Health (Workshop): https: / / www.europarl.europa.eu / document / activities / cont / 201312 / 20131205ATT75545 / 20131205ATT75545EN.pdf
6. Shale Energy Engineering 2014: Technical Challenges, Environmental Issues, and Public Policy (Proceedings): https: / / ascelibrary.org / doi / book / 10.1061 / 9780784413654

Skill Sets:

Topics relevant to **"EMPLOYABILITY SKILLS":** Shale Gas Exploration Technique for developing **Employability Skills** through **Participative Learning Techniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Ms. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET3108**	**Course Title:** **Natural Gas Hydrates** **Type of Course:** **1] Discipline Elective Course** **2] Theory only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of the course is to understand about the importance of one of the upcoming natural energy resources, i.e., gas hydrates. This gas hydrate is widely					

<table>
<tr><td></td><td colspan="4">spread throughout the world. It is estimated that the methane gas from the hydrate reservoirs can efficiently fulfil the world's energy demand for more than 200 years. The course is to enable the students to appreciate the need for understanding the extraction of natural gas hydrates reservoirs and utilization of this method for other applications. The course is conceptual and analytical in nature and needs fair knowledge of basic engineering science and computing. The course develops the critical and analytical thinking skills. The course also enhances the programming abilities through assessments.</td></tr>
<tr><td>Course Objective:</td><td colspan="4">The objective of the course is to familiarize the learners with the concepts of Natural Gas Hydrates and attain Employability through Problem Solving Techniques.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="4">On successful completion of the course the students shall be able to:
CO1:Explain the properties, significance, environmental aspects, safety aspects, and energy potential of natural gas hydrates,
CO2: Describe the thermodynamic behavior of gas hydrates, including nucleation, growth, dissociation, phase equilibria, and measurement techniques,
CO3:Explain the kinetic behavior of gas hydrates by describing nucleation, growth, dissociation, kinetic estimation techniques, measurement methods, and gas equations used in kinetic studies,
CO4: Apply hydrate prevention and remediation techniques to mitigate hydrate formation and safely remove hydrate plugs in flowlines and storage vessels,
CO5: Demonstrate the application of gas hydrates in gas transportation, storage, carbon capture and sequestration, and desalination systems.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1:</td><td>Overview and Prospect of Gas Hydrates</td><td>Assessment 1: Assignment / Quiz</td><td>Data Collection</td><td>06 Periods</td></tr>
<tr><td colspan="5">Topics:
Properties of Natural Gases, Hydrates as a Laboratory Curiosity,Hydrates in the Natural Gas Industry,Hydrates as an Energy Resource, Environmental Aspects of Hydrates, Safety Aspects of Hydrates.</td></tr>
<tr><td>Module 2:</td><td>Thermodynamics of Gas Hydrates</td><td>Assessment 2: Assignment / Quiz</td><td>Slide Designing and Presentation</td><td>07 Periods</td></tr>
<tr><td colspan="5">Topics:
Hydrate Nucleation, Growth and Dissociation,Estimation Techniques for Phase Equilibria of Natural Gas Hydrates, Statistical Thermodynamic Approach to Hydrate Phase Equilibria, Measurement Methods.</td></tr>
<tr><td>Module 3:</td><td>Kinetics of Gas Hydrates</td><td>Assessment 3: Assignment / Quiz</td><td>Poster designing</td><td>08 Periods</td></tr>
<tr><td colspan="5">Topics:
Hydrate Nucleation, Growth and Dissociation, Estimation Techniques for Kinetics of Natural Gas Hydrates, Measurement Methods, Gas equations for Kinetic studies.</td></tr>
<tr><td>Module 4:</td><td>Gas Hydrates for Flow assurance and other Applications</td><td>Assessment 4: Term Paper</td><td>Coding</td><td>11 Periods</td></tr>
<tr><td colspan="5">Topics:
Hydrates as a threat in flowline and storage vessels, Prevention of hydrates, Removal of Hydrate Plugs, Applications towards Gas Transport and Storage, CO_2 sequestration and Desalination.</td></tr>
<tr><td colspan="5">Targeted Application and Tools that can be used:
Applications: Oil and Gas / Energy Industry, Waste Water Treatment Plants, Desalination Plant as a Project Engineer and / or Research Officer.
Tools: MS Office, CSMGem (Industry used software).</td></tr>
<tr><td colspan="5">Textbooks:
T1: E.D. Sloan and C.A Koh, Clathrate Hydrates of Natural Gases, 3rd Edition, CRC Press, Taylor and Francis Group, 2008.
T2: Makogon, Y.F., Hydrates of Natural Gas, Moscow, Nedra, Izadatelstro, 208 (1974 in Russian). Translated by W.J. Cieslesicz, PennWell Books, Tulsa, Oklahoma, 237 (1981 in English).</td></tr>
</table>

References:

R1: Y Yuguang and L Changling, Natural gas hydrates: Experimental Techniques and their Applications, Springer, 2013.
R2: E.D. Sloan et al., Natural Gas Hydrates in Flow Assurance, Elsevier, 2010.

e-resources:

1.Presidency University e-resource Remote Access (KNIMBUS) portal through the shared link: https: / / presiuniv.knimbus.com / user# / home
2. https: / / www.usgs.gov / faqs / what-are-gas-hydrates
3. https: / / pemedianetwork.com / petroleum-economist / articles / upstream / 2005 / gas-hydrates-a-nice-idea
4. https: / / youtu.be / QEJmhokSmZM
5. https: / / youtu.be / dVM_-2hzFrk
6. https: / / puniversity.informaticsglobal.com / login

Skill Sets:

Topics relevant to **"EMPLOYABILITY SKILLS":** Kinetics of Gas Hydrates for developing **Employability Skills** through **Problem Solving Techniques**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Ms. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET3109**	**Course Title: Geomechanics for Wellbore Stability Analysis** **Type of Course: 1] Discipline Elective Course 2] Theory only**	**L-T-P-C**	2	1	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	It is an interdisciplinary course encompasses the fields of rock mechanics, structural geology, earthquake seismology and petroleum engineering to address a wide range of geomechanical problems that arise during the exploitation of oil and gas reservoirs. The purpose of this course is to provide a broad understanding of various geomechanical techniques used in the oil and gas industry. This course is both conceptual and analytical in nature and requires knowledge of basic science and engineering.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Geomechanics for Wellbore Stability Analysis and attain **Employability** through **Problem SolvingMethodologies**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Apply basic concepts of reservoir Geomechanics and tectonic stresses responsible for the deformation of Earth's crust, CO2: Illustrate mechanisms of overpressure generation and basic constitutive laws for the deformation of rocks, CO3: Identify various types of rock failure and the importance of fracture pressure estimation, CO4: Compare compressive and tensile failure in vertical wells and wellbore failure in deviated wells, CO5: Demonstrate wellbore stability of penetrating wellbore and stress					

	variations outside of depleting reservoir.			
Course Content:				
Module 1:	Geomechanics and Tectonic Stress Field	e-resource Review / Report Writing	Analytical Skills Development	08 Periods
Topics: Introduction to Geomechanics: Definition; Fundamentals of Rock Mechanics; Deformation of Rocks; Behaviour of Rocks; Geomechanical Model - Application of Geomechanical Model in Reservoir, Component of a Geomechanical Model, Foundation of the Geomechanical Model, Building a Geomechanical Model. Tectonic Stress Field: Distribution of stress in the Earth's crust. Basic definitions: Anderson's stress classification scheme; Stress orientations near Salt domes; Stress magnitudes at depth – Calculation of overburden stress; Measuring in-situ stress; Stress orientation indicators.				
Module 2:	Pore Pressure and Basic Constitutive Laws	Quiz / Written Tests	Preparedness for Competitive Exams	10 Periods
Topics: Pore Pressure: Basic definitions; Reservoir compartmentalization; Mechanisms of overpressure generation; Estimation of pore pressure at depth. Basic Constitutive Laws: Linear elasticity; Elastic moduli and seismic wave velocity; Elastic anisotropy; Poroelasticity and effective stress; Poroelasticity and dispersion; Viscous deformation in uncemented sands; Thermoporoelasticity.				
Module 3:	Rock Failure and Faults / Fractures at Depth	Case Study Presentation	Verbal Communication Skill Development	10 Periods
Topics: Rock Failure: Rock strength in compression; Strength and pore pressure; Rock strength anisotropy; Estimation of rock strength form geophysical data; Shear-enhanced compaction; Tensile rock failure; Shear failure and the frictional strength of rocks. Faults / Fractures at Depth: Faults, fractures and fluid flow; Wellbore imaging; Representation of fault and fracture data; Three-dimensional Mohr diagrams; Earthquake focal mechanisms; Fracture pressure – Estimation of fracture gradient; Case study.				
Module 4:	Failures in Vertical Wells and Deviated Wells	Poster Designing and Presentation	Verbal Communication Skill Development	06 Periods
Topics: Compressive and Tensile Failures in Vertical Wells: Stress concentration around a cylindrical hole and wellbore failure. Wellbore Failure and Stress Determination in Deviated Wells: State of stress surrounding an arbitrarily deviated well; Failure of arbitrarily deviated wells.				
Module 5:	Wellbore Stability andEffects of Reservoir Depletion	Group Discussion	Analytical and Verbal Communication Skill Development	06 Periods
Topics: Wellbore Stability: Preventing wellbore instability during drilling; Quantitative risk assessment; Role of rock strength anisotropy; Mud / Rock interaction; Maximizing the frac gradient; Mud penetration and time-dependent wellbore failure, Preventing sand production. Effects of Reservoir Depletion: Stress changes in depleting reservoirs; Deformation of depleting reservoirs; Deformation and stress changes outside of depleting reservoirs.				
Targeted Application and Tools that can be used: **Applications:** Geomechanical Engineer at Oil & Gas industry. **Tools:** Microsoft Excel and other Data Analysis Tools				
Textbooks: T1: Mark D. Zoback, Reservoir Geomechanics, Cambridge University Press, 2010. T2: J.C. Jaeger, N.G.W. Cook and R.W. Zimmerman, Fundamentals of Rock Mechanics, 4th Edition, Blackwell Publishing, 2007.				
References: R1: Mark D. Zoback, and Arjun H. Kohli, Unconventional Reservoir Geomechanics – Shale Gas, Tight Gas, and Induced Seismicity, Cambridge University Press, 2019. R2: C. David, and M. Le Ravalec-Dupin, Rock Physics and Geomechanics in the Study of Reservoirs and				

Repositories, Geological Society, Special Publication 284, 2007.

e-resources:

1. Link for e-resources: https: / / www.google.co.in /
2. Geomechanical Case Study (You Tube Video): https: / / www.youtube.com / watch?v=E1q15O4kOLk
3. Measuring and Estimating Pore Pressure (You Tube Video): https: / / www.youtube.com / watch?v=H6dvYn_HDrk

Skill Sets:

Topics relevant to "**EMPLOYABILITY SKILLS**": Topics such as Calculation of Overburden Stress, Estimation of Pore Pressure at Depth, Estimation of Rock Strength from Geophysical Data, State of Stress surrounding a Wellbore, and Quantitative Risk Assessment will be discussed for developing **Employability Skills** through **Problem SolvingMethodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Suman Paul, Ms. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: PET3110	**Course Title: Directional Drilling Technology** **Type of Course: 1] Discipline Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	Nil					
Anti-requisites:	Nil					
Course Description:	The course helps to understand the advance drilling techniques like directional drilling, slant hole drilling, their design procedures for different types of well profiles. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. The course also enhances the programming abilities through assignments.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Directional Drilling Technology and attain **Employability** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: explain directional drilling, its applications and deflection tools, CO2: sketch the different directional well profiles, CO3: discuss techniques used in directional drilling, CO4: describe the recent advances in directional well technologies as well as the associated problems.					
Course Content:						
Module 1:	Introduction and Deflection Tools and Techniques	Assignment / Quiz	Seminar	10 Periods		
Topics: Introduction, Applications, Coordinates Systems, Map Projections, Geographic North, Grid North, Magnetic North, Magnetic Declination, Azimuth, Well Coordinates, Slots, Targets, Inclination angle, Measured Depth, TVD, KOP, Rotary assembly, Deflection tools, Positive Displacement Motor and TurboDrill.						
Module 2:	Directional Well planning and Directional Survey Calculations	Project	Programming	10 Periods		
Topics:						

General consideration, Types of well profile-Type 1, Type 2 and Type 3, Survey calculation techniques-Tangential method, Balance tangential method, Average angle method, Radius of curvature method, Minimum curvature method.				
Module 3:	Directional Survey Tools	Assignment / Quiz	Programming	10 Periods
Topics: Dog leg angle, Acid bottle, Photo chemical devices, Steering tools, Solid state directional sensors, Rate Gyros, GCT, MWD, Telemetry channels, Transmission system, Power sources, MWD sensors, Surface system, Drilling with MWD, Applications				
Module 4:	Problem in Directional Wells and Recent Advances	Case Study	Literature Survey	10 Periods
Topics: Control over borehole geometry, Dog leg severity, Key seating, Wellbore instability, Differential sticking, Freeing stuck pipe, Backing off the drill string, Oil well fishing operation, Sidetracking. Highly deviated and Horizontal wells, Extended reach drilling Slant hole drilling, Plasma drilling, Laser Drilling				
Targeted Application and Tools that can be used: **Applications:** Directional drilling companies as a driller **Tools:** Landmark drill works, Petrel				
Textbooks: T1: Tom Inglis, "Directional Drilling", 1st Edition, 1987, Springer Netherlands. T2: H. Rabia, Graham and Trotman, "Oil Well Drilling Engineering: Principles and Practice", 1st Edition, 1986, Springer.				
References: R1: Hussain Rabia, "Well engineering and construction",1998, 1st Edition, Entrac Consulting Ltf. London. R2: Miska, S., 2011. Directional drilling. Fundamentals of Drilling Engineering, pp.449-583. **e-resources:** 1. Presidency University e-access portal: https: / / presiuniv.knimbus.com / user# / home 2. Dr. Petro YouTube channel: Drilling Rig Components Animated- https: / / youtu.be / JjGXsLWcwl0 3. Drilling Rig Online Courses YouTube channel: Drill String components and their functions- https: / / youtu.be / M6tic_OcNPY 4. Encyclopedia of petrochemistry YouTube channel: Casing and Cementing- https: / / youtu.be / iMUsMOopwpU 5. Harvest Chemical YouTube channel: Bit Hydraulics-https: / / youtu.be / I178EdbDV_Y 6. Case Studies: Best Practice Case Studies for Drilling Engineers: https: / / www.drillingpoint.com / 7. Robert F. Mitchell, "Fundamentals of Drilling Engineering", 1st Edition, 2016, Society of Petroleum Engineers, Inc. https: / / www.amazon.in / Fundamentals-Drilling-Engineering-Robert-Mitchell-ebook / dp / B01L0O8WJA 8. Directional Drilling https: / / www.youtube.com / watch?v=HOvmZ4rW7Hc 9. Directional Drilling [Montana Tech] https: / / www.youtube.com / watch?v=yYdsVrm9FEk 10.Introduction to Directional Drilling [By Ahmed Osman] https: / / www.youtube.com / watch?v=pensrhsGNac 11.Webinar on Directional Drilling Practices & Application by Nitin Kulkarni https: / / www.youtube.com / watch?v=1DQMecBnVdc				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Problem and Recent Advances in Directional wells for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan				
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Suman Paul, Ms. Amolina Doley, Dr. Rohit Kumar Saw, and Ms. Bidisha Borah			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

Course Code: PET3111	**Course Title: Advanced Well Engineering** **Type of Course: 1] Discipline Elective Course 2] Theory Only**			**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The goal of the course is to provide an insight into the planning and execution of a modern drilling operation This course gives an overview of the well construction process to design surface and subsurface component during drilling operation as per the requirement. Through conceptual and detailed engineering design calculations involved in planning a well, an attempt has been made to develop analytical skills.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Advanced Well Engineering and attain **Employability** through **Problem SolvingMethodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Explain the fundamentals of exploration and production licenses, drilling personnel, rotarydrilling equipment, drilling processes, drilling economics, and drilling rigcomponents, CO2: Describe the design of drill strings and drilling bits, bit selection criteria, Drill bit grading, and methods for assessing and improving drill bit performance, CO3: Predict pore and fracture pressures to recognize drilling problems associated with abnormal pressures, CO4:Demonstrate the prediction and confirmation of formation fracture pressures, the principles of primary and secondary well control, warning signs of kicks, well-killing procedures, and BOP equipment and stack arrangements, CO5:Examine the data collection process, factors influencing casing design, design criteria, collapse and burst criteria, combination strings, tension and compression criteria, service loads during drilling and production operations, and biaxial effects, CO6: Analyze the factors affecting well costs, drilling time estimation, well costing elements, non-productive time (NPT), risk assessment, technical limit drilling, cost reduction, and drilling contracting strategies.						
Course Content:							
Module 1:	Overview of Drilling Operations	Assignment, Quiz	Programming	10 Periods			
Topics: Exploration & production licenses, Drilling personnel and Rotary drilling equipment, the drilling process onshore and offshore, Drilling economics, Rig Components, The Drill string, Design of the drill string, Drilling Bits, Design of PDC and Roller Cone Bits, selection of bits, grading of dull bits, assessing and improving the performance of drill bits.							
Module 2:	Formation Pressures and Well Control	Case study, Assignment	Programming, Data collection	10 Periods			
Topics: Introduction to origin and representation of pore pressures and fracture pressures, Origin, prediction and detection of abnormal pressures, Drilling problems associated with abnormal pressures, Prediction and confirmation of formation fracture pressures, Principles of primary and secondary well control, Warning signs of kicks, Well killing procedures, BOP equipment and BOP stack arrangements.							
Module 3:	Casing Design principles	Assignment	Programming	10 Periods			
Topics: Data Collection, Factors Influencing Casing Design, Design Criteria, Collapse Criterion, Burst Criterion,							

Combination Strings, Tension Criterion, Service Loads During Drilling and Production Operations, Compression Loads, Biaxial Effects.				
Module 4:	Well costing	Assignment and Case Study	Programming	10 Periods
Topics: Reasons For Costing, Factors Affecting Well Costs, Drilling Time Estimate, Detailed Time Estimate, Elements of Well Costing, Total Well Costs, Non Productive Time (NPT), Risk Assessment In Drilling Cost Calculations, Technical Limit Drilling, Cost Reduction, Drilling Contracting Strategies.				
Targeted Application and Tools that can be used: **Applications:** Well design calculation required for well planning, GTO Preparation. **Tools:** MS Excel, Halliburton Software Pacakge				
Textbooks: T1: Hussain Rabia, "Well engineering and construction", 2001, Entrac Consulting. T2: T2. Rabia, H., 1985. Oil Well Drilling Engineering: Principleand Practice. *Graham and Trotman Inc., Gaihersburg, USA*.				
References: R1: V.K.Jain, "Drilling operation practices manual", Institute of Drilling Technology, 2007, oil and Natural Gas Corporation Ltd. **e-resources:** 1. E- remote acess portal: https: / / presiuniv.knimbus.com / user# / home 2. BHA Design, https: / / youtu.be / z7nKncXNTJI 3. Drilling Assembly BHA Design, https: / / youtu.be / czyc2SU4734 4. Overburden, Pore Pressure and Fracture Pressure Overview, https: / / youtu.be / QmgFxC6HnZE 5. Workshop on Drilling Optimization in Oil and Gas Industry: https: / / www.youtube.com / watch?v=2Ia5H_fEQQ0				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Well Costing methods for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Suman Paul, Ms. Amolina Doley, and Ms. Bidisha Borah			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: **PET3112**	**Course Title: Process Design and Calculations** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course is designed with the aim of familiarize with the latest advancements in drilling technologies such as Horizontal, Multilateral and Extended Reach Drilling. The course gives a comprehensive account of the methodology, processes and techniques utilized while Drilling a Horizontal, Multilateral and Extended Reach Drilling. A comprehensive hands-on case study provided to the participants with enable the students to develop their computational ability.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Multilateral and Horizontal Well Technology and attain **Employability Skills** through **Problem Solving Methodologies**.					

<table>
<tr><td>Course Outcomes:</td><td colspan="4">On successful completion of the course the students shall be able to:
CO1: Describe the basic concepts and advancements in horizontal, multilateral, extended reach drilling techniques and managed pressure drilling technologies,
CO2: Explain geological and engineering principles in horizontal and multilateral wells,
CO3: Employ formation evaluation techniques in horizontal and multilateral wells,
CO4: Analyse well performance behaviour using IPR/TPR curve,
CO5: Illustrate the application of horizontal wells in complex reservoir conditions.</td></tr>
<tr><td>Course Content:</td><td colspan="4"></td></tr>
<tr><td>Module 1:</td><td>Advanced Drilling Technologies</td><td>Quiz and Assignment</td><td>Poster Making</td><td>09 Periods</td></tr>
<tr><td colspan="5">Topics:
Introduction and Objectives of Horizontal wells, Extended Reach Drilling (ERD), Multilateral Drilling and Side tracking, Managed Pressure Drilling (MPD) and Managed Pressure Cementation (MPC).</td></tr>
<tr><td>Module 2:</td><td>Applications of Horizontal Wells</td><td>Assignment</td><td>Programming</td><td>11 Periods</td></tr>
<tr><td colspan="5">Topics:
Geological aspects and development of oil and gas field using horizontal wells, Drilling and completion of Horizontal wells, Reservoir engineering concepts of horizontal wells.</td></tr>
<tr><td>Module 3:</td><td>Formation Evaluation in Horizontal Wells</td><td>Case Study</td><td>Type Curve Matching</td><td>13 Periods</td></tr>
<tr><td colspan="5">Topics:
Different Logging Tools, Well Logging methods in Horizontal wells, Basics of Well Testing method, Well Test Analysis of Horizontal wells, Logging While Drilling (LWD) Tools</td></tr>
<tr><td>Module 4:</td><td>Horizontal Wellbore Productivity</td><td>Assignment / Quiz</td><td>Data Collection and Group Discussion</td><td>12 Periods</td></tr>
<tr><td colspan="5">Topics:
IPR and TPR graphs, Well Performance and Productivity of Horizontal wells, Water and Gas conning in Horizontal wells, Application of Horizontal wells in gas reservoirs and in recovery of heavy oils</td></tr>
<tr><td colspan="5">Targeted Application and Tools that can be used:
Applications: Drilling Engineer / Driller in Drilling companies
Tools: Engineer’s Desktop (Landmark Halliburton), Petrel</td></tr>
<tr><td colspan="5">Textbooks:
T1 Drilling Engineering Workbook by Baker Hughes INTEQ, December 1995
T2 Sada Joshi , Horizontal Well Technology Hardcover – 1 January 1991</td></tr>
<tr><td colspan="5">References:
R1. Drilling and well completions by carl Gartin, Department of Petroleum Engineering, The University of Texas, Hughes
R2. Surface Logging Systems Training Guide, Baker Hughes INTEQ, July 1996.

e-resources:
1. Presidency University e-resource Remote Access (KNIMBUS) portal through the shared link: https: / / presiuniv.knimbus.com / user# / home
2. Shadizadeh, Seyed Reza &Kargarpour, Mohammadali &Zoveidavianpoor, Mansoor. (2011). Modeling of Inflow Well Performance of Multilateral Wells: Employing the Concept of Well Interference and the Joshi's Expression. Iranian Journal of Chemistry and Chemical Engineering. 30. 119-133.
3. Zhang Yanping, Ren Rongquan, Wang Hui, Wang Jun, Multilateral drilling & completion technology based on Solid Expandable Tubular fixing system, Petroleum Exploration and Development, Volume 36, Issue 6, 2009,Pages 768-775, ISSN 1876-3804, https: / / doi.org / 10.1016 / S1876-3804(10)60008-0</td></tr>
<tr><td colspan="5">Skill Sets:
Topics relevant to “EMPLOYABILITY SKILLS”:Horizontal Wellbore Productivity for developing Employability Skills through Problem Solving Methodologies. This is attained through assessment component mentioned in course plan.</td></tr>
<tr><td>Catalogue prepared by:</td><td colspan="4">Mr. Bhairab Jyoti Gogoi, Dr. Suman Paul, Dr. Amolina Doley, Dr. Rohit Kumar Saw, and Ms. Bidisha Borah</td></tr>
<tr><td>Recommended by the Board of Studies</td><td colspan="4">20th Meeting of the Board of Studies held on 6th June, 2025</td></tr>
</table>

on:	
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025

Course Code: **PET3113**	**Course Title: Remote Sensing and GIS for Oil and Gas Exploration** **Type of Course: 1] Discipline Elective Course 2] Theory Based**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to give a comprehensive understanding about the fundamentals and application of Remote Sensing and GIS. Along with principles of remote sensing, it gives insights about classification of maps, grid systems, Remote sensing platforms – satellite-based and airborne sensors; Basic principles of image interpretation; Spectra of earths. The course develops the critical thinking and analytical skills.					
Course Objective	The objective of the course is to familiarize the learners with the concepts of Introduction to Geoinformatics and attain **Employability** through **Participative Learning Techniques**.					
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Identify various remote sensing systems, CO2: Explain various Remote Sensing process, CO3: Interpret the Visual Image and Digital Image, CO4: Describe the various GIS operations.					
Course Content:						
Module 1:	Introduction to Remote Sensing: Types and Applications	Assignment / Quiz	Data Collection	10 Periods		
Topics: Introduction: Active Remote sensing, Passive remote sensing, Overview on applications of remote sensing; Principles and Process of Remote sensing; Types of Remote Sensing Systems, how satellites acquire images, Application of Remote Sensing in Seismology and mineral Exploration						
Module 2:	Remote sensing: Basic principles and microwave Remote Sensing	Case Study / Quiz	Data Collection	10 Periods		
Topics: Introduction, Electromagnetic remote sensing process, Electromagnetic spectrum, Energy source and its characteristics, Atmospheric Window, Atmospheric properties – Absorption of ozone – Atmospheric effects on spectral response pattern, Data Acquisition, Sensing Devices-Multispectral scanners. Introduction, Radar principle, Factors affecting microwave measurements – surface roughness – radar scattering mechanism, Radar wavebands, Side Looking Airborne Radar (SLAR) systems, Synthetic Aperture Radar (SAR).						
Module 3:	Remote Sensing Platforms: Sensor, Visual Image Interpretation and Digital Image Processing	Quiz / Poster Presentation	Data Collection	10 Periods		
Topics: Introduction, Platforms and sensor systems, Satellite System Parameters - Instrumental Parameters - Viewing Parameters, Sensor Parameters - Spatial Resolution - Spectral Resolution - Radiometric resolution, Imaging Sensor Systems - Multispectral imaging sensor systems - Thermal sensing systems - Microwave image systems, Earth resources satellites. Introduction, Types of Pictorial Data Products, Image interpretation strategy – Levels of interpretation keys, Process of image interpretation, Interpretation of Aerial Photo, General procedure for photo interpretation – Stereoscopic depth perception – Stereo scope,						

Basic elements of Image Interpretation, Application of Aerial Photo Interpretation, Key elements of visual image interpretation , Visual Image interpretation of satellite imagery. Digital Image Processing: Introduction, Basic Character of Digital Image, Preprocessing, Image Registration, Image Classification. Applications of remote sensing, Verification of analyses.				
Module 4:	Fundamentals of GIS	Article Writing	Data collection	10 Periods
Topics: Introduction, Roots of GIS, Spatial data and geoinformation, Geographic Phenomena, Interactions of data types within a GIS, Image Processing of remotely sensed data, GIS. Definitions and Terminology – Geographical entities, Attributes, Topology, Cognitive models, Theoretical Models of GIS – Functional elements of GIS, Fundamental operations of GIS, Theoretical Framework for GIS, Levels / Scales of Measurement. Spatial Data Modelling: Introduction, Stages of GIS data modelling, Graphic Representation of Spatial Data –Raster data representation – Vector data representation – Spatial data models, Comparison of Raster and Vector models.				
Targeted Application and Tools that can be used: **Applications:** GIS engineer and specialist **Tool:** MS Excel, Arc GIS				
Textbooks: T1: M. Anji Reddy, Textbook of Remote sensing and GIS by, BSP Publications, Hyderabad. T2: A.M. Chandra, S.K. Ghosh, Remote Sensing and Geographic Information System, Second Edition, Alpha Science International Ltd., 2015 T3: Dr. Abdul Rahman K. Ali, Remote Sensing, 3rd Class, 1st Edition, Department of Applied Sciences, University of Technology				
References: R1: B.H.G. Brady and E.T. Brown, Rock Mechanics for underground mining, 3rd Edition, Kluwer Academic Publishers, 2004. R2: Basudeb Bhatta, Remote Sensing and GIS, 2nd edition, New Delhi, India: Oxford University Press, 2015. **e-resources:** 1. E- remote access portal: https: / / presiuniv.knimbus.com / user# / home 2. Remote Sensing for Mineral Exploration - https: / / youtu.be / epw74U4IoR8 3. SAR: https: / / www.youtube.com / watch?v=Xemo2ZpduHA 4. Electromagnetic Spectrum: https: / / www.youtube.com / watch?v=pj_ya0e20vE 5. Atmospheric Windows: https: / / www.youtube.com / watch?v=dykqL1xGG_A				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Remote Sensing: Types and Applications for developing **Employability Skills** through **Participative Learning Techniques**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Suman Paul, Ms. Amolina Doley, Dr. Rohit Kumar Saw, Mr. Bhairab Jyoti Gogoi, and Ms. Bidisha Borah			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Specialization Basket 3: Reservoir and Production Engineering Basket

Course Code: PET3114	**Course Title: Integrated Field Development and Planning** **Type of Course: 1] Discipline Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course is designed with the aim of developing a decision-making ability as a Reservoir Engineer. The course gives a comprehensive account of the methodology, processes and techniques utilized in developing an oil or gas field. A comprehensive hand on case study provides practical exposure to the issues discussed and group study sessions helps to develop the planning and organization skills.					
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Integrated Field Development and Planning and attain **Employability Skills** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Classify the stages of the field development cycle CO2: Explain the essential reservoir and well data used in field appraisal CO3: Apply well and reservoir dynamic concepts to estimate development well requirements CO4: Use production operations principles to prepare field development plans CO5:Analyze reservoir management processes to evaluate economic scenarios and uncertainties					
Course Content:						
Module 1:	Introduction to Field Development	Assignment	Decision Tree Analysis	10 Periods		
Topics: The field cycle: Exploration Phase, Appraisal Phase, Development Planning, Production Phase, Decommissioning, Hydrocarbon Accumulations, Exploration Methods and Techniques, and PVT analysis, Pressure - depth relationships, Data Gathering, Classification of methods, Coring and core analysis, Wire line logging, Petroleum Agreements and Bidding						
Module 2:	Field Appraisal and Study of Well Dynamic Behavior	Quiz and Assignment	Simulation	10 Periods		
Topics: The role of appraisal in the field life cycle, objective of performing appraisal activities,Identifying and quantifying sources of uncertainty, Appraisal tools, Cost-benefit calculations for appraisal Practical aspects of appraisal, Reservoir dynamic behavior and Well dynamic behavior: The driving force for production, Reservoir drive mechanisms, Gas reservoirs, Major differences between oil and gas field development, Estimating the number of development wells, Fluid flow near the wellbore, Horizontal wells, Production testing and bottom hole pressure testing, Tubing performance, Well completions.						
Module 3:	Production Operations and Management of Producing Field	Assignment	Programming	10 Periods		
Topics: Operating and Maintenance Objectives, Production Operations input to the FDP, Maintenance engineering input to the FDP, Managing the producing field: Managing the reservoir: Managing the Surface Facilities: Decommissioning: Legislation, Economic lifetime, decommissioning funding, Decommissioning methods, Phasing and organization, planning and control, Safety and Environment: Safety management system, current environmental concern.						
Module 4:	Introduction to Reservoir Management, Process and Economics	Case Study	Data Collection	15 Periods		
Topics:						

Definition, Scope, History, Integration Geoscience and Engineering, Integration of Exploration and Development, Goal setting, Developing plan, Economics, Surveillance and Monitoring, Evaluation, Data acquisition, Analysis and management, Economic criteria, Scenario, Data, Economic evaluation, Risk management and Uncertainties. Case studies on reservoir management. Reservoir management plans: Newly operated Field, secondary and EOR operated field.
Targeted Application and Tools that can be used: **Applications:** Oil and Gas Fields Development **Tools:** MS Excel, Halliburton Software Package
Textbooks: T1. Abdus Satter and Ganesh C. Thakur, "Integrated Reservoir management", PennwellBooks T2. Frank Jahn, Mark Cook and Mark Graham," Hydrocarbon exploration and Production" T3. "Introduction to fundamentals of reservoir engineering" L.P. Dake
References: R1 Tarek Ahmed and D. Nathan Meehan, "Advanced Reservoir Management and Engineering", Baker Hughes R2 Pathak, A. (2021). Petroleum Reservoir Management (1st ed.). CRC Press. Retrieved from https: / / www.perlego.com / book / 2555058 / petroleum-reservoir-management-considerations-and-practices-pdf **e-resources:** 1. E- remote access portal: https: / / presiuniv.knimbus.com / user# / home 2. Integrated Reservoir management: https: / / www.youtube.com / watch?v=e3b0ttaEzZI 3. Webinar: Reservoir Management Part 1: https: / / www.youtube.com / watch?v=yiSSHmIg8l4 4. Webinar: Reservoir Management Part 2: https: / / www.youtube.com / watch?v=9yiNIJkr-WA
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Field Development and study of Well dynamic behavior for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Suman Paul, Dr. Amolina Doley, and Ms. Bidisha Borah
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Course Code: **PET3115**	**Course Title: Solids Handling in Oil and Gas Industry** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3	
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The purpose of the course is to enable to appreciate the need for understanding the significance of unit operations in the various industries for proper functioning of the system. The course is conceptual in nature and analytical in nature and needs fair knowledge of basic engineering science and computing. The course develops the critical and analytical thinking skills. The course also enhances the programming abilities through assignments.						
Course Objectives	The objective of the course is to familiarize the learners with the concepts of Solids Handling in Oil and Gas Industry and attain **Employability** through **Problem SolvingMethodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: state the properties and characteristics of different particulate solids, CO2: identify the different types of transportation modes of handling the solid particulate mass,						

	CO3: discuss different screening equipments, filtration and separation processes for different particulate solids, CO4: explain separation and filtration operations for hydrocarbon components			
Course Content:				
Module 1:	Properties and Handling of Particulate Solids	Assignment	Data Collection	08 Periods
Topics: Handling and mixing of particulate solids: Characterization of solid particles, properties of particulate masses, storage and mixing of solids, types of mixers, mixers for cohesive solids, mixers for free flowing solids.				
Module 2:	Transportation of solid particulates	Term paper	Data Collection and Analysis	09 Periods
Topics: Transportation of solid particulate mass, belt, screw, apron conveyers, bucket elevators pneumatic.				
Module 3:	Screening and Filtration	Assignment	Programming	11 Periods
Topics: Screening, Industrial screening equipment's, Filtration, cake filters, centrifugal filters, Principles of cake filtration. Clarifying filters, liquid clarification, gas cleaning, and principles of clarification, Cross flow filtration.				
Module 4:	Separations and Distillation	Term paper	Simulation	10 Periods
Topics: Separation through gravity settling processes and centrifugal settling processes, Agitation and mixing of liquids: Agitation of liquids. Blending and mixing of liquids, suspension of solid particles, dispersion operations. Distillation and separation of hydrocarbon components.				
Targeted Application and Tools that can be used: **Applications:** Oil and Gas Industry but the knowledge can be used for other industries such as steel industry, manufacturing industry, etc.. **Tools:** ASPEN and UNISIM.				
Textbooks: T1: W.L. Mc Cab and J.C. Smith and Peter Harriott, Unit operations in Chemical Engineering, 5th Edition, Mc Graw Hill, 1993. T2: Unit Operations Handbook Mass Transfer Edited ByJohn J. McKetta, 1st edition, 1976, Taylor & Francis				
References: R1: A. Levy, H. KalmanHandbook of Conveying and Handling of Particulate Solids, 1st edition, 2001, Elsevier R2: Don McGlinchey, Bulk Solids Handling: Equipment Selection and Operation, 1st edition, 2008, Wiley **e-resources:** 1.Link for Knimbus remote login: https: / / presiuniv.knimbus.com 2. https: / / www.youtube.com / watch?v=1Rq1F1i7BN4&list=PL18CkeOzU3AIHQBmf7ZpYbjDEa-aVF964 3. https: / / www.youtube.com / watch?v=WX-vJ90rFjQ 4. https: / / www.youtube.com / watch?v=iJiQZjVpQmY				
Skill Sets: Topics relevant to**"EMPLOYABILITY SKILLS":** Screening and Filtrationfor developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Suman Paul, Ms. Amolina Doley, and Ms. Bidisha Borah			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: **PET3116**	**Course Title: Petroleum Production Optimization Techniques** **Type of Course: 1]Discipline Elective Course 2] Theory Only**			**L-T-P-C**	3	0	0	3
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	This course deals with the design basis of petroleum production equipment. The subject will help the students to recognize the basic requirements to design any production equipment. The course is both conceptual and analytical in nature. It develops the mathematical and computing skills in students. The course also enhances the programming abilities through assignment work.							
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Petroleum Production Optimization Techniques and attain **Employability Skills** through **Problem Solving Methodologies.**							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the principles of total production system analysis by explaining nodal analysis, tubing and flowline sizing, completion effects, well restrictions, depletion effects, and multiwell system performance., CO2: Explain the design principles of gas lift systems by describing the factors affecting gas lift performance, dynamic gaslift valve characteristics, and gas lift valve behavior, CO3: Classify gas lift systems by determining unloading valve depths, operating injection points, valve port sizes, and operating pressures for continuous and intermittent gas lift operations, CO4:Describe the working principles of heater treaters, including emulsion treating mechanisms, gravity separation, coalescence, and heat input requirements for crude oil treatment, CO5: Interpret heater treater dimensions and operating parameters using heat input equations and design methodologies for crude oil treatment, CO6: Apply heat transfer principles to determine the fluid placement and sizing of shell-and-tube heat exchangers based on process operating conditions.							
Course Content:								
Module 1:	Total Production System Analysis	Assignment	Presentation	12 Periods				
Topics: Introduction to Nodal Analysis, Tubing Size Selection, Flowline Size Effect, Effect of Stimulation, Systems Analysis for Wells with Restrictions, Surface Chokes, Subsurface Safety Valves, Evaluating Completion Effects, Nodal Analysis of Injection Wells, Effect of Depletion, Relating Performance to Time, AnalyzingMultiwell Systems								
Module 2:	Gas Lift Design	Assignment	Programming	11 Periods				
Topics: Fundamentals of Gas for Gas Lift Design, Factors having an effect on design of gas lift system, Dynamic Gas Lift Valve Performance, Determination of Depths of Unloading Valves and Operating Point of Injection, Constant pressure drop method for design of Continuous Gas Lift, Fallback Method for Design of Intermittent Lift, Gas Lift Valve Port Size and test rack opening pressures calculation								
Module 3:	Heater Treater	Quiz	Presentation	11 Periods				
Topics: Basics of heater treater; Emulsion Treating Methods; Gravity separation in heater treater; Coalescence in heater treater; Heat input equations; Sizing of heater treater.								
Module 4:	Shell and Tube Heat	Case study	Poster	11				

	Exchangers		Presentation	Periods

Topics:
Working principles of heat exchangers; Heat transfer theory: Sensible design, Latent design, Gas heat duty, Oil heat duty, Water heat duty; Fluid placement in shell and tube heat exchanger; Heat exchanger sizing.

Targeted Application and Tools that can be used:
Applications: Oil and Gas Industry; Manufacturing Industry.
Tools: MySep and S&THex.

Textbooks:
T1: Ken Arnold and Maurice Stewart, "Surface Production Operations", Vol. 1, 2nd Edition, Gulf Professional Publishing, 1999.
T2: Ken Arnold and Maurice Stewart, "Surface Production Operations", Vol. 2, 2nd Edition, Gulf Professional Publishing, 1999.

References:
R1: Boyun Guo, William C. Lyons, Ali Ghalambor,"Petroleum Production Engineering: A Computer-Assisted Approach" Elsevier Science & Technology Books, 2007.
R2: Tan Nguyen, "Artificial Lift Methods: Design, Practices and Applications", Springer.(1st Edition, March 2020)

e-Resources:
1.Presidency University e-access portal:https: / / presiuniv.knimbus.com / user# / home
2. Web Channel Whatispiping: https: / / whatispiping.com / heatertreater-design basics / #:~:text=A%20Separator%20is%20a%20type,gas%20phases%20from%20the%20mixture
3. Web Channel Whatispiping: https: / / whatispiping.com / 3-phase-separator-design /
4. Web Channel Whatispiping: https: / / whatispiping.com / shell-and-tube-heat-exchangers /
5. Energy(YoutubeChannel):
https: / / www.youtube.com / watch?v=SiMLey6XLTI&list=PLWVdW85uAEcqZVfjn8sRB7NKIDu0KE_LM

Skill Sets:
Topics relevant to **"EMPLOYABILITY SKILLS":** Heat exchanger sizing for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan

Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Amolina Doley, Dr. Rohit Kumar Saw, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET3117**	**Course Title: Wellbore Problems and Mitigation** **Type of Course: 1] Discipline Elective Course 2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course deals with the various problems that may be encountered during well bore drilling. The subject will help the students to recognize the problems and possible ways to mitigate the problems. The course is both conceptual and analytical in nature. It develops the critical thinking and analytical skills in students. The course also enhances the programming abilities through project work.					
Course objective	The objective of the course is to familiarize the learners with the concepts of Wellbore Problems and Mitigation andattain **Employability** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Discuss different scenarios that may result in drill pipe sticking,					

	CO2: Discuss causes and mitigation of lost circulation, CO3: Compute abnormal pore pressure based on shale pressure trend, CO4: Compute kick tolerance and kill mud density under specified condition.			
Course Content:				
Module 1:	Drill String Sticking	Assignment	Literature Survey and Presentation	12 Periods
Topics: Differential sticking; Mechanical sticking: Settled cuttings, Shale instability, Unconsolidated formation, Fractured formation, Cement blocks, Junk falling, Key seating, Mobile formation, Under gauge hole, Ledges and micro dogleg; Fishing, Problems and Remedies.				
Module 2:	Lost Circulation	Assignment	Data Collection and Presentation	06 Periods
Topics: Introduction; Causes of lost circulation: Natural losses, Induced fracture; Classes of lost circulation; Prevention of lost circulation; Curing of lost circulation.				
Module 3:	Abnormal Pressure	Assignment / Quiz	Presentation	10 Periods
Topics: Introduction; Causes of abnormal pressure; Tools for determination of abnormal pressure: MWD, RFT, DST; Quantitative estimation of abnormal pore pressure.				
Module 4:	Kick and Well Control	Assignment / Quiz	Programming	12 Periods
Topics: Kick: Definition, Cause, Detection; Pressure calculation; Kick control method; Kick tolerance.				
Targeted Application and Tools that can be used: **Applications:** Drilling Engineer / Well Control Operation Engineer in Oil and Gas industry **Tools:** Lost Circulation Tester, WellPlanTM Software - Landmark Solutions				
Textbooks: T1. H. Rabia, Graham and Trotman, "Oil Well Drilling Engineering: Principles and Practice", 1st Edition, 1986, Springer. T2. V.K. Jain, A.B. Sharma, R. Dhupar, R.P. Patel, D. Das Gupta, A. K. Joshi, and R. Shanker, "ONGC – Drilling Operation Practices Manual", 1st Edition, 2007, Shiva Offset Press, Dehradun.				
References: R1. Drilling Engineering, Heriot Watt Institute of Petroleum Engineering, Herriot Watt University, 2005. **e-resources:** 1.Presidency University Login: https: / / puniversity.informaticsglobal.com / login 2.Link for Knimbus remote login: https: / / presiuniv.knimbus.com 3. https: / / www.youtube.com / watch?v=W8dWwV9v9S8 4. https: / / www.youtube.com / watch?v=qb_ypXh1Rl8 5. https: / / www.youtube.com / watch?v=tZtjIg5oxKc 6. https: / / www.youtube.com / watch?v=DowMnQrcKuE 7. https: / / www.youtube.com / watch?v=fkNyBLUHW6Y				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Kick and Well Control for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Ms. Bidisha Borah and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: PET3118	**Course Title: Fluid Flow through Porous Media** **Type of Course: 1] Discipline Elective Course 2] Theory Only**		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The main objective of this course is to enable the students to construct flow model for fluid flow through porous media and to develop the basic abilities of modelling and analyzing the flow regimes. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical and computing. The course develops the critical thinking and analytical skills. Through the assignments given in this course student's programming abilities has been enhances.						
Course Objectives:	The objective of the course is to familiarize the learners with the concepts of Fluid Flow through Porous Media and attain **Employability** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: interpret the behavior of fluid flow in porous media, CO2: develop skills in modelling single- and multiphase fluid flow in porous media, CO3: understand fluid flow in rocks and its applications in reservoir engineering, CO4: describe mass, momentum and energy conservation equations for flow in porous media.						
Course Content:							
Module 1:	Introduction to Fluid Flow	Term paper and Quiz, Assignment	Data Collection	09Periods			
Topics: Importance of studying fluid flow through porous medium, natural vs. synthetic porous media, differences in fluid flow phenomena in porous materials with those in channels / pipes / tubes, pore structure, homogeneous vs heterogeneous porous media, scale-dependence of heterogeneity, and fractals. Properties of Porous Media, bundle of capillary tube models of porous medium, porosity-permeability relationships, pore connectivity and parametric functions, data analysis and correlation methods of typical permeability data.							
Module 2:	Single-phase Flow in Porous Media	Quiz, Assignment	Programming	09Periods			
Topics: Flow potential, incompressible and compressible flow in porous media, Darcy's law and non-Darcy effects, mass, momentum and energy transport equations, Forchheimer's equation and determination of its parameters, and viscous dissipation in porous media flow.							
Module 3:	Gas Transport in Tight Rocks	Term paper & Assignment	Programming	11Periods			
Topics: Gas transport mechanisms through nanopores, flow regimes, Knudsen number and mean flow paths, slip flow, thermal effects, apparent gas permeability, single- and multicomponent gas flow, and effect of pore size distribution on gas transport through porous media.							
Module 4:	Multi-phase Flow in Porous Media	Term paper & Assignment	Simulation	11Periods			
Topics: Multi-phase flow in porous media: Wettability and threshold potential, capillary pressure and its estimation, capillary pressure function, permeability dependence of capillary pressure and Leverett scaling, relative permeability, steady-state and unsteady-state relative permeability measurements and data interpretation. Mass, momentum, and energy transport in porous Media: Molecular diffusion, hydrodynamic dispersion, advective / convective flux functions, coupled transport equations, constitutive relationships, sources and sinks, phase transition and applications.							
Targeted Application and Tools that can be used: **Applications:** Oil and Gas industry **Tools:** Landmark nexus software.							
Textbooks:							

T1: Civan, F.A, Porous Media Transport Phenomena, Wiley, 2011. T2: Dullien, F.A.L, Porous Media 2nd Edition, Fluid Transport and Pore Structure, Elsevier, 1991.	
References: R1: Bear, J., Dynamics of Fluids in Porous Media, Dover, 1989	
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":**Wettability and threshold potential for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Niladri Shekhar Samanta, Dr. Suman Paul, Ms. Amolina Doley, and Ms. Bidisha Borah
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET3119**	**Course Title: Natural Gas Reservoir Engineering** **Type of Course: 1] Discipline Elective Course** **2] Theory only**		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The course will deal with essential aspects of Gas Reservoir Engineering like understanding the properties of natural gas and reservoir fluids; evaluating original gas in place (OGIP) using volumetric and material balance methods; analyzing gas deliverability in various types of gas reservoirs including dry, wet, and condensate systems; interpreting gas well performance through decline curve analysis techniques like Fetkovich and Carter; and understanding pressure-transient testing for diagnosing reservoir behavior. This course will also discuss its implications at different stages of gas field development and production planning.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Natural Gas Reservoir Engineering and attain **Employability Skills** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the basic gas reservoir behavior and properties, CO2: Apply volumetric and material balance methods for reserves estimation, CO3: Predict gas production using decline curve analysis, CO4: Employ pressure-transient techniques to diagnose reservoir behavior, CO5: Analyse production and testing data for gas field planning.						
Course Content:							
Module 1:	Basic Gas Reservoir Engineering and Gas Reserves	Assignment / Quiz	Literature Survey and Presentation	10 Periods			
Topics: Fluids and fluid types, Drive mechanisms, Properties of natural gas, Material balance, Determining gas reserves, Estimation of Original Gas In-Place (OGIP) using the Volumetric Method.							
Module 2:	Gas Volumes and Material-Balance Calculations	Assignment / Quiz	Programming	12 Periods			
Topics: Gas Volumes and Material-Balance Calculations, Gas Reserve and Volumetric Method, Volumetric method for dry gas reservoir, Volumetric method for wet gas and condensate gas reservoir, Material-Balance Method, Material-Balance Method for Dry-Gas Reservoirs with Water Influx, Material Balance method For Volumetric Geopressured Gas Reservoir.							

Module 3:	Decline Curve Analysis for Gas Wells	Assignment / Quiz	Group Discussion	10 Periods
Topics: Introduction to Decline Curve Analysis, Conventional Analysis Techniques--Decline Types and Applications, Fetkovich Decline Type Curve, Carter Decline Type Curve.				
Module 4:	Pressure-Transient Testing of Gas Wells	Article Review	Presentation	13 Periods
Topics: Types and Purposes of Pressure-Transient Tests, Pressure-Transient Analysis-Slightly Compressible Liquids, Complications in Actual Tests, Fundamentals of Pressure-Transient Testing In Gas Wells, Non-Darcy Flow, Gas Flow Tests with Discrete Rate Changes, Gas Flow Tests with Smoothly Changing Rates, Gas Buildup Test with Constant-Rate Production Before Shut In, Discrete Change in Rate Before Shut In, Type Curve Analysis 1, Type Curve Analysis 2, Type Curves comparison.				
Targeted Application and Tools that can be used: **Targeted Application:** Reservoir Engineer, Production Engineer, Gas Field Analyst in Oil & Gas Industry, Energy Sector, and Petroleum Consulting Firms. **Tool Used:** MS Excel				
Textbooks: T1. Chi U. Ikoku, "Natural Gas Reservoir Engineering", Krieger Publishing Company (September 1, 1992) T2. John Lee, Robert A Wattenbarger, "Gas Reservoir Engineering" Society of Petroleum Engineers (1 May 2014)				
References: R1. Nnaemeka Ezekwe, "Petroleum Reservoir Engineering Practice" R2. Michael Golan and Curtis H. Whitson, "Well Performance" **e-resources:** Presidency University e-resource Remote Access (KNIMBUS) portal through the shared link: https: / / presiuniv.knimbus.com / user# / home				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":**Oil Spill Control for developing **Employability Skills** through **Problem SolvingMethodologies**. This is attained through assessment component mentioned in course handout.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Dr. Suman Paul, and Ms. Bidisha Borah			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: **PET3120**	**Course Title: Natural Gas Production Engineering** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course**Pre-requisites:**	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to understand the natural gas reservoirs and their production, and performance analysis and to develop the basic abilities of designing the different facilities for natural gas treatment. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematical computation. The course also develops the programming abilities through assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Natural Gas Production Engineering and attain **Employability**					

	Skills through **Problem Solving Methodologies**.			
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the basic properties of natural gas relevant to production and utilization, CO2: Explain the significance of IPR and nodal analysis curves in predicting gas well productivity, CO3: Calculate wellbore and choke flow parameters for single-phase, mist flow, and wet gas conditions, CO4: Compute the design parameters of dehydration columns and flow measuring meters for solving industrial problems, CO5: Differentiate dehydration, acid gas removal, and volumetric measurement techniques to assess their suitability under varying gas processing conditions.			
Course Content:				
Module 1:	Properties of Natural Gas	Quiz	Data Collection	12 Periods
Topics: Production of Natural Gas, Gas well, Problems related to gas production, Surface facilities. What is natural gas – Utilization of natural gas – Natural gas industry (World and India) – Natural gas reserves – Types of natural gas resources – Future of natural gas industry Properties of natural gas:Specific gravity – Pseudo critical properties – Viscosity – Compressibility factor – Gas density – Formation volume factor and expansion factor – Compressibility of natural gas – Real gas pseudo pressure and real gas normalized pressure.				
Module 2:	Gas Reservoir Deliverability	Assignment	Programming, Simulation	11 Periods
Topics: Introduction – Analytical methods – Empirical methods – Construction of inflow performance relation curve. Well deliverability: Introduction – Nodal analysis – Analysis with wellhead node.				
Module 3:	Wellbore and Choke Performance	Assignment	Programming, Simulation	11 Periods
Topics: Wellbore performance**:**Introduction – Single phase gas well – Mist flow in gas wells. Choke performance**:**Introduction – Sonic and subsonic flow – Dry gas flow through chokes – Wet gas flow through chokes				
Module 4:	Gas Processing and Volumetric Measurement	Case Study	Model Making	11 Periods
Topics: Dehydration**:** Water content of natural gas streams, Dehydration systems, Glycol dehydrator design. Removal of acid gases**:**Iron – Sponge sweetening – Alkanol amine sweetening – Glycol / Amine process – Sulfinol process. Volumetric measurement**:**Measurement with orifice meters – Displacement metering – Turbine meter – Elbow meter – Natural gas liquid measurement				
Targeted Application and Tools that can be used: **Applications:** Oil and Gas Industry **Tools:** Honeywell, OGPPT				
Textbooks: T1: Boyan Guo Ali Ghalambor, “Natural Gas Engineering Handbook”, Gulf publishing company. T2: D.L.Katz, “Handbook of Natural Gas Engineering”, McGraw, Hill.				
References: R1: Chi U. Ikoku, “Natural Gas Production Engineering”, Krieger Publishing Company. R2: Tarek Ahmed, Elsevier, “Reservoir Engineering Handbook”. **e-resources:** 1. https: / / petrowiki.spe.org / Gas_well_deliverability 2. Link for Knimbus remote login: https: / / presiuniv.knimbus.com 3. Natural gas production: https: / / www.oreilly.com / library / view / petroleum-production-engineering /				

9780128096123 / xhtml / chp003.xhtml 4. Wellbore performance: https: / / petrowiki.spe.org / Wellbore_flow_performance 5. Choke performance: https: / / www.sciencedirect.com / topics / earth-and-planetary-sciences / choke 6. Oil and gas industry: https: / / www.petroleumonline.com / modules / m014 / hl_014_001.asp 7. Natural gas processing: https: / / www.e-education.psu.edu / fsc432 / content / natural-gas-processing
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Tubing Performance Relationship for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Suman Paul, and Ms. Bidisha Borah
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Course Code: **PET3121**	**Course Title: Introduction to Computational Fluid Dynamics** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course intends to give an overview of the Computational Fluid Dynamics and the flow modelling. The students will develop a strong foundation in numerical methods like FDM and FVM as they would apply the knowledge to formulate the equations. The course is theoretical in nature with special emphasis on the numerical modelling. Students should have strong background in mathematics, heat, and momentum and programming in order to excel in this course. It will lay the foundation of computational programming for the students.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Introduction to Computational Fluids Dynamics and attain **Skill Development** through **Problem SolvingMethodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Explain natural gas production, utilization, resources, and associated surface facilities and production challenges, CO2: Describe the physical and thermodynamic properties of natural gas used in reservoir and production engineering, CO3: Apply inflow performance relationships and nodal analysis techniques to evaluate and predict gas well deliverability and production performance, CO4:Interpret single-phase gas flow and mist flow behavior to assess gas wellbore performance, CO5: Determine choke performance under sonic and subsonic flow conditions for dry and wet gas wells, CO6:Analyze gas dehydration, acid gas removal, and volumetric measurement techniques to ensure efficient processing and accurate quantification of natural gas streams.					
Course Content:						
Module 1:	Introduction to Computational Fluid Dynamics	Term Paper	Data Collection and Review Paper	08 Periods		
Topics: Computational Fluid Dynamics: What, When, and Why?, CFD Applications, Numerical versus Analytical versus Experimental, Modeling vs Experimentation, Fundamental principles of conservation, Reynolds						

transport theorem, Conservation of mass, Conservation of linear momentum: Navier-Stokes Equation, Conservation of Energy, General Scalar Transport Equation.				
Module 2:	Introduction to Numerical Techniques in Computational Fluid Dynamics	Assignment	Programming	10 Periods
Topics: Derivation of finite difference equations – Simple Methods – General Methods for first and second order accuracy – Finite volume formulation for steady state One, Two and Three -dimensional diffusion problems - Parabolic equations – Explicit and Implicit schemes -Example problems on elliptic and parabolic equations – Use of Finite Difference and Finite Volume methods.				
Module 3:	Discretization	Assignment	Programming	06 Periods
Topics: Discretization Principles: Preprocessing, Solution, Postprocessing, Finite Element Method, Finite difference method, Well posed boundary value problem, Possible types of boundary conditions, Conservativeness, Boundedness, Transportiveness, Finite Volume Method (FVM), Illustrative examples: 1-D steady state heat conduction without and with constant source term, 1-D unsteady state diffusion problems: implicit, fully explicit and Crank-Nicholson scheme.				
Module 4:	Finite Volume Method	Assignment	Programming	08 Periods
Topics: Some Conceptual Basics and Illustrations through 1-D Steady State Diffusion Problems: Physical consistency, Overall balance, FV Discretization of a 1-D steady state diffusion type problem, Composite material with position dependent thermal conductivity, Four basic rules for FV Discretization of 1-D steady state diffusion type problem, Source term linearization, Implementation of boundary conditions.				
Targeted Application and Tools that can be used: **Applications:** CFD Engineer / Flow Dynamics / Numerical Modelling Engineer **Tools:** ANSYS FLUENT, OPENFOAM, and ANSYS CFX (Professionally used Software)				
Textbooks: T1. John D. Anderson Jr., “Computational Fluid Dynamics: The basics with Applications”, McGraw Hill Education.				
References: R1. H. Versteeg, W. Malalasekra “An Introduction to Computational Fluid Dynamics: The Finite Volume Method”, Pearson edition. R2. JiyuanTu, Guan Yeoh, Chaoqan Liu, “Computational Fluid Dynamics: A Practical Approach”, Second edition, Elsevier. **e-resources:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / www.youtube.com / watch?v=jQHp49OyPn8 3. https: / / www.youtube.com / watch?v=NlLy-u61yyk 4. https: / / www.youtube.com / watch?v=ygOcv4ynZ8A				
Skill Sets: Topics relevant to **“SKILL DEVELOPMENT”:** Introduction to Numerical Techniques in Computational Fluid Dynamics for **Skill Development** through **Problem Solving Methodologies**. This is attained through the Assignment as mentioned in the assessment component.				
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Mr. Bhairab Jyoti Gogoi, Dr. Rohit Kumar Saw, Dr. Suman Paul, Ms. Amolina Doley, and Ms. Bidisha Borah			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Specialization Basket 4: Pipeline and Petroleum Refining Engineering Basket

Course Code: PET3122	**Course Title:** Process Design and Calculations **Type of Course:** 1] Discipline Elective Course 2] Theory Only	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to enable the student to understand the basics of Engineering calculations, Stoichiometry and Material and Energy Balance. They will learn definition and estimation of properties of process materials and engineering approach to problem solving using material and energy balance equations. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking and analytical skills.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Process Design and Calculations and attain **Employability Skills** through **Problem Solving Methodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Explain the different stoichiometric relationships and methods of expressing compositions of mixtures and solutions, CO2: Interpret the behavior of ideal gases, vapor pressure, humidity relations, and their applications in process calculations, CO3: Apply material balance equations to steady and unsteady state processes with recycle, bypass, and purge operations, CO4: Analyse complex process flowsheets and evaluate material and energy balances for unit operations such as distillation, absorption, extraction, and drying, CO5: Use combustion principles to perform calculations related to air requirement, flue gases, calorific values, and thermal efficiency.					
Course Content:						
Module 1:	Stoichiometry	Assignment	Data Collection	10 Periods		
Topics: Stoichiometric and Composition relations: Stoichiometric relation, basis of calculations, methods of expressing compositions of mixtures and solutions, density and specific gravity, Baume and API gravity scales. Behavior of Ideal gases: Kinetic theory of gases, application of ideal gas law, gaseous mixtures, gases in chemical reactions.						
Module 2:	Basic Chemical Calculations	Assignment	Data Collection	12 Periods		
Topics: Vapor pressure: Liquefaction and liquid state, vaporization, boiling point, effect of temperature on vapor pressure, Antoine equation, vapor pressure plots, estimation of critical properties, vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non-volatile solutes. Humidity and Saturation: Partial saturation, Humidity- Absolute Humidity, Vaporization process, Molal humidity, Relative and percentage saturation, dew point, humid heat, wet bulb and dry bulb temperatures, use of humidity charts, adiabatic vaporization.						
Module 3:	Material Balance without Chemical Reactions	Poster Presentation	Programming	13 Periods		
Topics: Process flowsheet, Degree of freedom, Material balance with and without recycle; Bypass and purge streams, Material balance around equipments related to unit operations like absorber and stripper, distillation towers, extractors, dryers, evaporators, etc. Material balance of unsteady state operations.						
Module 4:	Fuels and Combustions	Assignment	Data Collection	10 Period		

				s

Topics:
Combustion Calculations: Introduction, fuels, calorific value of fuels, coal, liquid fuels, gaseous fuels, air requirement and flue gases, combustion calculations, incomplete combustion, material and energy balances, thermal efficiency calculations. Problems on combustion of coal, liquid fuels, gaseous fuels, etc., Proximate and ultimate analysis, Combustion calculations, theoretical flame temperature, etc., Air requirement and flue gases.

Targeted Application and Tools that can be used:
Applications: Process Engineering Industries in operation such as Distillation column, Solvent Adsorption and extraction and fuel testing services.
Tools: MS Excel

Textbooks:
T1: Hougen O A, Watson K.M. and Ragatz R.A, "Chemical Process Principles", Part -I: Material and Energy Balance, John Wiley and Sons, New York.

References:
R1: D.H. Himmelblau, "Basic Principles and Calculation in Chemical Engineering", PHI.
R2: B.I. Bhatt and S.M.Vora, "Stoichiometry", Tata McGraw Hill Publishing Company Ltd.

Skill Sets:
Topics relevant to development of "**EMPLOYABILITY SKILLS**": Fuels and Combustionsfor developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Rohit Kumar Saw, Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, and Dr. Suman Paul
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Course Code: **PET3123**	**Course Title:** **Process Pipeline Design** **Type of Course:** **1] Discipline Elective Course** **2] Theory Only**		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The main aim of learning this course is to understand the fundamental principles and design of pipelines, land piping systems and integrity of pipelines. This course helps in learning the fundamental principles in materials, design, fabrication, inspection, testing, operation, maintenance, and integrity of plant piping systems and pipelines.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Process Pipeline Design and attain **Employability Skills** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course, the student shall be able to: CO1: Classify the types of pressure losses during the transportation of liquids and gases through pipeline, CO2: Apply pump and compressor performance curves to locate optimal stations, CO3: Demonstrate how improper welding compromises pipeline integrity, CO4: Calculate capital and operating costs to appraise pipeline viability, CO5: Explain key cost components and the role of risk analysis in pipeline economic decision-making.						
Course Content:							
Module 1:	Pipeline Hydraulics	Assignment 1	Programming	12			

				Periods
Topics: Types of Pipelines, Properties of Liquids and Gases, Flow-through Pipelines, Series and Parallel Pipeline systems, Injections and Deliveries.				
Module 2:	Pumps and Compressors	Assignment 2	Group discussion	11 Periods
Topics: Pumps, Affinity Laws, Pump Station Location, Pump Curve Analysis, Compressors, Types of Compressors, Compressor station location, Compressor Performance Curves, Types of Compression.				
Module 3:	Pipeline Fabrication, Inspection, and Quality Control	Assignment 3	Presentation	11 Periods
Topics: Pipeline Sizing, NPS, Schedule Number, Mechanical Properties of Materials, Pipeline Construction – materials and stages,Fabrication, Pipeline Coating, Cleaning and Inspection, Pipeline Inspection Gauge (PIG), Pipeline Testing, Corrosion, Pipeline Failure, Color Code of different types of pipelines, Valves, Pipeline Supports.				
Module 4:	Pipeline Economics	Assignment 4	Case Study	11 Periods
Topics: CAPEX, OPEX, and other costs, Risk Analysis, Feasibility studies, Economic Pipe Size, CNG.				
Targeted Application and Tools that can be used: **Applications**: Oil and Gas Industries- Pipeline engineer **Tools:** PIPESIM and OLGA Multi Phase Flow Simulator				
Textbooks: T1: Geoff, Barker, "Engineer's guide to plant layout and piping design for the oil and gas industries", Elsevier (2018). T2: Miesner, Thomas O, "Oil and gas pipelines in nontechnical language",Pennwell (2015).				
References: R1: Krishna Murty, "All in one manual of industrial piping practice and maintenance", Kindle edition. R2: Keith Escoe, "Piping and pipelines assessment guide", Kindle edition. **e-resources:** 1.Presidency University e-resource library: https: / / presiuniv.knimbus.com / user# / home 2.Pipeline Pressure Drop Calculation Article: https: / / whatispiping.com / pressure-drop-equation-calculation / 3. Pipeline Pressure Drop Calculation: https: / / petrowiki.spe.org / Pressure_drop_evaluation_along_pipelines 4. Pipeline Knowledge and Development You Tube Channel: https: / / www.youtube.com / channel / UCG4_koi2AZs_C8BxfXAaw7A				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Pumps and Compressors for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Rohit Kumar Saw, Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
Date of Approval by the Academic Council:	26th Meeting of the Academic Council held on 25th July, 2025			

<table>
<tr><td>Course Code:
PET3124</td><td colspan="4">Course Title: Corrosion Science and Technology
Type of Course: 1] Discipline Elective Course
2] Theory only</td><td>L-T-P-C</td><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Version No.:</td><td colspan="9">1.0</td></tr>
<tr><td>Course Pre-requisites:</td><td colspan="9">NIL</td></tr>
<tr><td>Anti-requisites:</td><td colspan="9">NIL</td></tr>
<tr><td>Course Description:</td><td colspan="9">The main aim of this course is to get an overview how corrosion problems are identified and rectified especially in the oil and gas industry. The course deals to understand the occurrence of different types of corrosion such as, general corrosion, localized corrosion, bimetallic corrosion, erosion-corrosion or impingement, intergranular corrosion, etc., in nature especially in oil and gas equipment's. Corrosion in oil and gas industries based on using different materials. Importance of protective coatings and different inhibition mechanisms for different type of material's applications in oil and gas industries. Corrosion detection methods, monitoring and prevention techniques. Case studies related to corrosion failures in oil and gas industries.</td></tr>
<tr><td>Course Objective:</td><td colspan="9">The objective of the course is to familiarize the learners with the concepts of Corrosion Science and Technology and attain Employability through Problem Solving Methodologies.</td></tr>
<tr><td>Course Outcomes:</td><td colspan="9">On successful completion of the course the students shall be able to:
CO1: explain the basics of corrosion, different types of mechanisms, nature of corrosion, causes and problems in the oil and gas industries,
CO2: identify the importance and impact of corrosion problems and how it can be monitored and controlled to mitigate / avoid losses of time and money of the oil and gas industry,
CO3: illustrate the effect of inhibition methods and interpret the mechanisms of different inhibitors which eventually be able to help the oil and gas industries,
CO4: applying knowledge to simulate the real conditions of corrosion problems and can find the appropriate solutions.</td></tr>
<tr><td>Course Content:</td><td colspan="9"></td></tr>
<tr><td>Module 1:</td><td>Introduction to Corrosion in Oil and Gas Sector</td><td colspan="2">Assessment 1: Assignment / Quiz</td><td colspan="2">Literature Survey</td><td colspan="3">09 Periods</td></tr>
<tr><td colspan="10">Topics:
Introduction, Basics of corrosion, Different types of corrosion. Corrosion challenges in oil and gas industries: mainly for upstream and downstream equipment.</td></tr>
<tr><td>Module 2:</td><td>Protective Measurements</td><td colspan="2">Assessment 2: Assignment / Quiz</td><td colspan="2">Data Collection</td><td colspan="3">10 Periods</td></tr>
<tr><td colspan="10">Topics:
Protective coatings: classifications, coating formulation, coating systems, coating applications, inspection, coating of production facilities and equipment.</td></tr>
<tr><td>Module 3:</td><td>Inhibition and Controlling Systems</td><td colspan="2">Assessment 3: Assignment / Quiz</td><td colspan="2">Programming Task</td><td colspan="3">13 Periods</td></tr>
<tr><td colspan="10">Topics:
Inhibition mechanisms: usage of different inhibitors such as, MEA (mono ethanol amine), Propanol, etc., Corrosion detection and monitoring.</td></tr>
<tr><td>Module 4:</td><td>Corrosion Prevention</td><td colspan="2">Assessment 4: Case Study</td><td colspan="2">Data Collection and Analysis</td><td colspan="3">08 Periods</td></tr>
<tr><td colspan="10">Topics:
Introduction to Cathodic Protection (CP), Principles, Criteria, CP Systems, Survey and Test methods, Applications in Oil and Gas Industries.</td></tr>
<tr><td colspan="10">Targeted Application and Tools that can be used:
Applications: Corrosion Engineer in Oil and Gas / Steel / Process / Manufacturing Industry</td></tr>
</table>

Tools: Predict 7.1 and iFILMS(Professionally Used Software)	
Textbooks: T1. H.G.Byars, Corrosion control in Petroleum production, 2nd Edition, TPC 5 Publications, 1999. T2. Ropital; Harston, Amine Unit Corrosion in Refineries, 1st Edition, CRC Press, 2007.	
References: R1: Sankara Papavinasam; Corrosion Control in the Oil and Gas Industry, Gulf Professional Publishing, 2014. **e-resources:** 1. https: / / presiuniv.knimbus.com 2. https: / / www.usna.edu / NAOE / _files / documents / Courses / EN380 / Course_Notes / Corrosion%20Basics.pdf(Notes - Corrosion Basics) 3. https: / / link.springer.com / article / 10.1186 / 2228-5547-4-35(Review Journal Article- Corrosion problems during oil and gas production and its mitigation) 4. https: / / www.corrosionpedia.com / definition / 2301 / protective-coating-corrosion(Basic Definition-Protective Coating) 5. https: / / www.uv.mx / personal / rorozco / files / 2011 / 02 / CORROSION-INHIBITORS.pdf(Textbook on Corrosion Inhibitor) 6. https: / / cdn.intechopen.com / pdfs / 46243.pdf(Book Chapter - Corrosion Inhibitors – Principles, Mechanisms and Applications)	
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Corrosion challenges for Petroleum Equipments for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET3125**	**Course Title: Polymer Science and Technology** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of the course is to enable the students to understand basic scientific and engineering principles used in the polymer industry. This course will provide an integrated view of the fundamentals of polymer science and Technology. The course is theoretical in nature and needs fair knowledge of basic engineering science and computing. The course develops the critical and analytical thinking skills. The course also enhances the programming abilities through assignments.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Polymer Science and Technology and attain **Entrepreneurship** through **Problem SolvingMethodologies**.					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Explain various types of polymers and polymerization method, CO2: Describe thermal, mechanical properties & elastic behavior of polymers, CO3: Discuss various polymer additives and polymer processing operations, CO4:Applyindustrial use of various polymers based on their composition and properties.					
Course Content:						

Module 1:	Introduction to Polymer Technology	Assignment	Programming	10 Periods
Topics: Basic definition; Classification of polymers; Molecular Weight determination; Chemical structure. Step and Chain Growth Polymerization; Polymerization kinetics; Polymerization Techniques; Polymer Reactivity.				
Module 2:	Polymer Properties	Assignment	Data Collection and Presentation	09 Periods
Topics: Solid-State Properties - Amorphous and Crystalline State, Thermal Transitions and Properties, Mechanical Properties and Solid-State Characterization Methods. Polymer Elasticity - Introduction to Viscoelasticity and Rubber Elasticity. Polymer Degradation and the Environment - Polymer Degradation and Stability; Plastic management.				
Module 3:	Polymer Components and Processing	Assignment	Data Collection and Group Discussion	11 Periods
Topics: Polymer Components - Additives, Polymer Blends and Interpenetrating Networks, Block Copolymers, Composites. Polymer Processing and Rheology - Basic Processing Operations, Introduction to Polymer Rheology, Rheometry.				
Module 4:	Industrial Polymers	Assignment	Data Collection and Presentation	12 Periods
Topics: Introduction to industrial polymers- Biopolymers and Other Naturally Occurring Polymers, Fibers, Thermoplastics, Elastomers, Thermosets,Industrial application of polymers, Plastics – Properties and uses of plastics as engineering materials, Ecology and environmental aspects of polymer industries; Polymer waste management.				
Targeted Application and Tools that can be used: **Applications:** Engineer in Polymer industry (Manufacturing and Selection), Petroleum industry (Hydro-Frac & EOR) **Tools:** FTIR – Microscopy, Injection Molding Unit, Extruder				
Textbooks: T1: Joel R. Fried, "Polymer Science and Technology", Prentice Hall. Third Edition (2014)				
References: R1: Billmeyer, F.W.Jr., "Textbook of Polymer Science", John Wiley and sons. Third Edition (1984) R2: R. Sinha, "Textbook of Polymer Technology – I and II", Biotech Pharma Publications. First Edition (2018) **e-resources:** 1. Link for Knimbus remote login: https: / / presiuniv.knimbus.com 2. Polymer Technology: https: / / www.youtube.com / watch?v=rzVeVd16vFQ 3. Introduction to polymer Technology: https: / / www.youtube.com / watch?v=_GBx1xzYMo8 4. NPTEL Lecture: Polymer Processing: https: / / www.youtube.com / watch?v=MV0MXWaxBv4 5. NPTEL Lecture: Polymer Processing: https: / / www.youtube.com / watch?v=T-m045Rm6G0 6. Injection molding:https: / / www.youtube.com / watch?v=b1U9W4iNDiQ&t=30s				
Skill Sets: Topics relevant to **"ENTREPRENEURIAL SKILLS":** Polymer Components and Processingfordeveloping **Entrepreneurial Skills** through **Problem Solving Methodologies**. This is attained through the Assignment as mentioned in the assessment component.				
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: **PET3126**	**Course Title: Fundamental of Chemical Engineering** **Type of Course: 1] Discipline Elective Course 2] Theory Only**			**L-T-P-C**	3	0	0	3
Version No.:	1.0							
Course Pre-requisites:	NIL							
Anti-requisites:	NIL							
Course Description:	The purpose of this course is to enable the student to understand the basics of Chemical Engineering calculations, Stoichiometry and Material and Energy Balance, distillation types of reactors and their application. They will learn definition and estimation of properties of process approach to problem solving using fundamental equations. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking and analytical skills.							
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Fundamental of Chemical Engineering and attain **Employability** through **Problem Solving Methodologies**.							
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: describe the different stoichiometric relationship and apply material heat energy balance in process calculation, CO2: define the different reactor and pumps and their applications, CO3: learn the types of separation process specially design distillation column and application in downstream process, CO4: classify the different types of heat transfer process heat exchanger and their application							
Course Content:								
Module 1:	Stoichiometry and Process Calculations	Assignment	Data Collection	10 Periods				
Topics: Stoichiometric and Composition Relations: Stoichiometric relation, basis of calculations, methods of expressing compositions of mixtures and solutions, density and specific gravity, Liquefaction and liquid state, vaporization, boiling point, effect of temperature on vapor pressure, Antoine equation, vapor pressure plots, estimation of critical properties, vapor pressure of immiscible liquids and ideal solutions, Raoult's law, Non-volatile solutes.								
Module 2:	Principles Fluid Mechanics and Reaction Engineering	Assignment	Data Collection	10 Periods				
Topics: Fluid flow Phenomena: Laminar flow shear Rate, Shear stress, Rheological Properties of Fluids, Turbulence and Boundary Layer, Drag coefficients, Pipe fittings and Valves, Pumps; Types, mechanisms and design of different isothermal reactor design								
Module 3:	Mass Transfer and its Application	Poster Presentation	Programming	10 Periods				
Topics: Principles of Diffusion and Mass Transfer, Fick's Law and its application, Mass Transfer Coefficients: Absorption with Chemical Reaction; Distillation, Flash distillation, Plate calculation and efficiency using Maccabe Thielie Method, Packed distillation, Azeotropic and extractive distillation for single and multi-component distillation.								
Module 4:	Heat Transfer and its Application	Assignment	Data Collection	10 Periods				
Topics: Heat transfer by conduction convection and radiation; Heat transfer through fluids both laminar and turbulent flow; Heat exchanger designing and application								
Targeted Application and Tools that can be used: **Applications:** Process Engineering Industries in operation such as Distillation column, Solvent Adsorption								

and extraction and designing of heat exchanger services. **Tools:** MS Excel
Textbooks: T1: Hougen O A, Watson K.M. and Ragatz R.A, "Chemical Process Principles", Part -I: Material and Energy Balance, John Wiley and Sons, New York. T2. McCabe W.L, Smith,J.C, Harriot P "Unit Operations of Chemical Engineering", McGraw-Hill International Edition T3. Levenspiel O "Chemical Reaction Engineering" Wiley Student Edition
References: R1: B.I. Bhatt and S.M.Vora,"Stoichiometry", Tata McGraw Hill Publishing Company Ltd. R2: Coulson and Richardson's Chemical Engineering Prticle Technology and Separation Process
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Estimation of critical properties, vapor pressure of immiscible liquids and ideal solutions for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET3127**	**Course Title: Advanced Refining Engineering** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	The purpose of this course is to understand the different process used in refining industries. They will learn the different cracking methods, reforming techniques to be used in various processes to increase the efficiency of the products. The course is and analytical in nature and needs fair knowledge of chemical reactions. The course develops the critical thinking and analytical skills.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Advanced Refining Engineering and attain **Employability Skills** through **Problem Solving Methodologies.**					
Course Outcomes:	On successful completion of the course the students shall be able to: CO1:Explain the fundamental process in the petrochemical refinery industry, and summarize types and functions of Secondary Process, Cracking process like Thermal Cracking and Visbreaking, Different types Feed Stock, Products Yields, Qualities and Recent Development, Hydro Cracking along with their principles, reactions in Hydro Cracking, Catalyst, Hydro Cracking Reaction Conditions, Iso Max Processes and Hydro Desulphurization Processes, Methods of Petroleum Coke Production via different process like Kopper process, Thermal Cracking, Delayed Coking, Fluid Coking and Contact Coking process, CO2: Illustrate the Catalytic Cracking process, Commercial Catalyst used in catalytic cracking process, Feedstock and Conditions of Catalytic Cracking, Types and Processes of Fixed Bed Cracker, Fluid Catalytic Cracking (FCC), and Flexi Cracking process, CO3:Summarize the Reaction Conditions and Catalyst for Catalytic Reforming, Platforming, Houdri Forming, Rhein Forming, Power Forming, and Selecto Forming process, Ultra-Forming, Rex Forming, Naphtha Cracking, Feedstock Selection, and Effect of Steam,					

	CO4:Illustrate the Feed Stocks and Reactions for Alkylation Process, Cascade Sulphuric Acid Alkylation, and Hydrofluoric Acid Alkylation process, CO5: Differentiate Isomerization with Platinum Catalyst and Aluminium Chloride Process.			
Course Content:				
Module 1:	Thermal Cracking and Coking	Exercise	Data Collection and Report Presentation	14 Periods
Topics: Need and significance, types and functions of Secondary Processing. Cracking, Thermal Cracking and Visbreaking. Different Feed Stocks, Products Yields, Qualities and Recent Development. Hydro Cracking-principles, reactions in Hydro Cracking, Catalyst, Hydro Cracking Reaction Conditions, Iso Max Processes and Hydro Desulphurization Processes. Methods of Petroleum Coke Production – Koppers, Thermal Cracking, Delayed Coking, Fluid Coking and Contact Coking.				
Module 2:	Catalytic Cracking and Hydro Cracking	Team Activity	Poster Presentation	11 Periods
Topics: Catalytic Cracking, Commercial Catalyst, Feedstock and Catalytic Cracking Conditions, Types and Processes- Fixed Bed Cracker, Fluid Catalytic Cracking (FCC), Flexi Cracking.				
Module 3:	Catalytic Reforming	Quiz	Online Quiz	10 Periods
Topics: Theory, Reaction Conditions and Catalyst for Catalytic Reforming, Platforming, Houdri Forming, Rhein Forming, Power Forming, Selecto Forming. Ultra Forming and Rex Forming. Naphtha Cracking, Feedstock Selection and Effect of Steam				
Module 4:	Alkylation and Isomerization	Team Exercise	Presentation	10 Periods
Topics: Feed Stocks and Reactions for Alkylation Process- Cascade Sulphuric Acid Alkylation, Hydrofluoric Acid Alkylation. Isomerization Process- Isomerization with Platinum Catalyst and Aluminium Chloride Process.				
Targeted Application and Tools that can be used: **Applications:** Process Engineering Industries in operation such as Cracking, Hydrogenation and in operations relating to different chemical reactors. **Tools:** UniSim Design Software				
Textbooks: T1. Ram Prasad, “Petroleum Refining Technology”, First Edition,1998 Khanna Publishers. T2. Bhaskara Rao, B.K., “Modern Petroleum Refining Processes”, 3rd edition, Oxford and IBH Publishing Company Pvt. Ltd. Limited,1985. T3. Watkins, R. N “Petroleum Refinery Distillations”, 2nd Edition, Gulf Publishing Company, Texas, 1981.				
References: R1. Parkash, S., Refining processes handbook, Gulf Professional Publishing, First Edition 2003. R2. Hobson, G. D “Modern Petroleum Refining Technology”, 4th Edition, Institute of Petroleum, U. K. 1973. **e- References:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / www.slideshare.net / janapra / notes-petrorefine1 3. https: / / nptel.ac.in / courses / 103 / 102 / 103102022 /				
Skill Sets: Topics relevant to **“EMPLOYABILITY SKILLS”:** Fluid Catalytic Cracking for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Dr. Amolina Doley, Mr. Bhairab Jyoti Gogoi, and Dr. Suman Paul			
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Course Code: **PET3128**	**Course Title: Advanced Petrochemical Engineering** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**			**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The purpose of this course is to understand the different petrochemicals obtained from the Petroleum industry. They will learn the different composition, classification, separation and production techniques of different petrochemicals. The course develops the critical thinking and analytical skills.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Advanced Petrochemical Engineering and attain **Employability** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Describe the different types of production techniques of synthesis gas and its derivatives, CO2: Classify different petrochemicals based on methane, ethylene, acetylene, propylene and butane, CO3: Illustrate the different separation techniques for aromatics, CO4: Explain different production methods of synthetic fibers and polymers.						
Course Content:							
Module 1:	Synthesis Gas	Quiz	Online Quiz	09 Periods			
Topics: Production and utilization of synthesis gas: generation of synthesis gas by steam reforming of naptha and natural gas, fuel oil partial oxidation. Chemicals from synthesis gas, methanol via synthesis gas route, formaldehyde from methanol, chloromethane by direct chlorination of methane, trichloroethylene, perchloroethylene by pyrolysis of carbon tetra chloride. Fischer Tropsch process.							
Module 2:	Petrochemical based on Methane, Ethylene, Acetylene	Exercise	Data Collection and Report Presentation	11 Periods			
Topics: Petrochemical based on methane, ethylene, acetylene, propylene and butane: acetylene and methanol from methane, VCM, VAM, ethylene oxide and ethylene glycol, ethanol amides from ethylene. VCM, VAM, acrylonitrile etc. from acetylene. Isopropanol, Propylene oxide, Glycerine, acrylonitrile, Acrylic acid, etc. from propylene. Production of butadiene by dehydrogenation of butane, nitrogen							
Module 3:	Separation and Utilization of Aromatics	Team Exercise	Presentation	12 Periods			
Topics: Separation and utilization of aromatics: catalytic reforming operation-separation of BTX from Reformate, isolation of benzene, toluene, xylene, aromatics derived from thermal cracking of naptha, pyrolysis gasoline hydrogenation process. Alkylation of benzene. production of pthalic anhydride etc. synthetic detergents: classification of detergents production of KERYL Benzene Sulphonate etc., filter, binders, dyes, perfumes, etc. for detergents. Hard and soft detergents							
Module 4:	Synthetic Fibres, Rubbers, Plastics, and Resins	Team Activity	Poster Presentation	08 Periods			
Topics: Synthetic fibres, rubbers, plastics, resins: method, mechanism and types of polymerization, production of HDPE,LDPE, PP,PVC, polystyrene, poly butadiene, etc., manufacture of polyesters, nylons, acrylic fibres, etc. production of phenol formaldehyde resin, epoxy resin, production principle of ABS plastic, polycarbonates, etc. manufacturing techniques of butyl rubber, SBR, isoprene rubber, etc.							
Targeted Application and Tools that can be used: **Applications**: Process Engineer in Refining Industries, petrochemical industry. **Tools:** UniSim Design Software							
Textbooks: T1: A Text on Petrochemicals, B.K.B.Rao, 5th Edition, 2004, Khanna publishers. T2: Petrochemical process technology, I D Mall, 2nd Edition, 2006, Macmillan.							

References: R1: Trends in Petrochemical Technology, Brownstein A.M. 1976, First Edition, Petroleum Publishing Company. R2: Handbook of Petrochemicals Production Processes, Robert Meyers, First Edition, 2004, McGraw Hill Handbooks. **e-Reference** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / www.slideshare.net / sajjad_al-amery / episode-3-production-of-synthesis-gas-by-steam-methane-reforming 3. https: / / nptel.ac.in / courses / 103 / 102 / 103102022 /
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Production of butadiene by dehydrogenation of butane for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.

Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Mr. Bhairab Jyoti Gogoi, and Dr. Suman Paul
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Course Code: **PET3129**	**Course Title: Process Equipment Design** **Type of Course: 1] Discipline Elective Course** **2] Theory Only**		**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The purpose of this course is to understand the basics of the design part of the process equipment. They will learn the different design parameters to take into consideration while designing the different equipment for various processes. The course is both conceptual and analytical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking and analytical skills.						
Course Objective	The objective of the course is to familiarize the learners with the concepts of Process Equipment Design and attain **Employability** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Discuss the various thermodynamic properties for design evaluation, CO2: Explain the Heat exchanger design parameters, CO3: Describe the evaporation design parameters, CO4: Classify the different types of pumps, fans and compressors.						
Course Content:							
Module 1:	Thermodynamic Properties Evaluation for Design	Quiz	Online Quiz	09 Periods			
Topics: Physical properties evaluation, Thermodynamic properties of gases and binary mixtures – Methods of calculations – Vapour-liquid equilibrium data for ideal and non-ideal mixtures. Bubble points and dew points, flash distillation calculation.							
Module 2:	Heat Exchanger Design	Team Activity	Poster Presentation	11 Periods			
Topics: Design of double pipe heat exchangers, Heat exchanger types and its selection – shell and tube							

heat exchangers and Condensers – Effectiveness – NTU method of heat exchanger analysis. Design of cooling towers.				
Module 3:	Evaporator Design	Exercise	Data Collection and Report Presentation	08 Periods
Topics: Steam – Uses of steam – Outstanding qualities of steam – BPE – Duhring's Rule – Principle of multiple effect evaporation – Temperature driving force – Evaporator types and its selection – Design of single and multiple effect evaporators. Design of batch and continuous Dryers.				
Module 4:	Pumps, Fans and Compressors	Team Exercise	Presentation	12 Periods
Topics: Pumps, fans and compressors – Types and its applications – Selection criteria - Characteristics – NPSHR and NPSHA – Power rating calculations based on process duty - Performance analysis of pumps, fans and compressors - Pump Cavitation. Surge problem in compressors.				
Targeted Application and Tools that can be used: **Applications:** Process Engineers in Industries for operation such as Distillation column, Evaporators and Dryers, Heat exchangers etc. **Tools:** UniSim Design Software.				
Textbooks: T1: Ernest E. Ludwig., "Applied Process Design for Chemical and Petrochemical Plants", Vol.I, II and III, Gulf Professional Publishing, 2002. T2: Dawande, S. D., "Process Design of Equiments", 4th Edition, Central Techno Publications,Nagpure, 2005.				
References: R1: Coulson, M. and Richardson, J.F., "Chemical Engineering", Vol.6, 3rd Edition, PergamonPress, 1987. R2: Robert H. Perry and Don W. Green, "Perry's Chemical Engineer's Hand Book", 7th Edition, McGraw Hill – International, 1997. R3: Van Winkle, "Distillation Operations", McGraw Hill Publications, First Edition, 1987. R4: D. Q. Kern, "Process Heat Transfer", Tata McGraw Hill Publishing Co., New Delhi, First Edition, 1990. **e- References:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / nptel.ac.in / courses / 103 / 107 / 103107207 / 3. https: / / www.msubbu.in / ln / design /				
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Design of cooling towers for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.				
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, and Dr. Suman Paul			
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025			
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Course Code: **PET3130**	**Course Title: Chemical Reaction Engineering** **Type of Course: 1] Discipline Elective Course 2] Theory Only**			**L-T-P-C**	3	0	0	3
Version No.:	1.0						
Course Pre-requisites:	NIL						
Anti-requisites:	NIL						
Course Description:	The purpose of this course is to understand the basics concepts of chemical reaction in various process. They will learn the different design parameter. The course is both conceptual and theoretical in nature and needs fair knowledge of Mathematics. The course develops the critical thinking and analytical skills.						
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Chemical Reaction Engineering and attain **Employability** through **Problem Solving Methodologies**.						
Course Outcomes:	On successful completion of the course the students shall be able to: CO1: Explain the kinetics and classification of chemical reactions, CO2: Describe the Kinetics of homogeneous reaction, CO3: Identify the different types of Batch Reactors, CO4: Classify the types of rectors and size comparison.						
Course Content:							
Module 1:	Introduction to Chemical Reaction Engineering	Exercise	Data Collection and Report Presentation	10 Periods			
Topics: Introduction, kinetics, classification of chemical reactions, rate of reaction - Factors affecting reaction rate, molecularity and order of reaction pseudo molecularity of reaction- Zero order reaction, chemical equilibrium, Le-chatelier's Principle. Thermodynamics first and second law, - system, surroundings, intensive and extensive properties, thermodynamics properties-internal energy, enthalpy, entropy, free energy, chemical potential, fugacity, and activity. Feasibility of chemical reaction from the free energy change.							
Module 2:	Kinetics of Homogenous Reaction	Quiz	Online Quiz	11 Periods			
Topics: Concentration dependent term of a rate equation, rate constant 'K', representation of reaction rate-kinetic model for non-elementary reaction-Testing kinetic model for non-elementary reaction -Temperature dependent term of a rate equation, significance of activation energy-Temperature dependency from thermodynamics, collision theory, transition state theory.-Comparison of these theories with Arrhenius law							
Module 3:	Introduction to Batch Reactor Data	Team Exercise	Presentation	09 Periods			
Topics: Constant volume batch reactor and analysis of total pressure data obtained in a constant Volume system. Analysis of kinetic data by integral and by differential method for first order, second order, zero order nth order-parallel, autocatalytic, series irreversible reactions and first order reversible reaction. – Half-life method, differential method of analysis, variable volume batch reactor, - Integral method of analysis of reactions for variable volume. Temperature and reaction rate.							
Module 4:	Introduction to Reactor Design and Types of Reactors	Team Activity	Poster Presentation	10 Periods			
Topics: General view of reactor design, classification of chemical reactor-single ideal reactors, ideal batch reactor- Performance equations for ideal batch reactor,-Steady state mixed flow reactor, space - time and space velocity,-Holding time and space time for flow system.-Multiple reactor system, plug flow reactor in series-mixed flow reactor of different sizes in series, autocatalytic reactions							
Targeted Application and Tools that can be used: **Applications:** Engineer in Process Industries refineries in operation such as Distillation Column, Evaporators and Dryers, Heat exchangers.							

Tools: Aspen HYSIS Software	
Textbooks: T1: Chemical Engineering Kinetics, J. M. Smith, First Edition 1981, McGraw-Hill Chemical Engineering Series. T2: Chemical Reaction Engineering, Gavane K.A., First edition, 2019, Nirali Prakashan publisher.	
References: R1: Levenspiel O, "Chemical Reaction Engineering", Wiley Eastern Ltd., II Edition, 2000. R2: Smith, J.M, "Chemical Engineering Kinetics", McGraw Hill, III Edition, 1981. R3: Fogler. H.S., "Elements of Chemical Reaction Engineering", Prentice Hall of India Ltd., 3rd Edition, 2000. **e- References:** 1. https: / / puniversity.informaticsglobal.com / login 2. https: / / nptel.ac.in / courses / 103 / 108 / 103108097 / 3. https: / / ocw.mit.edu / courses / chemical-engineering / 10-37-chemical-and-biological-reaction-engineering-spring-2007 / lecture-notes /	
Skill Sets: Topics relevant to **"EMPLOYABILITY SKILLS":** Model for non-elementary reaction-Testing kinetic model for non-elementary reaction for developing **Employability Skills** through **Problem Solving Methodologies**. This is attained through assessment component mentioned in course plan.	
Catalogue prepared by:	Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, Mr. Bhairab Jyoti Gogoi, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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OPEN ELECTIVE COURSES (OEC)

Course Code: **PET3301**	**Course Title: Energy Industry Dynamics** **Type of Course: 1] Open Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course provides a comprehensive understanding of the complex and evolving energy sector, focusing on the interplay between market forces, technological advancements, policy frameworks, and environmental considerations. Students will have a thorough understanding of the dynamics within the energy industry, enabling them to analyze market trends, evaluate policy impacts, and contribute to the development and implementation of innovative energy solutions.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts of Energy Industry Dynamics and attain **Skill Development** through **Participative Learning Techniques**.					
Course Outcomes:	Upon successful completion of the course the students shall be able to: CO1:Explain the fundamentals of renewable and non-renewable energy sources, the evolution of the energy industry, major sectors of the energy value chain, energy demand and supply dynamics, energy policies and regulations, and the environmental impacts of energy production and consumption, CO2:Compare the principles of fossil fuel exploration and production, renewable energy technologies, nuclear energy systems, energy storage solutions, grid management, and energy efficiency technologies to address contemporary energy challenges, CO3: Illustrate appropriate market principles, pricing mechanisms, trading					

	strategies, and economic concepts to examine the functioning of national and regional energy markets, CO4: Interpret the technological innovations, policy and regulatory frameworks, and their role in facilitating the transition toward sustainable energy systems, CO5:Examine the role of digitalization, smart grids, and advanced energy management technologies in improving energy efficiency and mitigating climate change.			
Course Content:				
Module 1:	Introduction to the Energy Industry	Assignment / Quiz	Analytical Skills Development	09 Periods
Topics: Overview of Energy Sources - Renewables and Non-renewables, History and Evolution of the Energy Industry, Sectors in Energy Industry, Energy Demand and Supply Dynamics, Energy Policy and Regulation, Environmental Impact of Energy Production and Consumption.				
Module 2:	Energy Production and Technologies	Assignment / Quiz	Analytical Skills Development	11 Periods
Topics: Exploration and Production of Fossil Fuels, Renewable Energy Technologies - Solar, Wind, Hydro, and Biomass, Nuclear Energy Production, Advances in Energy Storage and Grid Management, Energy Efficiency Technologies.				
Module 3:	Energy Markets and Economics	Poster Presentation	Verbal Communication Skill Development	09 Periods
Topics: Structure and Dynamics of Energy Markets, Pricing Mechanisms and Market Regulation, Energy Trading and Risk Management, Economics of Energy Production and Consumption, Case Studies of National and Regional Energy Markets.				
Module 4:	Future Trends and Innovations in the Energy Industry	e-Resource Review	Literature Survey and Report Submission	11 Periods
Topics: Transition to Sustainable Energy Systems, Technological Innovations in Energy, Policy and Regulatory Changes for Sustainable Energy, Impact of Digitalization and Smart Grids, Energy Industry's Role in Climate Change Mitigation.				
Targeted Applications and Tools that can be used: **Applications:** Energy Management, Policy, and Technology Development and related fields. **Tools:** EIA Open Data, MATLAB Simulink.				
Textbooks: T1. "Energy Market and Energy Transition: Dynamics and Prospects", Dayong Zhang, Farhad Taghizadeh-Hesary, Phoumin Han, Qiang Ji, Xunpeng (Roc) Shi, Frontiers Media SA, 2021. T2. "Innovation Dynamics and Policy in the Energy Sector: Building Global Energy Markets, Institutions, Public Policy, Technology and Culture on the Texan Innovation Example", Milton L. Holloway, Elsevier Science, 2021. T3. "Dynamics of Energy, Environment and Economy: A Sustainability Perspective", Hassan Qudrat-Ullah, Muhammad Asif, Springer International Publishing, 2020. T4. "Fundamentals of Oil & Gas Industry for Beginners", Samir Dalvi, Notion Press; 1st Edition, 2015.				
References: R1. "Renewable Energy in India: Economics and Market Dynamics", Pramod Deo, Sushanta Kumar Chatterjee, Shrikant Modak, Sage PublicationsIndia Pvt Limited, 2021. R2. "Handbook of Energy Economics and Policy - Fundamentals and Applications for Engineers and Energy Planners", Alessandro Rubino, Alessandro Sapio, and Massimo La Scala, Elsevier, 2021. R3. "Energy Economics: Concepts, Issues, Markets, and Governance", Subhes C. Bhattacharyya, Springer, 2019. R4. "Energy Economics: Markets, History and Policy", Roy L. Nersesian, Routledge; 1st Edition, 2016. R5. "The Quest: Energy, Security, and the Remaking of the Modern World", Daniel Yergin, Penguin Publication, Revised and Updated Version, 2012. R6. "Renewable Energy: Power for a Sustainable Future", Godfrey Boyle, Oxford University Press, 2012.				

e-resources: 1. Link for PU e-resources: https://presiuniv.knimbus.com/user#/home 2. The Oil and Gas Industry in Net Zero Transitions: https://www.youtube.com/watch?v=NcGyZfIPtOw 3. Energy Information Administration https://www.eia.gov/energyexplained/ 4. Energy Information Administration (EIA) Reports: https://www.eia.gov/ 5. International Energy Agency (IEA) Reports: https://www.iea.org/ 6. Renewable Energy World Reports: https://www.renewableenergyworld.com/ 7. The U.S. Department of Energy (DOE) Reports: https://www.energy.gov/ 8. Energy Central Reports: https://energycentral.com/ World Energy Council Reports: https://www.worldenergy.org/	
Skill Sets: Topics relevant to **"SKILL DEVELOPMENT"**: Advances in Energy Storage and Grid Management, Energy Efficiency Technologies, Pricing Mechanisms and Market Regulation, Energy Trading and Risk Management, Economics of Energy Production and Consumption, Technological Innovations in Energy, Policy and Regulatory Changes for Sustainable Energy, Impact of Digitalization and Smart Grids for **Skill Development** through **Participative Learning Techniques.** This is attained through assessment component mentioned in course handout.	
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, and Dr. Suman Paul
Recommended by the Board of Studies on:	20th Meeting of the Board of Studies held on 6th June, 2025
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Course Code: **PET3302**	**Course Title: Energy Sustainability Practices** **Type of Course: 1] Open Elective Course** **2] Theory Only**	**L-T-P-C**	3	0	0	3
Version No.:	1.0					
Course Pre-requisites:	NIL					
Anti-requisites:	NIL					
Course Description:	This course offers an in-depth exploration of both renewable and non-renewable energy sources, focusing on the technologies, environmental impacts, and policies that drive sustainable energy practices. Students will engage with theoretical concepts and practical applications, equipping them with the knowledge and skills needed to contribute effectively to the field of energy sustainability.					
Course Objective:	The objective of the course is to familiarize the learners with the concepts Energy Sustainability Practices and attain **Skill Development** through **Participative Learning Techniques**.					
Course Outcomes:	Upon successful completion of the course the students shall be able to: CO1:Explain the principles of energy sustainability, the global energy landscape, environmental impacts of energy production and consumption, energy policies and regulations, and the fundamentals of Life Cycle, CO2: Apply the principles of solar, wind, hydropower, and biomass energy technologies to evaluate their suitability for diverse energy generation applications, CO3:Demonstrate the application of geothermal, ocean, and hydrogen energy technologies in diverse renewable energy scenarios, CO4: Apply the principles of fossil fuels, nuclear energy technologies, carbon capture and storage (CCS), and energy transition strategies to evaluate sustainable energy solutions while considering environmental and health impacts, CO5: Demonstrate the application of energy-efficient technologies, industrial energy management practices, sustainable transportation solutions, and					

	smart grid systems for energy conservation.			
Course Content:				
Module 1:	Fundamentals of Energy Sustainability	Assignment / Quiz	Analytical Skills Development	09 Periods
Topics: Overview of Energy Sustainability, Global Energy Landscape and Challenges, Environmental Impact of Energy Production and Consumption, Energy Policy and Regulation for Sustainability, Introduction to Life Cycle Assessment (LCA).				
Module 2:	Renewable Energy Sources and Technologies	Assignment / Quiz	Analytical Skills Development	11 Periods
Topics: Solar Energy: Photovoltaics and Solar Thermal Systems, Wind Energy: Onshore and Offshore Technologies, Hydropower: Large-scale and Small-scale Systems, Biomass and Bioenergy. Emerging Renewable Technologies: Geothermal, Ocean Energy, and Hydrogen.				
Module 3:	Non-Renewable Energy Sources and their Impacts	Poster Presentation	Verbal Communication Skill Development	09 Periods
Topics: Fossil Fuels: Coal, Oil, and Natural Gas, Nuclear Energy: Fission and Fusion Technologies, Environmental and Health Impacts of Non-Renewable Energy, Carbon Capture and Storage (CCS), Transition Strategies from Non-Renewable to Renewable Energy.				
Module 4:	Energy Efficiency and Sustainable Practices	e-Resource Review	Literature Survey and Report Submission	11 Periods
Topics: Principles of Energy Efficiency, Energy-Efficient Technologies for Buildings, Industrial Energy Efficiency Practices, Sustainable Transportation Solutions, Smart Grids and Energy Storage.				
Targeted Applications and Tools that can be used: **Applications:** Energy Management, Policy, and Technology Development and related fields. **Tools:** EIA Open Data, MATLAB Simulink.				
Textbooks: T1. "Sustainable Policies and Practices in Energy, Environment and Health Research: Addressing Cross-cutting Issues", Diogo Guedes Vidal, Maria Alzira Pimenta Dinis, Ricardo Cunha Dias, Walter Leal Filho, Springer International Publishing, 2021. T2. "Renewable Energy and Green Technology: Principles and Practices", Amit Kumar, Hukum Singh, Narendra Kumar, CRC Press, 2021. T3. "Sustainability and Energy Management: Innovative and Responsible Business Practices for Sustainable Energy Strategies of Enterprises in Relation with CSR", Gregor Weber, Springer Fachmedien Wiesbaden, 2017. T4: "An Introduction to Sustainable Transportation: Policy, Planning, and Implementation", Preston L. Schiller, and Jeffrey R. Kenworthy, Routledge, 1st Edition, 2010.				
References: R1. "Introduction to Renewable Energy", Vaughn C. Nelson, and Kenneth L. Starcher, CRC Press, 2nd Edition, 2016. R2. "Transport, Climate Change and the City", Robin Hickman, and David Banister, Routledge, 1st Edition, 2014. R3. "Sustainable Energy: Choosing Among Options" by Elisabeth M. Drake, Jefferson W. Tester, Michael J. Driscoll, Michael W. Golay, and William A. Peters, MIT Press, 2nd Edition, 2012. R4. "The Quest: Energy, Security, and the Remaking of the Modern World", Daniel Yergin, Penguin Publication, Revised and Updated Version, 2012. R5. "Renewable Energy: Power for a Sustainable Future", Godfrey Boyle, Oxford University Press, 3rd Edition, 2012. **e-resources:** 1. Link for PU e-resources: https://presiuniv.knimbus.com/user#/home 2. Project Drawdown: https://drawdown.org/ 3. UN Sustainable Development Goals (SDGs): https://sdgs.un.org/ 4. GreenBiz: https://www.greenbiz.com/				

5. Global Footprint Network: https://www.wri.org/ 6. Environmental Protection Agency (EPA) on Sustainability: https://www.epa.gov/sustainability 7. Courses on Coursera Online Platform: https://www.coursera.org/en-IN TED Talks on Sustainability: https://www.ted.com/topics/sustainability	
Skill Sets: Topics relevant to **"SKILL DEVELOPMENT"**:Carbon Capture and Storage (CCS), Transition Strategies from Non-Renewable to Renewable Energy, Energy-Efficient Technologies for Buildings, Industrial Energy Efficiency Practices, Sustainable Transportation Solutions, Smart Grids and Energy Storage for **Skill Development** through **Participative Learning Techniques.** This is attained through assessment component mentioned in course handout.	
Catalogue prepared by:	Mr. Bhairab Jyoti Gogoi, Ms. Bidisha Borah, Dr. Niladri Shekhar Samanta, Dr. Rohit Kumar Saw, Ms. Amolina Doley, and Dr. Suman Paul
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