

**CURRICULUM FOR
DIPLOMA OF ASSOCIATE
ENGINEER
IN
PETROLEUM TECHNOLOGY
(3 - Years Course)**

**SCHEME OF STUDIES FOR 3 YEARS DIPLOMA OF ASSOCIATE
ENGINEER IN PETROLEUM TECHNOLOGY**

<u>FIRST YEAR</u>					T	P	C	Page
1.	Gen	111	Islamyat & Pakistan Studies	1	0	1	3	
2.	Eng	112	English		2	0	2	12
3.	Math	113	Applied Mathematics-I		3	0	3	14
4.	Phy	123	Applied Physics		2	3	3	19
5.	Chem	133	Applied Chemistry		2	3	3	27
6.	Comp	122	Computer Applications		1	3	2	34
7.	MT	142	Basic Engineering Drawing	1	3	2	39	
8.	Pet	113	Fundamentals of Petroleum Technology		2	3	3	44
9.	Pet	123	Workshop Practice-I	1	6	3	49	
10.	Pet	132	Occupational Health, Safety & Environment	2	0	2	54	
Total					17	21	24	
<u>SECOND YEAR</u>								
1	Gen	211	Islamyat & Pakistan Studies		1	0	1	62
2	Math	213	Applied Mathematics		3	0	3	68
3	Mgm	211	Business Communication		1	0	1	73
4	ET	212	Applied Electricity & Electronics		1	3	2	76
4	Pet	213	Petroleum Geology		2	3	3	80
5	Pet	223	Fluid Mechanics & Thermodynamics		2	3	3	85
6	Pet	233	Petrochemicals & Industrial Stoichiometry		2	3	3	90
7	Comp	213	Computer Application Software		1	6	3	95
8	Pet	243	Drilling Technology		2	3	3	101
10	Pet	261	Workshop Practice –II		0	3	1	106
Total					15	24	23	
<u>THIRD YEAR</u>								
1	Gen	311	Islamyat & Pakistan Studies		1	0	1	111
2	Pet	313	Petroleum Refining		2	3	3	118
3	Pet	323	Well logging and Testing		2	3	3	124
4	Pet	333	Gas Technology		2	3	3	128
5	Pet	343	Petroleum Production Technology		2	3	3	135
6	Ar	133	Basic Computer in Petroleum Technology		1	6	3	140
7	Pet	353	Fuels and Combustion		2	3	3	145
8	Pet	363	Instrumentation and Control		2	3	3	149
9	Mgm	221	Business Management and Industrial Economics		1	0	1	156
Total					15	24	23	

FIRST YEAR

اسلامیات / مطالعہ پاکستان

GEN III

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

موضوعات حصہ اول اسلامیات

کتاب و سنت۔

(ا) قرآن مجید۔

1- تعارف قرآن مجید 2- نزول قرآن 3- مکی ومدنی سورتوں کی خصوصیات 4- وحی کی اقسام 5- پندرہ منتخب آیات مع ترجمہ۔

- 1.1 تنالو البر حتی تنفقوا ممالککم۔
- 1.2 واعتصموا بحبل اللہ جمیعاً ولا تفرقوا۔
- 1.3 ولا یجرمنکم شنان قوم علی ان لا تعدلوا۔
- 1.4 ان اللہ یامرکم ان تودوا الامانات الی اهلها۔
- 1.5 ان اللہ یامر بالعدل والاحسان۔
- 1.6 ان الصلوٰتہ تنہی عن الفحشاء وامنکر۔
- 1.7 لقد کان لکم فی رسول اللہ سۃ حسنہ۔
- 1.8 ان اکرمکم عند اللہ اتقاکم۔
- 1.9 وما آتاکم الرسول فخرزو ومانہی عنہوا انتہوا۔
- 1.10 و اوفوا بالعہد۔
- 1.11 وما شرورہن بالمعروف۔
- 1.12 یمحق اللہ الربو ویریبی الصمدقات۔
- 1.13 واصبر علی ما صابک۔
- 1.14 وقولوا قولا سدیداً۔
- 1.15 ان الدین عند اللہ السلام۔

(ب) سنت۔

- 1- سنت کی اہمیت۔
- 2- دس منتخب احادیث مع ترجمہ و تشریح

ٹی پی سی
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کل وقت: 20 گھنٹے

- 1- انملا عمال بالنيات۔
- 2- اما بنت لا تم مكارم الاخلاق۔
- 3- لايومن احدكم حق يحب الاخيه ما يحب النفسه
- 4- المسلم من سلم المسلمون من سلم المسلمون من السانه ويده۔
- 5- قل امننت بالله سلم استقم۔
- 6- خيركم خيركم لا اله۔
- 7- سباب المسلم فسوق وقتاله كفر۔
- 8- المومن اخو المومن۔
- 9- كل المسلم على المسلم حرام بمعه وماله وفرقه۔
- 10- ايتہ المنافق ثلاث اذا حديث كذب و افاو تمن خان و اذا وفد اخلف۔

دين اسلام

2.1 اسلام کے بنیادی مقاصد کی وضاحت اور انسان کی انفرادی و اجتماعی زندگی پر ان کے اثرات

1- توحید

2- رسالت

3- آخرت

4- ملائکہ

5- آسمانی کتب

2.2 عبادات

1- نماز روزہ حج زکوٰۃ

مندرجہ بالا عبادات کی اہمیت و فضیلت، حکمتیں اور انسان کی انفرادی و معاشرتی زندگی پر اس کے اثرات۔

تدریسی مقاصد

1 - قرآن مجید

عمومی مقصد: طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمات کا اصل سرچشمہ قرآن مجید ہے۔

خصوصی مقاصد: طالب علم اس قابل ہو جائے گا کہ

☆ قرآن مجید کی تعریف کر سکے

☆ قرآن مجید کے نزول کی صورت بیان کر سکے

☆ قرآن مجید کی کئی و مدنی سورتوں کی پہچان کر سکے

☆ منتخب آیات کا ترجمہ تشریح کر سکے

عمومی مقصد: یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی تعلیمات کا مفہوم کیا ہے

☆ قرآنی آیات کا ترجمہ و تشریح کر سکے

☆ قرآنی تعلیمات کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

2 - سنت

عمومی مقصد: طالب علم سنت نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا

خصوصی مقاصد:

☆ سنت کی تعریف بیان کر سکے

☆ سنت کی اہمیت و ضرورت کی وضاحت کر سکے

☆ سنت کی روشنی میں اسوہ حسنہ پر عمل کر سکے

3 - منتخب احادیث نبویہ

عمومی مقصد: احادیث کی روشنی میں اخلاقی اقدار سے آگاہی حاصل کر سکے

خصوصی مقصد: احادیث کا ترجمہ تشریح کر سکے

اسول اللہ ﷺ کے اسوۂ حسنہ کی پیروی کا جذبہ پیدا ہو سکے۔

4- دین اسلام

عمومی مقصد: دین اسلامی کے بنیادی مقاصد اور عبادات کے بارے میں جان سکے اور بیان کر سکے

خصوصی مقاصد:

لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے

اسلام کے بنیادی مقاصد کی اہمیت بیان کر سکے

اسلام کے بنیادی مقاصد سے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے

عبادت کے لفظی و اصطلاحی معنی بیان کر سکے

عقیدے اور عبادت کا فرق بیان کر سکے

عبادات (نماز، روزہ، حج، زکوٰۃ کے فوری احکامات اور انسانی زندگی پر ان کے اثرات بیان کر سکے

اسلامی مقاصد و عبادت کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکے۔

(غیر مسلم طلباء کے لئے)

GEN III

نصاب اخلاقیات سال اول

حصہ دوم مطالعہ پاکستان

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کل وقت: 20 گھنٹے

موضوعات

اخلاقیات کی تعریف اور اہمیت
 اخلاقیات کا معیار (قانون، عقل، الہمی کتب)
 مندرجہ ذیل اخلاق کی وضاحت

☆ دیانتداری

☆ وفاداری

☆ نظم و ضبط

☆ راست گوئی

☆ صبر و استقلال

☆ حوصلہ مندی

☆ وقت کی پابندی

☆ صفائی

☆ اعتماد

☆ باہمی احترام

☆ مصلحت

نصاب اخلاقیات (سال اول)

تدریسی مقاصد

عمومی مقاصد: اعلیٰ اخلاق کی وجہ سے ملکی ترقی کر سکے

خصوصی مقاصد: طالب اس علم سے اس قابل ہوگا کہ

- ☆ موضوعات کا مطلب بیان کر سکے
- ☆ عملی زندگی سے مثالوں کی نشاندہی کر سکے
- ☆ اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
- ☆ دیانت داری کی اہمیت بیان کر سکے
- ☆ وفاداری کی اہمیت بیان کر سکے
- ☆ نظم و ضبط کی افادیت بیان کر سکے
- ☆ صدق بیان کی ضرورت بیان کر سکے
- ☆ حوصلہ مندی کے فوائد بیان کر سکے
- ☆ وقت کی پابندی کے فوائد بیان کر سکے
- ☆ صفائی اور باہمی اختیار سے حسن کارکردگی کو بیان کر سکے
- ☆ مصلحت کے فوائد بیان کر سکے۔

نصاب (سال اول) GEN III

کل وقت: 12 گھنٹے

مطالعہ پاکستان

حصہ دوم

موضوعات

- ☆ حریت فکر: مسلمان قوم میں آزادی فکر کی تاریخ۔ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت۔
- ☆ ذہنی و جسمانی غلامی کے نقصانات
- ☆ نظریہ پاکستان
- ☆ قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض و غایت نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان اور علامہ اقبال اور قائد اعظم کے ارشادات کی روشنی میں۔
- ☆ نظریہ پاکستان کا تاریخی پہلو
- ☆ محمد بن قاسم کی آمد: مجدد الف ثانی اور شاہ ولی اللہ کی تبلیغی خدمات سید شہید کی تحریک مجاہدین۔
- ☆ تعلیمی تحریکیں
- ☆ علی گڑھ۔ ندوت العلماء۔ دیوبند۔ مدرسۃ الاسلام۔ (سندھ) اسلامیہ کالج (پشاور) انجمن حمایت اسلام (لاہور)۔

مطالعہ پاکستان (حصہ دوم)

تدریسی مقاصد

حریت فکر:

عمومی مقصد:

طالب علم یہ جان لے کہ اسلام میں اور مسلمان قوم میں آزادی فکر کی اہمیت ہے۔
خصوصی مقاصد:

☆ حریت فکر کا معنی و مفہوم بیان کر سکے۔

☆ آزادی فکر کی اہمیت بیان کر سکے۔

☆ خصوصاً اسلام میں آزادی اظہار رائے کی اہمیت بیان کر سکے۔

☆ ذہنی غلامی کے قومی سطح پر نقصانات کو بیان کر سکے۔

☆ جسمانی غلامی کے قومی سطح پر نقصانات بیان کر سکے۔

نظریہ پاکستان

عمومی مقصد:

نظریہ پاکستان (دین اسلام) سے پوری طرح واقفیت ہو جائے

خصوصی مقاصد:

☆ نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے

☆ نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے

☆ علامہ اقبال اور قائد اعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد:

☆ نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے

خصوصی مقاصد:

☆ محمد بن قاسم کے بارے میں بیان کر سکے

- ☆ محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکے۔
- ☆ محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکے۔
- ☆ بیان کر سکے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکتہ آغاز کیا ہے۔
- ☆ مجدد الف ثانی کی علمی خدمات بیان کر سکے۔
- ☆ شاہ ولی اللہ کی علمی خدمات بیان کر سکے۔
- ☆ مجدد الف ثانی اور شاہ ولی اللہ نے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکے

علمی تحریکیں

عمومی مقصد:

- ☆ برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد:

- ☆ علی گڑھ۔ دیوبند۔ ندوت العلماء مدرسۃ السلام۔ اسلامیہ کالج۔ انجمن حمایت اسلام نے تعلیم کے ذریعہ شعور مسلمانوں میں پیدا کیا اسے بیان کر سکے
- ☆ آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کر سکے۔

ENGLISHCODE: **Eng-112**

P	T	C
2	0	2

TOTAL CONTACT HOURS:

Theory	64
Practical	0

AIMS:

At the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day – to - day use and will inculcate skills of reading, writing, and comprehension.

COURSE CONTENTS**Paper A:**

- | | |
|--|-----------------|
| 1. Prose/Text | 16 Hours |
| 1.1 First eight essays of Intermediate English Book –II | |
| 2. Cloze Test | 04 Hours |
| 2.1 A passage comprising 50 to 100 words will be selected from the text. Every 11 th word or any word for that matter will be omitted. The number of missing word will range between 5 and 10. The chosen word may be or may not be the one used in the text, but it should be an appropriate word. | |

Paper B

- | | |
|---|-----------------|
| 3. Grammar | 26 Hours |
| 3.1 Sentence structure | |
| 3.2 Tenses. | |
| 3.3 Parts of Speech. | |
| 3.4 Punctuation. | |
| 3.5 Change of narration. | |
| 3.6 One word for several. | |
| 3.7 Words often confused | |
| 4. Composition | 08 Hours |
| 4.1 Letters/Messages. | |
| 4.2 Job application letter. | |
| 4.3 Application for Character Certificate/grant of scholarship. | |
| 4.4 Telegrams, Cablegrams and radiograms, Telexes, Facsimiles, e-mails. | |
| 4.5 Essay Writing. | |
| 4.6 Technical Education, science and our Life, computers, Environmental pollution, Duties of student. | |
| 5. Translation | 10 Hours |
| 5.1 Translation from Urdu into English. | |

For foreign students: A paragraph or a Dialogue.

BOOKS RECOMMENDED

1. Intermediate English Book-II
2. An English Grammar and Composition of Intermediate level.
3. A Handbook of English Students by Gatherer

INSTRUCTIONAL OBJECTIVES

PAPER A:

1. **Demonstrate Better Reading, Comprehension, and Vocabulary**
 - 1.1 Manipulate skimming and scanning of the text.
 - 1.2 Identify new ideas.
 - 1.3 Reproduce facts, characters in own words.
 - 1.4 Write summary of stories.
2. **Understand Facts of the Text**
 - 2.1 Rewrite words to fill in the blanks recalling the text.
 - 2.2 Use own words to fill in the blanks.

PAPER B:

3. **Apply the Rule of Grammar in Writing and Speaking**
 - 3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
 - 3.2 State classification of time i.e., present, past, and future tense and use verb correctly in different forms to denote relevant time.
 - 3.3 Identify function words and content words.
 - 3.4 Use makes of punctuation to make sense clear.
 - 3.5 Relate what a person says in direct and indirect forms.
 - 3.6 Compose his writings.
 - 3.7 Distinguish between confusing words.
4. **Apply the concept of composition writing to Practical Situations**
 - 4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship.
 - 4.2 Facsimiles.
 - 4.3 Describe steps of good composition writing.
 - 4.4 Describe features of a good composition.
 - 4.5 Describe methods of composition writing.
 - 4.6 Use these concepts to organize facts and describe them systematically in practical situation.
5. **Apply the Rules of Translation**
 - 5.1 Describe confusion.
 - 5.2 Describe rules of translation.
 - 5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

APPLIED MATHEMATICS-I

CODE: **Math-113**

P	T	C
3	0	3

TOTAL CONTACT HOURS:

Theory	96
Practical	0

PRE-REQUISTE: *Must have completed a course of Elective Mathematics at Matric level.*

AIMS:

After completing the course, the students will be able to:

1. Solve problems of Algebra, Trigonometry, Vectors, Mensuration, Matrices, and Determinants.
2. Develop skill, mathematical aptitude, and logical perception in the use of mathematical instruments required in the technological fields.
3. Acquired mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

- | | | |
|-----------|--|-----------------|
| 1. | Quadratic Equations | 6 Hours. |
| | 1.1 Standard form.
1.2 Solution.
1.3 Nature of Roots.
1.4 Sum and product of roots
1.5 Formation.
1.6 Problems. | |
| 2. | Arithmetic Progression and Series | 3 Hours. |
| | 2.1 Sequence.
2.2 Series.
2.3 n th term.
2.4 Sum of the first n terms
2.5 Means.
2.6 Problems. | |
| 3. | Geometric Progression and Series | 3 Hours. |
| | 3.1 n th term.
3.2 Sum of the first n terms.
3.3 Means.
3.4 Infinite Geometric Progression.
3.5 Problems. | |
| 4. | Binomial Theorem | 6 Hours |
| | 4.1 Factorials.
4.2 Binomial expression. | |

- 4.3 Binomial Coefficient.
 4.4 Statement.
 4.5 The general term.
 4.6 The Binomial series.
 4.7 Problems.
- 5. Partial Fractions 6 Hours.**
 5.1 Introduction.
 5.2 Linear distinct factors case I.
 5.3 Linear repeated factors case II.
 5.4 Quadratic distinct factors case III.
 5.5 Quadratic repeated factors case IV.
- 6. Fundamentals of Trigonometry 6 Hours.**
 6.1 Angles.
 6.2 Quadrants.
 6.3 Measurements of angles.
 6.4 Relation between hexadecimal and circle system.
 6.5 Relation between length of a circular arc and the radian measure of its central angle.
 6.6 Problems.
- 7. Trigonometric Functions and Ratios 6 Hours.**
 7.1 Trigonometric functions of any angle.
 7.2 Signs of trigonometric functions.
 7.3 Trigonometric ratios of particular angles.
 7.4 Fundamental identities.
 7.5 Problems
- 8. General Identities 6Hours.**
 8.1 The fundamental law.
 8.2 Deductions.
 8.3 Sum and difference formulae.
 8.4 Double angle identities.
 8.5 Half angle identities.
 8.6 Conversion of sum or difference to products.
 8.7 Problems.
- 9. Solution of Triangles 6 Hours**
 9.1 The law of Sines.
 9.2 The law of Cosines.
 9.3 Measurement of heights and distances.
 9.4 Problems.
- 10. Mensuration of Solids 30 Hours**
 10.1 Review of regular plane figures.
 10.2 Prisms.
 10.3 Cylinders.
 10.4 Pyramids.

- 10.5 Cones.
- 10.6 Frusta.
- 10.7 Spheres.

11. Vectors**9 Hours**

- 11.1 Scalars and Vectors.
- 11.2 Addition and Subtraction.
- 11.3 The unit vectors I, J, K.
- 11.4 Direction Cosines.
- 11.5 Scalar or Dot Product.
- 11.6 Deductions.
- 11.7 Dot Product in terms of orthogonal components.
- 11.8 Vector or cross products.
- 11.9 Deductions.
- 11.10 Analytical expression for $a \times b$.
- 11.11 Problems.

12. Matrices and Determinants**9 Hours**

- 12.1 Definition of matrix.
- 12.2 Rows & columns.
- 12.3 Order of a matrix.
- 12.4 Algebra of matrices.
- 12.5 Determinants.
- 12.6 Properties of determinants.
- 12.7 Solution of linear equations.
- 12.8 Problems.

BOOKS RECOMMENDED

1. Ghulam Yasin Minhas, "Technical Mathematics" Vol-I, Ilmi Kitab Khana, Lahore.
2. Riaz Ali Khan, "Polytechnic Mathematic Series", Vol-I and II, Majeed Sons, Faisalabad.
3. Sana Ullah Bhatti, "A Text Book of Analytic Geometry and Calculus", Punjab Text Book Board Lahore.

INSTRUCTIONAL OBJECTIVES**1. Understand Different Methods for the Solution of Quadratic Equations.**

- 1.1 Define a standard quadratic equation.
- 1.2 Use method of factorization and method of completing the square for solving the equations.
- 1.3 Derive quadratic formula.
- 1.4 Write expression for the discriminant.
- 1.5 Explain nature of the roots of quadratic equations.
- 1.6 Calculate the sum and Product of the roots.
- 1.7 Form a quadratic equation from the given roots.
- 1.8 Solve problems involving quadratic equations.

2. Understand Apply Concept Of Arithmetic Progression and Series

- 2.1 Define an arithmetic sequence and a series.
- 2.2 Derive formula for the nth term of an A.P.
- 2.3 Explain Arithmetic Mean between two numbers.
- 2.4 Insert n arithmetic means between two numbers.
- 2.5 Drive formulas for summation of an Arithmetic series.
- 2.6 Solve problems on arithmetic Progression and Series.
- 2.7

3. Understand Geometric Progression and Series.

- 3.1 Define a Geometric Progression and a series.
- 3.2 Drive formula for the nth term of a G.P.
- 3.3 Explain geometric means between two numbers.
- 3.4 Insert n geometric means between two numbers.
- 3.5 Drive a formula for the summation of geometric series.
- 3.6 Deduce a formula for the summation of an infinite geometric series.
- 3.7 Solve problem using these formulas.

4. .Expand and Extract Roots of a Binomial.

- 4.1 State binomial theorem for positive integral index.
- 4.2 Explain binomial coefficients: $(n,0), (n,1), \dots, (n,r), \dots, (n,n)$.
- 4.3 Derive expression for the general term.
- 4.4 Calculate the specified terms.
- 4.5 Expand a binomial of a given index.
- 4.6 Extract the specified roots.
- 4.7 Compute the approximate value to given decimal place.
- 4.8 Solve problems involving binomials.

5. Resolve a Single Fraction into Partial Fraction using different Methods.

- 5.1 Define a partial fraction, a proper and improper fraction.
- 5.2 Explain all the four types of partial fractions.
- 5.3 Setup equivalent partial fractions for each type.
- 5.4 Explain the methods for finding constants involved.
- 5.5 Resolve a single fraction into partial fractions.
- 5.6 Solve problems involving all the four types.

6. Understand the Systems of Measurement of Angles.

- 6.1 Define angles and the related terms.
- 6.2 Illustrate the generation of an angle.
- 6.3 Explain hexadecimal and circular systems for the measurement of angle.
- 6.4 Drive the relationship between radian and degree.
- 6.5 Convert radians to degrees and vice versa.
- 6.6 Derive a formula for the circular measure of a central angle.
- 6.7 Use this formula for solving problems.

7. Apply Basic Concepts and Principles of Trigonometric Fractions.

- 7.1 Define the basic trigonometric functions/ ratio of an angle as ratios of the sides of a right triangle.
- 7.2 Derive fundamental identities.
- 7.3 Find trigonometric ratios of particular angles.
- 7.4 Draw the graph of trigonometric functions.

7.5 Solve problem involving trigonometric functions.

8. Use Trigonometric Identities in Solving Technological Problems.

- 8.1 List fundamental identities.
- 8.2 Prove the fundamental law.
- 8.3 Deduce important results.
- 8.4 Derive sum and difference formulas.
- 8.5 Establish half angle, double angle, and triple angle formulas.
- 8.6 Convert sum or difference into product and vice versa.
- 8.7 Solve problems.

9. Use concepts, Properties, and Laws of Trigonometric Functions for solving Triangles.

- 9.1 Define angle of elevation and angle of depression.
- 9.2 Prove the law of Sine and law of Cosines.
- 9.3 Explain elements of triangle.
- 9.4 Solve triangles and the problem involving heights and distances.

10. Use principal of Mensuration in Finding Surfaces, Volumes, and Weights of Solids.

- 10.1 Define mensuration of plane and solid figures.
- 10.2 List formulas for perimeters and area of plane figures.
- 10.3 Define pyramid and cone.
- 10.4 Define frusta of Pyramid and cone.
- 10.5 Define a sphere and a shell
- 10.6 Calculate the total surface and volume of each type of solid.
- 10.7 Compute weight of solids.
- 10.8 Solve problems of these solids.

11. Use the concept and Principles of vectors in solving Technological Problems

- 11.1 Define vector quantity.
- 11.2 Explain addition and subtraction of vectors.
- 11.3 Illustrate unit vectors I, J, K.
- 11.4 Express a vector in the component form.
- 11.5 Explain magnitude, unit vector, direction cosines of a vector.
- 11.6 Derive analytic expression for dot product and cross product of two vectors.
- 11.7 Deduce conditions of perpendicularity and parallelism of two vectors.
- 11.8 Solve problem.

12. Use the Concept of Matrices & Determinants in solving Technological Problems.

- 12.1 Define a matrix and a determinant.
- 12.2 List types of matrices.
- 12.3 Define transpose, adjoint, and inverse of a matrix.
- 12.4 State properties of determinants.
- 12.5 Explain basic concepts.
- 12.6 Explain algebra of matrices.
- 12.7 Solve linear equations by matrices.
- 12.8 Explain the solution of a determinant.
- 12.9 Use Grammars Rule of solving linear equations.

APPLIED PHYSICS

CODE: Phy-123

P	T	C
2	3	3

TOTAL CONTACT HOURS:

Theory	64
Practical	96

AIMS:

The students will be able to understand the fundamental principles and concepts of physics, use these to solve problems in practical situations/technological courses and understand concepts to learn advance physics and technical courses.

COURSE CONTENTS

- | | |
|---|----------------|
| <p>1. Measurements</p> <p>1.1 Fundamental units and derived units.</p> <p>1.2 Systems of measurement and S.I Units.</p> <p>1.3 Concept of dimensions, dimensional formula.</p> <p>1.4 Conversion from one system to another.</p> <p>1.5 Significant Figures.</p> | 2 Hours |
| <p>2. Scalars and Vectors</p> <p>2.1 Revision of head to tail rule.</p> <p>2.2 Laws of parallelogram, triangle, and polygon of forces.</p> <p>2.3 Resolution of a vector.</p> <p>2.4 Addition of vectors by rectangular components.</p> <p>2.5 Multiplication of two vectors, dot product and cross product.</p> | 4 Hours |
| <p>3. Motion.</p> <p>3.1 Review of laws and equations of motion.</p> <p>3.2 Law of conservation of momentum.</p> <p>3.3 Angular motion.</p> <p>3.4 Relation between linear and angular motion.</p> <p>3.5 Centripetal acceleration and force.</p> <p>3.6 Equations of angular motion.</p> | 4 Hours |
| <p>4. Torque, Equilibrium , and Rotational Inertia</p> <p>4.1 Torque.</p> <p>4.2 Center of gravity and center of mass.</p> <p>4.3 Equilibrium and its conditions.</p> <p>4.4 Torque and angular acceleration.</p> <p>4.5 Rotational inertia.</p> | 4 Hours |
| <p>5. Wave Motion.</p> <p>5.1 Review Hook's law of elasticity.</p> <p>5.2 Motion under an elastic restoring force.</p> <p>5.3 Characteristics of simple harmonic motion.</p> <p>5.4 S.H.M and circular motion.</p> <p>5.5 Simple pendulum.</p> | 4 Hours |

- 5.6 Wave form of S.H.M.
 5.7 Resonance.
 5.8 Transverse vibration of a stretched string.
- 6. Sound 4 Hours**
- 6.1 Longitudinal Waves.
 6.2 Intensity, loudness, pitch, and quality of sound.
 6.3 Units of intensity of level and frequency response of ear.
 6.4 Interference of sound waves, silence zones, beats.
 6.5 Acoustics.
 6.6 Doppler Effect.
- 7. Light 5 Hours**
- 7.1 Review law of reflection and refraction
 7.2 Image formation by mirrors and lenses.
 7.3 Optical instruments.
 7.4 Wave theory of light.
 7.5 Interface, diffraction, polarization of light waves.
 7.6 Applications of polarization in sun glasses, optical activity and stress analysis.
- 8. Optical Fiber 2 Hours**
- 8.1 Optical communication and problems.
 8.2 Review total internal reflection and critical angle.
 8.3 Structure of optical fiber.
 8.4 Fiber material and manufacture.
 8.5 Optical fiber –Uses.
- 9. Lasers 3 Hours**
- 9.1 Corpuscular theory of light.
 9.2 Emission and absorption of light.
 9.3 Stimulated absorption and absorption of light.
 9.4 Laser principle.
 9.5 Structure and working of lasers.
 9.6 Types of lasers with brief description.
 9.7 Applications, basic concepts.
 9.8 Material processing.
 9.9 Laser welding.
 9.10 Laser assisted machining.
 9.11 Micro machining.
 9.12 Drilling, scribing and making.
 9.13 Printing.
 9.14 Laser in medicines.
- 10. Heat 4 Hours**
- 10.1 Review of calorimetry and gas laws.
 10.2 Thermal expansion of solids, liquid, and gases.
 10.3 Heat of fusion, vaporization.
 10.4 Humidity, absolute and relative.
 10.5 Law of cooling.
 10.6 Thermoelectricity.

- 10.7 Thermocouple.
- 11. Thermodynamics** **4 Hours**
- 11.1 Heat energy and internal energy.
 - 11.2 First law of thermodynamics.
 - 11.3 Isometric and adiabatic processes.
 - 11.4 Efficiency of heat engine.
 - 11.5 Second law of thermodynamics (both statements).
 - 11.6 Heat engine and refrigerator.
- 12. Transfer of Heat** **5 Hours**
- 12.1 Review modes of transfer of heat.
 - 12.2 Emission and absorption of heat.
 - 12.3 Black Body Radiation.
 - 12.4 Laws of energy distribution.
 - 12.5 Plank's Quantum Theory.
 - 12.6 The photoelectric effect.
 - 12.7 X-rays, production, properties, and uses.
- 13. Electromagnetic Waves** **3 Hours**
- 13.1 Magnetic field around a current carrying conductor.
 - 13.2 Electric field induced around a changing magnetic flux.
 - 13.3 Moving fields.
 - 13.4 Types of electromagnetic waves.
 - 13.5 Generation of radio waves.
 - 13.6 Spectrum of electromagnetic waves.
- 14. Atomic Nucleus** **5 Hours**
- 14.1 Structure of the nucleus.
 - 14.2 Radioactivity.
 - 14.3 Radioactive series.
 - 14.4 Transmutation of elements.
 - 14.5 The fission reaction.
 - 14.6 The fusion reaction.
 - 14.7 The nuclear reactor.
- 15. Nuclear Radiations.** **5 Hours**
- 15.1 Properties and interaction with matter.
 - 15.2 Radiation detectors.
 - 15.3 Radiation damage and its effects.
 - 15.4 Radiation therapy
 - 15.5 Radioactive tracers.
 - 15.6 Application of radiation techniques in archeology, agriculture, chemical industry, polymerization, sterilization, food preservation, gauging and control, radioactivity.
- 16. Artificial Satellite** **2 Hours**
- 16.1 Review law of gravitation.
 - 16.2 Escape Velocity.
 - 16.3 Orbital Velocity.
 - 16.4 Geosynchronous and geostationary satellites.

16.5 Use of satellites in data communication.

17. Magnetic Materials

2 Hours

17.1 Magnetism.

17.2 Domains theory

17.3 Para, Dia, and Ferromagnetism and magnetic materials.

17.4 B.H. Curve and hysteresis loop.

18. Semiconductor Materials

2 Hours

18.1 Crystalline structure of solids.

18.2 Conductors, semiconductors, insulators.

18.3 P-type and N-type materials.

18.4 P-N junction.

18.5 P-N junction as a diode.

18.6 Photovoltaic cell (solar cell).

PRACTICALS

96 Hours

1. Draw graph representing the functions:
 - a) $y = mx$ for $m = 0, 0.5, 1, 2$.
 - b) $y = x^2$
 - c) $y = 1/x$
2. Find the volume of a given solid cylinder using vernier calipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Prove that force is directly proportional to (a) mass (b) acceleration, using Fletchers' Trolley.
5. Verify law of parallelogram of forces using Grave-sand apparatus.
6. Verify law of triangle of forces and Lami's Theorem.
7. Determine the weight of a given body using.
 - a) Law of parallelogram of force.
 - b) Law of triangle of force.
 - c) Lami's theorem.
8. Verify law of polygon of force using Grave- sand apparatus.
9. Locate the position and magnitude of resultant of like parallel forces.
10. Determine the resultant of two unlike parallel forces.
11. Find the weight of a given body using principle of moments.
12. Locate the center of gravity of regular and irregular shaped bodies.
13. Find young's Modulus of Elasticity of a metallic wire.
14. Verify Hook's Law using helical spring.
15. Study of frequency of stretched string with length.
16. Study of variation of frequency of stretched sting with tension.
17. Study resonance of air column in resonance tube and find velocity of sound.
18. Find the frequency of the given tuning fork using resonance tube.
19. Find velocity of sound in rod by Kundt's tube.
20. Verify rectilinear propagation of light and study shadow formation.
21. Study effect of rotation of plane mirror on reflection.
22. Compare the refractive indices of given glass slabs.
23. Find focal length of concave mirror by locating center of curvature.

24. Find focal length of concave mirror by object and image method.
25. Find focal length of concave mirror with converging.
26. Find refractive index of glass by apparent depth.
27. Find refractive index of glass by spectrometer.
28. Find focal length of converging lens by plane mirror.
29. Find focal length of converging lens by displacement method
30. Find focal length of diverging lens using converging lens.
31. Find focal length of diverging lens using concave mirror.
32. Find angular magnification of an astronomical telescope.
33. Find angular magnification of a simple microscope (magnifying glass).
34. Find angular magnification of a compound microscope.
35. Study working and structure of camera.
36. Study working and Structure of Sextant.
37. Compare the different scales of temperature and verify the conversion formula.
38. Determine the specific heat of lead shots.
39. Find the coefficient of linear expansions of a metallic rod.
40. Find the heat of fusion of ice.
41. Find the heat of vaporization.
42. Determine relative humidity using hygrometer.

BOOKS RECOMMENDED

1. Tahir Hussain, "Fundamentals of Physics" Vol-I and II.
2. Farid Khuwaja, "Fundamentals of Physics" Vol- I and II.
3. Wells and slusher, " Schaum's Series Physics"
4. Nelcon and Oyborn "Advanced level practical Physics".
5. Mehboob Ilahi Malik and Inam-ul-Haq "Practical Physics".
6. Wilson "lasers –Principles and Applications.
7. M. Aslam Khan and M. Akram Sandhu " Experimental Physics Notes"

INSTRCTIONAL OBJECTIVES

1. Use concepts of Measurement to Practical Situations and Technological Problems.

- 1.1 Write dimensional formulae for physical quantities.
- 1.2 Derive units using dimensional equations.
- 1.3 Convert a measurement from one system to another.
- 1.4 Use concepts of measurement and significant figures in problem solving.

2. Use Concepts of scalars and Vectors in Solving Problems involving these Concepts.

- 2.1 Explain laws of parallelogram, triangle, and polygon of forces.
- 2.2 Describe method of resolution of vector into components.
- 2.3 Describe method of addition of vectors by rectangular components.
- 2.4 Differentiate between dot product and cross product of vectors by rectangular components.
- 2.5 Use the concept in solving problems involving addition, resolution, and multiplication of vectors.

3. Use the law of Conservation of Momentum and Concepts of Angular Motion to Practical situations.

- 3.1 Use law of conservation of momentum to practical/ technological problems.
- 3.2 Explain relation between linear and angular motion.
- 3.3 Use concepts and equations of angular motion to solve relevant technological problems.

4. Use Concepts of Torque, Equilibrium, and Rotational Inertia to Practical Situations/ Problems.

- 4.1 Explain Torque.
- 4.2 Distinguish between center of gravity and center of mass.
- 4.3 Explain rotational equilibrium and its conditions.
- 4.4 Explain rotational inertia giving examples.
- 4.5 Use the above concepts in solving technological problems.

5. Use concepts of Wave Motion in solving relevant Problems.

- 5.1 Explain Hook's law of elasticity.
- 5.2 Derive formula for motion under an elastic restoring force.
- 5.3 Derive formula for simple harmonic motion and simple pendulum.
- 5.4 Explain wave form with reference to S.H.M to solve relevant problems.
- 5.5 Explain resonance.
- 5.6 Explain transverse vibration of a stretched string.
- 5.7 Use the above concepts and formulae of S.H.M to solve relevant problems.

6. Understand Concept of Sound.

- 6.1 Describe longitudinal wave and its propagation.
- 6.2 Explain the concepts; Intensity, Loudness, Pitch, and Quality of sound.
- 6.3 Explain Units of intensity of level and frequency response of ear.
- 6.4 Explain phenomena of silence zone, beats.
- 6.5 Explain acoustics of buildings.
- 6.6 Explain Doppler Effect giving mathematical expressions.

7. Use the Concepts of Geometrical Optics to Mirrors and Lenses and Understand waves Theory of Light.

- 7.1 Explain laws of reflection and refraction.
- 7.2 Use mirror formula to solve problems.
- 7.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g microscopes, telescopes, camera, and sextant.
- 7.4 Explain wave theory of light.
- 7.5 Explain phenomena of interference, diffraction, polarization of light waves.
- 7.6 Describe uses of polarization given in the course contents.

8. Understand the Structure, Working and Uses of Optical Fiber.

- 8.1 Explain the structure of the optical fiber.

- 8.2 Explain its principle of working.
- 8.3 Describe uses of optical fiber in industry and medicine.

9. Understand the Structure, Working, and Uses of Lasers

- 9.1 Explain the stimulated emission of radiation.
- 9.2 Explain the laser principle.
- 9.3 Describe the structure and working of lasers.
- 9.4 Distinguish between types of lasers.
- 9.5 Describe the applications of lasers in the fields mentioned in the course contents.

10. Understand Concepts of Heat.

- 10.1 Explain calorimetry
- 10.2 Explain gas laws giving mathematical expressions.
- 10.3 Explain thermal expansion of solids, liquids, and gases.
- 10.4 Distinguish between heat of fusion, vaporization.
- 10.5 Distinguish between absolute and relative humidity.
- 10.6 Describe law of cooling.
- 10.7 Explain basic concepts of thermoelectricity.
- 10.8 Describe thermocouple giving its principle, structure, and working.

11. Understand Laws of Thermodynamics

- 11.1 Distinguish between heat energy and internal energy.
- 11.2 Explain first law of thermodynamics giving its applications.
- 11.3 Distinguish between isometric and adiabatic processes.
- 11.4 Explain second law of thermodynamics describing alternate statements.
- 11.5 Distinguish between work of heat engine and refrigerator.

12. Understand Laws of Energy Distribution and Emission of Radiation

- 12.1 Explain modes of transfer of heat.
- 12.2 Explain Black Body Radiation and laws of energy distribution.
- 12.3 Describe Plank's Quantum Theory.
- 12.4 Explain photoelectric effect.
- 12.5 Explain production, properties, and uses of X-rays.

13. Understand Natural , Types, Generation, and Spectrum of Electromagnetic Waves

- 13.1 Explain magnetic field due to current, and electric field due to changing magnetic flux.
- 13.2 Explain moving fields.
- 13.3 Describe types of electromagnetic waves.
- 13.4 Explain generation of Radio waves.
- 13.5 Explain spectrum of electromagnetic waves.

14. Understand the Structure of the Atomic Nucleus and Relevant Activities.

- 14.1 Describe the structure of the nucleus.
- 14.2 Explain radioactivity and radioactive series.
- 14.3 Explain transmutation of elements.
- 14.4 Distinguish between fission reaction and fusion reaction.
- 14.5 Explain the structure and working of the nuclear reactor.

15. Understand Nuclear Radiations, Their Effects, and Uses.

- 15.1 Describe properties of nuclear radiations and their interaction with matter.
- 15.2 Explain working of radiation detectors.
- 15.3 Explain damaging effects of nuclear radiations.
- 15.4 Explain radiation therapy.
- 15.5 Describe radioactive tracers.
- 15.6 Describe applications of radiation techniques in course contents.

16. Understand Types and Uses of Artificial Satellites

- 16.1 Explain escape velocity.
- 16.2 Explain orbital velocity.
- 16.3 Distinguish between geosynchronous and geostationary satellites.
- 16.4 Describe uses of artificial satellites in data communication.

17. Understand Basic Concepts and Classification of Magnetic Materials.

- 17.1 Explain domains theory of magnetism.
- 17.2 Distinguish between Para, Dia, and Ferro-magnetism and magnetic materials.
- 17.3 Distinguish between B and H.
- 17.4 Describe B.H. Curve.
- 17.5 Describe hysteresis loop.

18. Understand Basic Concepts of Semi- Conductor Materials and Their Uses.

- 18.1 Explain crystalline structure of solids.
- 18.2 Distinguish between conductors, semiconductors, insulators.
- 18.3 Describe semiconductors giving examples with reference to their structure.
- 18.4 Distinguish between P-type and N-type materials.
- 18.5 Explain working of P-N junction as a diode.
- 18.6 Explain working of solar cell.

APPLIED CHEMISTRY

CODE:	Chem-133	T	P	C
		2	3	3

TOTAL CONTACT HOURS:

Theory	64
Practical	96

PRE-REQUISITE:

The student must have studied the subject of Elective Chemistry at Secondary School level.

AIMS:

After studying this course the students:

1. Understands the significance and role of chemistry in the development of modern technology.
2. Becomes acquainted with the basic principles of chemistry.
3. Knows the scientific methods of production, preparation, and use of materials of industrial and technological significance.
4. Gains skill for the efficient conduct of practical's in a chemistry laboratory.

COURSE CONTENTS

- | | | |
|-----------|---|----------------|
| 1. | Fundamental Concepts of chemistry | 6 Hours |
| | 1.1 Chemistry in petroleum and chemical industry. | |
| | 1.2 Elements, compounds, and mixtures. | |
| | 1.3 Atom, atomic weight, molecule, valency, molecular weight. | |
| | 1.4 Symbols, formulae, and equations. | |
| | 1.5 Molecular formula, and Empirical formula. | |
| | 1.6 Physical and chemical changes. | |
| | 1.7 Physical and chemical properties. | |
| | 1.8 Acids, bases, and salts. | |
| | 1.9 Law of conservation of mass. | |
| | 1.10 Law of constant proportion. | |
| | 1.11 Law of reciprocal proportion. | |
| | 1.12 Law of multiple proportion. | |
| 2. | Structure of Atom and Chemical Bonding | 8 Hours |
| | 2.1 Fundamental particles of atom. | |
| | 2.2 Bohr's model of atom and its defects. | |
| | 2.3 Energy levels, sub-energy levels and orbitals. | |
| | 2.4 Electronic configuration. | |
| | 2.5 Ionization potential, electronegativity, and electron affinity. | |
| | 2.6 Ionic bond with examples. | |
| | 2.7 Covalent bond (polar and nonpolar), Sigma and Pi bonds with examples. | |
| | 2.8 Coordinate covalent bond with examples. | |
| 3. | Physical States of Matter | 6 Hours |
| | 3.1 Physical states of matter, explanation with the help of kinetic molecular theory. | |
| | 3.2 Properties of liquids; surface tension, viscosity, capillary action, diffusion. | |

- 3.3 Behavior of gases, kinetic theory of gases.
 - 3.4 Boyle's and Charles law, general gas equation, problems relating to these laws.
 - 3.5 Graham's low of diffusion, Dalton's law of partial pressures and Gay Lussac law.
 - 3.6 Isomorphism and polymorphism.
 - 3.7 Amorphous solids.
- 4. Metals and Alloys** **5 Hours**
- 4.1 Metals and non-metals
 - 4.2 Important ores; properties and uses of Cu, AL, Zn, and Fe Metals.
 - 4.3 Corrosion; Definition, causes and control.
 - 4.4 Alloys; introduction.
 - 4.5 Compositions, properties, and uses of bell metal, stainless steel, and brass.
- 5. Water** **4 Hours**
- 5.1 Sources, chemical nature, and properties of water.
 - 5.2 Impurities of water.
 - 5.3 Hardness of water.
- 6. Solutions and Colloids** **5 Hours**
- 6.1 Types of Solutions.
 - 6.2 Concentration.
 - 6.3 Solubility.
 - 6.4 Colloids.
- 7. Acid and Base** **5 Hours**
- 7.1 Concept of acid and base.
 - 7.2 Properties of acid and base.
 - 7.3 Strength of acid and base.
- 8. Halogens** **4 Hours**
- 8.1 Introduction to halogens.
 - 8.2 Preparation, properties, and uses of Chlorine.
 - 8.3 Preparation, properties, and uses of HCl.
- 9. Thermo chemistry** **4 Hours**
- 9.1 Introduction.
 - 9.2 Exothermic and endothermic reactions.
 - 9.3 Heat of reaction.
 - 9.4 Heat of formation.
 - 9.5 Heat of combustion.
 - 9.6 Heat of neutralization.
 - 9.7 Hess's law of constant heat summation.
- 10. Electrochemistry** **4 Hours**
- 10.1 Theory of ionization.
 - 10.2 Solubility product.
 - 10.3 Electrolytes and electrolysis.
 - 10.4 Faraday's laws of electrolysis.
 - 10.5 Conductivity of electrolytes.
 - 10.6 pH of solutions and pH scale.

10.7 Measurement of pH.

11. Organic Chemistry**12 Hours**

- 11.1 Introduction to Organic Chemistry.
- 11.2 Classification of hydrocarbons (Alkanes, Alkenes, Alkynes, Naphthenes, Aromatics).
- 11.3 Introduction to Alcohols.
- 11.4 Introduction to Alkyl Halides.

PRACTICALS**96 HOURS**

1. To study the working of Bunsen burner.
2. To study some elementary operations in glass blowing.
3. To weigh the chemicals on an analytical balance use of sensitive analytical balance)
4. To separate the ingredients of the given mixtures (sand and NaCl, alcohol and water, etc.)
5. To obtain distilled water from river water.
6. To determine the hardness of water.
7. Preparation of crystals of CuSO_4 , and KN O_3 .
8. To determine the Melting Points of given solids.
9. To determine the Boiling Points of given liquids.
10. To determine the specific gravity of given liquids such as different oils and other chemical compounds.
11. To determine the viscosity of given liquids by a viscometer.
12. To determine the solubility of common salt in water at room temperature.
13. To determine the effect of temperature on solubility.
14. To separate the mixture by sublimation.
15. To obtain alcohol from a mixture of alcohol and water by distillation. .
16. To determine the equivalent weight of magnesium and (to verify the law of constant Composition)
17. To determine the standard solutions of alkalis and acids e. g., NaOH, KOH, oxalic acid etc.
18. Prepare approximate solution of H_2SO_4 and determine its exact molality by titrating it against standard N/ 10 NaOH. .
19. To determine surface tension of given liquids by torsion balance.
20. To verify the Faraday's law of electrolysis
21. To determine pH of given solutions.
22. To separate the salts by.
 - Sublimation process
 - Filtration process
 - Sedimentation process
23. To study the analysis scheme.
24. Detection of acidic and basic radicals of salts.

BOOKS RECOMMENDED

1. Dr. Rehman Chaudhry, Dr. Zafar Iqbal, Dr. M.Munawar Iqbal, etc. "Text Book of Chemistry for class XI", Chohan Book Depot, Urdu bazaar Lahore.
2. B.S. Bhal, G.D. Tuli; "Essentials of Physical Chemistry".
3. "Vogel's Textbook of Quantitative Analysis , Including Elementary Instrumental Analysis", Forth Edition, ELBS/Longman, England.

INSTRUCTIONAL OBJECTIVES

1. Understand Basic Concepts of Chemistry.

- 1.1 Describe the importance of chemistry in petroleum and chemical industries.
- 1.2 Distinguish between element, compound, and mixture.
- 1.3 Define atom, molecule, valency, variable valency, atomic weight, and molecular weight with examples of each.
- 1.4 Define symbol, formula, and equation with examples of each. Give chemical formula of some common compounds used in petroleum industry.
- 1.5 Distinguish between molecular formula and empirical formula.
- 1.6 Write molecular formula of different compounds.
- 1.7 Write empirical formula of different compounds.
- 1.8 Distinguish between physical changes and chemical changes.
- 1.9 Differentiate between physical properties and chemical properties.
- 1.10 Define acid, base, and salt with examples of each.
- 1.11 State the law of conservation of mass, law of constant proportion, law of reciprocal proportion, law of multiple proportions, and solve problems based on these laws.

2. Understand Structure of Atom and Chemical Bonding.

- 2.1 Describe the characteristics properties of fundamental particles of atom
- 2.2 Explain the various aspects of Bohr's model of atom and defects of this model.
- 2.3 Define energy levels, sub-energy levels, and orbitals.
- 2.4 State the rules for the distribution of electrons. Write the electronic configuration of atoms of different elements.
- 2.5 Define ionization potential, electronegativity, and electron affinity with examples of each.
- 2.6 Define chemical bond and give its types.
- 2.7 Describe ionic bond, covalent bond, and coordinate covalent bond.
- 2.8 Differentiate between polar bond and nonpolar bond, sigma and pi bond with examples of each.

3. Understand the Physical States of Matter and Properties of Gases, Liquids, and Solids

- 3.1 Explain the kinetic molecular theory.
- 3.2 Explain the physical states of matter with the help of kinetic molecular theory.
- 3.3 Explain kinetic theory of gases.
- 3.4 Describe temperature effect on gases.
- 3.5 State Boyle's law.
- 3.6 State Charle's law.
- 3.7 Describe absolute temperature.
- 3.8 Derive gas equation.
- 3.9 Solve problems based on gas equation.
- 3.10 State Graham's Law of Diffusion.
- 3.11 Explain Dalton's law of partial pressures.
- 3.12 State Gay Iaussac law.
- 3.13 Solve problems based on Graham's law of diffusion and Gay Iaussac law.
- 3.14 Enlist important properties of liquids.
- 3.15 Define viscosity.
- 3.16 Give units of viscosity in different system of units.
- 3.17 Enlist methods of measurement of viscosity of liquids.

- 3.18 Explain method of measurement of viscosity by Oswald's Viscometer.
- 3.19 Describe temperature effect on viscosity.
- 3.20 Describe surface tension.
- 3.21 Name the units of surface tension.
- 3.22 Enlist methods for the measurement of surface tension.
- 3.23 Explain measurement of surface tension by Torsion Balance.
- 3.24 Explain capillary action of liquids.
- 3.25 Explain diffusion of liquids.
- 3.26 Explain density and give units of density.
- 3.27 Describe effect of temperature on volume of solids.
- 3.28 Define isomorphism, polymorphism, lattice energy, and amorphous solids.

4. Understand the Nature and Importance of Metals and Alloys

- 4.1 Define metals.
- 4.2 Distinguish between metals and non-metals giving examples of each.
- 4.3 Describe the properties and uses of Cu, Al, Zn, and Fe.
- 4.4 Define corrosion.
- 4.5 State the causes of corrosion and methods to control corrosion.
- 4.6 Define ores.
- 4.7 Enlist the important ores of Cu, Al, Zn, and Fe.
- 4.8 Define alloys.
- 4.9 Give examples of alloys with their composition.
- 4.10 Enlist general properties of alloys.
- 4.11 State uses of alloys.
- 4.12 Give composition and uses of German silver, bronze, stainless steel, and Nichrom.
- 4.13 Define Amalgam and Solder.
- 4.14 Give composition and uses of Bell Metal and Solder.

5. Understand the Chemical Nature and Impurities present in water

- 5.1 Enlist water sources.
- 5.2 Describe water and state its physical and chemical properties.
- 5.3 Name the common impurities (minerals) present in water.
- 5.4 Define hard water.
- 5.5 Define soft water.
- 5.6 Explain causes of hardness.
- 5.7 Explain removal of permanent hardness by different methods.
- 5.8 Explain removal of temporary hardness by different methods.

6. Understand the solution and colloidal state of Matter

- 6.1 Describe solution and its properties.
- 6.2 Name types of solutions.
- 6.3 Give examples of different types of solutions.
- 6.4 Describe various units of concentration.
- 6.5 Explain ideal and non-ideal solutions giving examples of each.
- 6.6 Define solubility.
- 6.7 Describe the factors affecting solubility.
- 6.8 Distinguish between colloids and true solutions.
- 6.9 Describe types and general properties of colloids.

7. Understand acids and bases

- 7.1 Define acid.
- 7.2 Distinguish between acid and base
- 7.3 Describe general properties of acids
- 7.4 Give examples of strong and weak acids
- 7.5 Give examples of strong and weak bases
- 7.6 Define acidity
- 7.7 Define basicity
- 7.8 Calculate acidity and basicity

8. Understand the Halogens

- 8.1 Define halogens.
- 8.2 Describe preparation, Properties, and uses of chlorine.
- 8.3 Describe preparation, Properties, and uses of HCl.

9 Understand Thermo chemistry

- 9.1 Define thermo chemistry
- 9.2 Distinguish between exothermic and endothermic reactions
- 9.3 Give examples of exothermic and endothermic reactions
- 9.4 Explain heat of reaction
- 9.5 Enlist factors affecting heat of reactions
- 9.6 Describe heat of formation
- 9.7 Explain heat of combustion.
- 9.8 Enlist applications of heat of combustion.
- 9.9 Describe heat of neutralization.
- 9.10 State Hess's Law of constant heat summation.
- 9.11 Solve problems based on Hess's Law.

10. Understand Electrochemistry

- 10.1 Describe electrolytes.
- 10.2 Describe the main postulate of Arrhenius theory of electrolytic dissociation.
- 10.3 Describe solubility product.
- 10.4 Describe conductivity of electrolytes.
- 10.5 Explain effect of dilution on conductivity.
- 10.6 Explain the process of electrolysis with examples.
- 10.7 State and explain the faraday's law of electrolysis
- 10.8 Use Faraday's laws to solve related numerical problems
- 10.9 List the application of electrolysis
- 10.10 Describe electroplating
- 10.11 Explain pH of solutions and pH scale
- 10.12 Describe the methods to measure pH of solutions
- 10.13 Explain the buffer solutions.

11. Organic Chemistry

- 11.1 Give introduction to Organic Chemistry.
- 11.2 Give Sources of Organic Compounds and their Applications.
- 11.3 Give Classification of Organic Compounds with their General Formula and Functional Groups.

- 11.4 Enlist main classes of hydrocarbons and their nomenclature according to IUPAC system.
- 11.5 Describe the following classes of hydrocarbons.
 - 11.5.1 Paraffin series.
 - 11.5.2 Olefin series.
 - 11.5.3 Naphthalene series.
 - 11.5.4 Aromatic series.
 - 11.5.5 Diolefin.
 - 11.5.6 Isomeric compounds.
- 11.6 Give introduction to Alkyl Halides.
- 11.7 Give Introduction to Alcohols.

COMPUTER APPLICATION

CODE:	Comp-122	T	P	C
		1	3	2

TOTAL CONTACT HOURS:

Theory	32
Practical	96

AIMS:

This subject will enable the student to be familiar with the operation of a microcomputer. He will also learn DOS, BASIC language, and word processing to elementary level.

COURSE CONTENTS

1	Electronic Data Processing (EDP)	6 Hours
	1.1 Basics of computers.	
	1.2 Classification of computers.	
	1.3 Block diagram of a computer system.	
	1.4 System of binary numbers.	
	1.5 BIT, BYTE, RAM, ROM, EROM, EPROM.	
	1.6 Input and output devices.	
	1.7 Secondary storage media detail.	
	1.8 Processors and their types	
	1.9 Using computers for system software.	
	1.10 Using computers for application software.	
	1.11 Common types of software and their application	
2	DISK OPERATING SYSTEM (DOS)	6 Hours
	2.1 Internal commands.	
	2.2 External commands.	
	2.3 Batch files.	
	2.4 Advance features.	
3	Basic Language	10 Hours
	3.1 Introduction to high level languages.	
	3.2 Introduction to BASIC.	
	3.3 REM statement.	
	3.4 Assignment statement.	
	3.5 Input statement.	
	3.6 Read data statement.	
	3.7 IF-THEN statement.	
	3.8 IF-THEN ELSE statement.	
	3.9 FOR-NEXT statement.	
	3.10 DIM statement.	
	3.11 LPRINT statement.	
	3.12 STOP Statement.	

- 3.13 END statement.
- 3.14 Logic of a BASIC program.
- 3.15 Running a BASIC program.
- 3.16 Saving and retrieving a program.
- 3.17 Advance features.

4. Word Processing 7 Hours

- 4.1 Starting word processing session.
- 4.2 Opening a document.
- 4.3 Saving a document.
- 4.4 Ending word processing session (Temporarily).
- 4.5 Retrieving a document.
- 4.6 Spell check.
- 4.7 Margins and tab setting.
- 4.8 Aligning Paragraph.
- 4.9 Printing a document.
- 4.10 Advance feature.

5. Computer Graphics in BASIC 3 Hours

- 5.1 Graphics fundamental.
- 5.2 Points and Lines.
- 5.3 Dots in space.
- 5.4 A lightning blot.
- 5.5 Shapes.
- 5.6 Expanding circles and rectangles.

PRACTICALS
96 HOURS

DOS

1. Identify keyboard, mouse, CPU, disk drives, disks, monitor, and printer.
2. Practices for booting up of a computer system with DOS system disk and power off.
3. Practice for CLS, VER, VOL, DATE & TIME commands.
4. Practice for COPY, REN commands.
5. Practices for DEL, TYPE, PATH, PROM, COPY CON, MD, CD, RD commands.
6. Practices of the practical at Sr. No. 3, 4, 5,
7. Practice for FORMAT command with /s, /4, /u, switches.
8. Practice for DISKCOPY, DISKCOMP commands.
9. Practice for SCANDISK, XCOPY, DELTREE, TREE, LABEL commands.
10. Practice for PRINT, UNDELETE, commands.
11. Practice for the practical at Sr.No 8, 9, 10, 11.
12. Practice for creating a batch file.

BASIC

1. Practice for loading and unloading BASIC software and identify role of function keys in BASIC.
2. Identify role of various keys in continuation with ALT key in BASIC programming.

3. Practice for CLC, LOAD, SAVE, FILE, RENUM, and command by loading any existing BASIC program.
4. Practice for editing any existing BASIC program
5. Prepare BASIC program to display sum of two numbers using INPUT.
6. Prepare BASIC program to display sum of two number using RAED DATA.
7. Prepare BASIC program multiply two numbers.
8. Prepare BASIC program to calculate area of rectangle when length and width are given.
9. Prepare BASIC program to calculate area of circle when radius\diameter is given.
10. Prepare very simple BASIC program using IF-THEN-ELSE and NEXT statements.
11. Identify DIM statement.
12. Practice for LPRINT statement for various program hard copy output.

Word Processing

1. Practice for loading and unloading a word processor.
2. Practice for creating document and saving it.
3. Practice for spell-check facility of the word processor.
4. Practice for editing an existing document.
5. Practice for various word processing Menu Option.
6. Practice for printing a document.
7. Practice for margin and TAB setting and document alignment.
8. Practice for some advance features.

BOOKS RECOMMENDED

1. Syed Shahid Afzal, "Teachers Notes on Computer Application", Technical education Project Sindh.
2. Syed Shahid Afzal "TLRs on Computer Applications", Technical Education Project, Sindh.
3. Ron S. Gottfrid, "Programming with BASIC".
4. Any Word Processor Latest Release, e.g., Word, Word perfect, etc.
5. ABC's of DOS (latest release).
6. Judd Robbins, "Mastering DOS 6.0 and 6.2

INSTRUCTIONAL OBJECTIVES

1. Understand Electronic Data Processing (EDP)

- 1.1 Describe basics of computers.
- 1.2 Describe classification of computers.
- 1.3 Explain block diagram of a computer system.
- 1.4 Describe system of binary numbers.
- 1.5 State the terms used in computers such as BIT, BYTE, RAM, ROM, EROM, EPROM.
- 1.6 Identify input and output devices.
- 1.7 Describe secondary storage media.
- 1.8 Explain processors.
- 1.9 Name different type of processors.

- 1.10 Explain the use of computers for system software
- 1.11 Explain the use of computers for application software
- 1.12 Enlist common types of software and their application.

1.13 Explain various application of above software mentioned.

2. Understand Disk Operating System (DOS)

2.1 Explain the use of various internal commands of DOS.

2.2 Explain use of various external commands of DOS.

2.3 Describe batch files.

2.4 Identify advance features.

3. Understand Basic Language

3.1 Explain high level language.

3.2 Explain BASIC language.

3.3 Describe REM statement.

3.4 Describe Assignment statement.

3.5 Explain input statement.

3.6 Explain read-Data statement.

3.7 Explain IF-THEN statement.

3.8 Explain IF-THEN-ELSE statement.

3.9 Explain FOR-NEXT statement.

3.10 Explain DIM statement.

3.11 Explain LPRINT statement.

3.12 Explain STOP statement.

3.13 Explain END statement.

3.14 Describe logic of a BASIC program.

3.15 Describe running a BASIC program.

3.16 Describe saving and retrieving a BASIC program.

3.17 Describe some advance features of BASIC program.

4. Understand Word Processing

4.1 Describe word processing.

4.2 Name command to be entered on DOS-prompt to load word processor.

4.3 Identify initial screen.

4.4 Describe the command to open a document.

4.5 Describe a procedure naming the document.

4.6 Explain importance of giving extension to the document.

4.7 Describe saving and retrieving a document.

4.8 Explain importance of saving the work at regular interval.

4.9 State temporarily Ending word processor session and document retrieval.

4.10 State procedure to re-enter word processor.

4.11 State procedure to re-open word processor and editing.

4.12 Describe spell check facility.

4.13 Describe Margin and Tab setting

4.14 Describe to align paragraph.

4.15 Describe re-editing techniques.

4.16 Describe procedure to set-up printer.

4.17 Describe command for printouts.

4.18 Explain multiple copy printouts.

4.19 Explain some advance feature.

4.20 Describe procedure of condensed printing.

4.21 Describe procedure of change of fonts.

- 5. Understanding programming Instructions for Computer Graphs in Basic language**
- 5.1 Identify graph graphics fundamentals in BASIC language.
- 5.2 Explain to draw points and lines.
- 5.3 Explain to draw dots in space.
- 5.4 Explain to draw lightning blot.
- 5.5 Explain to draw shapes.
- 5.6 Explain to draw expanding circles and rectangles.

BASIC ENGINEERING DRAWING

CODE: MT-142

T P C
1 3 2

TOTAL CONTACT HOURS:

Theory 32
Practical 96

AIMS:

At the end of this course the student will be able to understand the fundamentals of engineering drawing used in various field of industry specially in the mechanical technology and will become familiar with the use of conventional drawing instruments.

COURSE CONTENTS

- | | | |
|-----------|---|---------------|
| 1 | Used and Application of Technology Drawing
1.1 Technology drawing and the technician.
1.2 Use of technical drawing.
1.3 Common drawing forms.
1.4 Application of drawing forms.
1.5 Practices and conventions. | 3 Hour |
| 2. | Drawing Tools and Accessories
2.1 Drawing Pencil.
2.2 Drawing papers specifications.
2.3 Drawing instruments.
2.4 Use and care of drawing instruments and material. | 3 Hour |
| 3. | Alphabet of Lines used in Drawing
3.1 Importance of alphabet of lines.
3.2 Common alphabet of lines.
3.3 Uses and correct line Weightage of the line.
3.4 Application of line. | 3 Hour |
| 4. | Lettering
4.1 Importance of good lettering.
4.2 Single stroke of gothic.
4.3 Letter strokes.
4.4 Letter guide lines.
4.5 Vertical single stroke gothic.
4.6 Inclined single stroke gothics.
4.7 Composition of lettering. | 3 Hour |
| 5. | Drawing Lines Technology
5.1 Introduction to sketching techniques.
5.2 Sketching lines.
5.3 Sketching circles and arcs
5.4 Sketching ellipse. | 4 Hour |

5.5 Sketching views of object

- 6. Geometrical Construction** **2 Hours**
- 6.1 Introduction to geometry.
 - 6.2 Definitions of terms.
 - 6.3 Different conventional shapes, surfaces and objects.
 - 6.4 Basic geometrical construction.
 - 6.5 Construction: ellipse, parabola.
 - 6.6 Involutives and cycloids.
- 7. Introduction to Multi-View Projections** **4 Hours**
- 7.1 Definition and concept of multi-view drawings.
 - 7.2 Perceptual view of planes of projections.
 - 7.3 Orthographic projection.
 - 7.4 1st angle and 3rd angle projection.
 - 7.5 Principal views.
 - 7.6 Arrangement of views.
 - 7.7 Multi-view drawing.
- 8. Introduction to Pictorial Drawings** **3 Hours**
- 8.1 Uses of pictorial
 - 8.2 Three types of pictorial views.
 - 8.3 Isometric sketching of rectangular block.
 - 8.4 One point perspective sketching of a rectangular block.
 - 8.5 Two point perspective sketching of a rectangular block
 - 8.6 Preparation of pictorial drawings of simple objects.
- 9. Basic Dimensioning** **3 Hours**
- 9.1 Definition of dimensioning.
 - 9.2 Types of dimensioning.
 - 9.3 Elements of dimensioning.
 - 9.4 System of measurements.
 - 9.5 Dimensioning multi-view drawings.
 - 9.6 Dimensioning pictorial views.
 - 9.7 Dimensioning rules and practices
 - 9.8 Notes and Specifications.
- 10. Sectioning and Sectional Views** **2 Hours**
- 10.1 Definition and purpose.
 - 10.2 Cutting planes position and cutting plane lines.
 - 10.3 Types of section views.
 - 10.4 Conventional section lines of different materials.
 - 10.5 Practices sectioned views.
- 11. Multi-views Drawing of Machine Elements** **2Hours**
- 11.1 Terminology and drawing of rivets and riveted joints
 - 11.2 Terminology and drawing of screw threads
 - 11.3 Terminology and drawing of keys and cotters
 - 11.4 Description and drawing of simple bearings
 - 11.5 Description and drawing of simple couplings

PRACTICALS

96 HOURS

1. Lettering 5mm height.
2. Lettering 3mm height.
3. Use of Tee square and set squares for drawing horizontal, vertical, and inclined lines.
4. Use of Tee square and set squares for drawing centers, crossing of lines.
5. Use of compass, circles, half circles, radius.
6. Draw round corners, figure inside and outside circle.
7. Plan geometry angles and triangles.
8. Plan geometry quadrilateral, square, rhombus, rectangle, and parallelogram.
9. Plan geometry parallel lines, perpendicular, bisect line and angle.
10. Plan geometry equal division of line and some ratio with the help of compass and set square.
11. Plan geometry inscribes and circumscribes square, triangle and hexagon.
12. Plan geometry construction of polygon, five, six, seven, and eight sides.
13. Plan geometry inscribes pentagon in a circle and pentagon by general and different methods.
14. Plan geometry of tangent of circle inside and outside.
15. Plan geometry construction of ellipse with two methods.
16. Plan geometry construction of ellipse with next two methods.
17. Plan geometry construction of parabola curve 4 methods.
18. Plan geometry construction of hyperbola curve.
19. Plan geometry of spiral curve.
20. Plan geometry of helix curve.
21. Plan geometry construction of in volute curve of square, rectangle, hexagon, and circle.
22. Different types of drawing lines.
23. Orthographic projection 1st and 3rd angle L block.
24. Orthographic projection 1st and 3rd angle Step block.
25. Orthographic projection 1st and 3rd angle Vee block.
26. Orthographic projection 1st and 3rd given block.
27. Orthographic projection and isometric drawing of given block.
28. Different types of sectioning.
29. Different section lines for different materials.
30. Orthographic projection of V-block sectional views.
31. Orthographic projection Gland sectional views.
32. Orthographic projection open bearing sectional views.

BOOKS RECOMMENDED

1. French Wirk, "Engineering Drawing"
2. Alan R. Miller, "ABC's of Auto CAD Release-12".

INSTRUCTIONAL OBJECTIVES

1. **Uses and Applications of Technical Drawing**
 - 1.1.1 Know the uses of technical drawing.
 - 1.1.2 Describe the importance of technical drawing from the view of a technician.
 - 1.1.3 Explain the main uses of technical drawing from the point of view of a technician.
 - 1.1.4 Recognize the different applications of technical drawing.
 - 1.1.5 Identify commonly used drawing forms.
 - 1.1.6 Illustrate the different drawing forms.
 - 1.1.7 Differentiate different drawing forms.

1.1.8 Develop technical vocabulary.

2. Know the Common Drawing Tools and Accessories

- 2.1 Identify the uses of different pencils for technical drawing.
- 2.2 Identify different paper sizes for drawing.
- 2.3 Identify different type of papers suitable for drawing.
- 2.4 Identify different type of erasers and their uses.
- 2.5 Maintain a well sharpened pencil for drawing.
- 2.6 Describe the drawing instrument.
- 2.7 State the use of drawing instruments.

3. Understand the Importance of Alphabet, Correct Weight age, and Application of Lines Used in Technical drawing

- 3.1 Know the importance of lines.
- 3.2 Know the alphabet of lines.
- 3.3 Identify the characteristics of each alphabet of lines.
- 3.4 Draw horizontal, vertical, and inclined lines.
- 3.5 Draw alone lines with correct Weightage.

4. Apply the Good Lettering in a Drawing

- 4.1 Know the importance of lettering in a technical drawing.
- 4.2 Identify the letter style used in technical drawing.
- 4.3 State letter strokes and guidelines
- 4.4 Perform better stroke in single stroke gothic.
- 4.5 Print vertical single stroke letters and numbers.
- 4.6 Print inclined single stroke letters and numbers.
- 4.7 Observe stability and pleasing appearance of letters in printing.

5. Understand Selecting of Circles, Arcs, and Views of Objects

- 5.1 Draw a circular arc using circular line method.
- 5.2 Draw a circular arc using square method.
- 5.3 Draw an ellipse using rectangular method.
- 5.4 Draw view of simple objects.

6. Apply Drawing Skill with the Aid of Drawing Instruments in Geometrical Construction

- 6.1 Define common terms used in geometrical construction.
- 6.2 Explain different geometrical shapes, surfaces of objects.
- 6.3 Draw basic geometrical construction.
- 6.4 Draw involute, cycloid, spiral, tangent to circle and arc.

7. Understand the Multi-view Projections Specific Objective

- 7.1 Define the concept of multi-view drawings
- 7.2 Know principle planes of projection
- 7.3 Know the orthographic method of projection
- 7.4 Explain the 1st and 3rd angle projections
- 7.5 State six principle views
- 7.6 Practice multi-views

8. Apply the Use, Types, and Methods of Pictorial Views

- 8.1 Know the use of pictorial views.
- 8.2 Know the pre-requisite of pictorial drawing.
- 8.3 State three types of pictorial drawings.
- 8.4 Draw isometric view of rectangular blocks, arcs, circles.
- 8.5 Draw oblique sketching of rectangular blocks.
- 8.6 Draw one-point perspective view of a rectangular block.
- 8.7 Draw two-point perspective view of a rectangular block.
- 8.8 Prepare/draw pictorial drawings of simple objects.

9. Apply Good Dimensioning on Multi-views and Pictorials

- 9.1 Define dimensioning.
- 9.2 Identify the types of dimensioning.
- 9.3 Enlist the elements of dimensioning.
- 9.4 Identify the system of measurement.
- 9.5 Indicate complete dimensions on multi-view drawings.
- 9.6 Indicate complete dimensions on pictorial drawings.
- 9.7 Following the general rules for dimensioning.
- 9.8 Indicate notes and specifications on multi-view drawings.

10. Apply the Sectioning Methods of Materials and Draw Sectional Views

- 10.1 Define sectioning and its purpose.
- 10.2 Describe cutting planes and lines.
- 10.3 State types of sectional views.
- 10.4 Explain conventional section lines of different materials.
- 10.5 Practice sectioning.

11. Apply Drawing Methods to Draw Multi-views of Machine Elements

- 11-1 Draw multi-views of Vee-blocks
- 11-2 Draw multi-views of Gland
- 11-3 Draw Keys and cotters
- 11-4 Draw multi-views of simple bearing

FUNDAMENTAL OF PETROLEUM TECHNOLOGY

CODE: Pet-113

T	P	C
2	3	3

TOTAL CONTACT HOURS:

Theory	64
Practical	96

COURSE CONTENTS

- | | | |
|-----------|--|-----------------|
| 1. | Units of Measurement. | 9 Hours |
| | 1.1 SI System of units and other derived units. | |
| | 1.2 Conversion of units. | |
| | 1.3 Large and small measures. | |
| | 1.4 Simple derived units. | |
| | 1.5 Temperature. | |
| | 1.6 Pressure, standard and atmospheric. | |
| | 1.7 Multiple derived units, Examples. | |
| | 1.8 Graphing. | |
| 2. | Origin and Composition of Petroleum | 9 Hours |
| | 2.1 The origin of petroleum. | |
| | 2.2 The composition of petroleum | |
| | 2.3 Geology fundamental. | |
| | 2.4 Main division of rocks of the earth. | |
| | 2.5 Rock Structure (faults and folds). | |
| | 2.6 Sediments formation. | |
| | 2.7 Geology structures. | |
| | 2.8 Unconformity. | |
| | 2.9 Paleontology. | |
| | 2.10 Geology process. | |
| | 2.11 Types of sedimentary rock and their properties. | |
| | 2.12 Rock structure. | |
| 3. | Exploration – Looking for Oil | 8 Hours |
| | 3.1 Early techniques. | |
| | 3.2 Magnetic Survey. | |
| | 3.3 Gravity Survey. | |
| | 3.4 Seismic survey. | |
| 4. | Reservoir Studies | 12 Hours |
| | 4.1 Reservoir classification | |
| | 4.2 Types of reservoirs | |
| | 4.3 Initial reservoir pressure | |
| | 4.4 Natural production mechanisms. | |
| | 4.5 Secondary recovery. | |

- 4.6 Reservoir fluid sampling.
- 4.7 Subsurface pressures.
- 4.8 Subsurface temperature.

5. Properties of Liquid and Gaseous Petroleum 14 Hours

- 5.1 Properties of liquid petroleum.
- 5.2 API gravity.
- 5.3 Bubble point pressure.
- 5.4 Formation volume factor.
- 5.5 The solution gas-oil-ratio.
- 5.6 The oil viscosity.
- 5.7 Flash and differential vaporization.
- 5.8 Properties of gaseous petroleum.
- 5.9 Wet gas and dry gas.
- 5.10 Sour gas and Sweet gas.
- 5.11 Gas gravity.
- 5.12 Standard condition.
- 5.13 Compressibility.

6. Reservoir Pore Space and Fluid flow. 12 Hours

- 6.1 Porosity.
- 6.2 Classification of porosity.
- 6.3 Typical porosity values.
- 6.4 Quantitative use of porosity data.
- 6.5 Permeability.
- 6.6 Darcy's equation.

PRACTICALS

96 HOURS

1. Plotting different types of graphs; rectangular, semi log, log-log.
2. Identification of different types of rocks igneous, metamorphic, sedimentary.
3. Identification of various types of sedimentary rocks: sandstone, shale, limestone and dolomite.
4. Draw sketches and study various types of faults.
5. Draw Sketches and study various types of folds.
6. Determine the specific gravity of various crude oil samples by means of hydrometers and calculate API gravity of each sample at laboratory temperature and pressure conditions.
7. Determine the viscosity of crude oil samples by Saybolt viscometer.
8. Determination of bulk volume from measurement of the dimensions of the uniformly shaped rock samples; cylindrical cores, rectangular cores.
9. Determination of bulk volume by volumetric fluids displacement method; coated sample immersed in water.
10. Determination of bulk volume by volumetric fluids displacement method; immersion in Kerosene oil of the core sample saturated with kerosene oil.
11. Gravimetric determination of bulk volume by observing the loss in weight of the core sample when immersed in a liquid (water in case of coated-sample, kerosene oil in case of a sample saturated with kerosene oil).
12. Gravimetric determination of bulk volume by observing the change in weight of a pycnometer when filled with mercury and when filled with mercury and core sample.

13. Determination of sand grain volume by Melcher-Nutting method.
14. Determination of sand grain volume by Helium Porosimeter.
15. Determination of permeability of a vertical sand pack under a constant water head of water flowing through it.
16. Determination of water saturation by ASTM distillation apparatus.

BOOKS RECOMMENDED

1. Carl Gatlin, "Petroleum Engineering - Drilling and Well Completions", Prentice-Hall Inc.
2. J. W. Amyx, D. M. Bass, Jr., and R. L. Whiting, Petroleum Reservoir Engineering, Physical Properties, McGraw-Hill Book Co.
3. Union Texas Pakistan, Inc. Production Operator II.
4. A. I. Levorsen, "Petroleum Geology" CBS Publishers and Distributors.
5. Union Texas Pakistan, Inc., Production Operator IV.

INSTRUCTIONAL OBJECTIVES

1. **Understand the Units of Measurement**
 - 1.1 Name the different units of measurement.
 - 1.2 Explain the measurement of flow.
 - 1.3 State the SI system of units.
 - 1.4 Describe the derived units.
 - 1.5 Explain the process of conversion of units.
 - 1.6 Explain the process of units' conversion by an example.
 - 1.7 Distinguish between large and small measures.
 - 1.8 Define the simple derived units.
 - 1.9 Define temperature.
 - 1.10 Name the instruments to measure temperature.
 - 1.11 Define pressure.
 - 1.12 Describe various types of pressures.
 - 1.13 Define atmospheric pressure.
 - 1.14 Define absolute pressure.
 - 1.15 Explain the standard atmosphere.
 - 1.16 Give the examples of multiple of derived units.
 - 1.17 Define the main characteristics of multiple derived units.
 - 1.18 Describe various types of graphs; rectangular graphs, semi-log graphs, log-log graphs.
 - 1.19 Solve relevant numerical problems.
2. **Understand Origin and Composition of Petroleum**
 - 2.1 State the commonly accepted concept regarding the origin of petroleum.
 - 2.2 Discuss composition of petroleum and describe two main families of hydrocarbons of which petroleum is made up.
 - 2.3 Describe non-hydrocarbon constituents commonly found in crude oils and natural gases.
 - 2.4 List and describe various hydrocarbon mixtures.
 - 2.5 State the three main divisions of the rocks of the earth.
 - 2.6 Describe with the help of a diagram the rock cycle and sediment formation.
 - 2.7 Define geological structure and describe main types of structures; Bedding, Current Bedding, Graded Bedding, Slump Bedding, Ripple Marks.
 - 2.8 Describe what is meant by unconformity.
 - 2.9 Define two methods for determining age of rocks.

- 2.10 Define Paleontology.
- 2.11 Describe various geological processes; Deposition, Geosynclines, Deltaic deposition.
- 2.12 State the types of sedimentary rocks and their properties.
- 2.13 Explain various rock structures (faults and folds) and their types with the help of diagrams.

3. Know the Fundamental Methods of Exploration.

- 3.1 Briefly describe the principles of various methods of exploration.

4. Understand Basis of Reservoir Studies

- 4.1 Describe classification of hydrocarbon reservoirs on the basis of the fluids and their physical states.
- 4.2 Discuss the sources of reservoir pressure and its effects on the reservoir fluids and their production.
- 4.3 Describe the natural production mechanisms; Water Drive, Solution Gas and Gas Cap Drive.
- 4.4. Describe the secondary recovery phase of reservoir: Water Injection, Gas Injection.
- 4.5 Give introduction to reservoir fluid sampling.
- 4.6 Describe the aim of sampling and reservoir fluids behavior.
- 4.7 Describe important features of oil reservoir sampling.
- 4.8 Briefly describe the sources of subsurface pressures.
- 4.9 State the magnitude of subsurface pressures.
- 4.10 Describe the relationship of subsurface temperature and depth.
- 4.11 Solve relevant numerical problems.

5. Understand Properties of Liquid and Gaseous Petroleum

- 5.1 Define the Salient features of the following properties of liquid petroleum.
 - API Gravity.
 - Bubble Point Pressure.
 - Formation Volume Factor.
 - The Solution Gas-Oil-Ratio.
 - The oil Viscosity.
 - Flash and Differential Vaporization.
- 5.2 Define the salient features of the following properties of gaseous petroleum.
 - Wet Gas and Dry Gas.
 - Sour Gas and Sweet Gas.
 - Gas Gravity.
 - Standard Conditions.
- 5.3 Describe the gas law.
- 5.4 Define compressibility factor.
- 5.5 Solve relevant numerical problems.

6. Understand the Reservoir Rock Properties; Porosity, Permeability

- 6.1 Define porosity and describe the equation for its calculation.
- 6.2 Give classification of rock porosity; Absolute Porosity, Effective Porosity.
- 6.3 Describe classification of porosity according to its mode of origin; Primary Porosity, Secondary Porosity.
- 6.4 Describe three types of secondary porosity based on mechanism of formation.
- 6.5 Explain the use of porosity data.

- 6.6 Explain Darcy equation which describes flow of fluid through porous media.
- 6.7 List the limitations of Darcy's equation.
- 6.8 Solve relevant numerical problems.

WORKSHOP PRACTICE-I

Code:	Pet-123	T	P	C
		1	6	3

TOTAL CONTACT HOURS:

Theory 32

Practical 192

AIMS:

After completing this course the student will:

1. Become familiar with the tools, equipments, and machines used in the pipe fitting, welding, machine & metal shops.
1. Achieve the basic skills in the above workshops by preparing specific jobs in each shop.

COURSE CONTENTS

- | | | |
|------------|--|-----------------|
| 1. | Pipes and Pipe Fitting | 10 Hours |
| | 1.1 Pipes | |
| | 1.1.1 Piping classification. | |
| | 1.1.2 Process lines. | |
| | 1.1.3 Utility lines. | |
| | 1.1.4 Pipe size. | |
| | 1.1.5 Pipe schedule. | |
| | 1.1.6 Pipe material; Metallic Piping, Ferrous Piping, Non-ferrous Piping.
Plastic Piping, Thermo-plastic Piping, Thermo-setting plastic Piping. | |
| 1.2 | Methods of Joining Pipes. | |
| | 1.2.1 Welded joints. | |
| | 1.2.2 Flanged joints. | |
| | 1.2.3 Screwed joints. | |
| | 1.2.4 Coupled joints. | |
| 1.3 | Pipe Fitting. | |
| | 1.3.1 Types of pipe fittings. | |
| | 1.3.2 Pipe supports. | |
| | 1.3.3 Flared fitting. | |
| | 1.3.4 Flare less fitting. | |
| 1.4 | Tubing | |
| | 1.4.1 Metallic tubing. | |
| | 1.4.2 Seamless tubing. | |
| | 1.4.3 Welded tubing. | |
| | 1.4.4 Methods of joining tubing. | |
| 2. | Welding | 10 Hours |
| | 2.1 Introduction, shop orientation, and shop policies. | |
| | 2.2 Shop rules and regulations. | |
| | 2.3 Operating procedures. | |
| | 2.4 Care and maintenance. | |
| | 2.5 Safety precautions and operations. | |

- 2.6 Welding process and Equipments.
- 2.7 Welding process and material.
- 2.8 Welding principles
- 2.9 Arc welding.
- 2.10 Welding torches.
- 2.11 Welding flames.
- 2.12 Pressure gauges.
- 2.13 Gas cylinders and gas welding tools.
- 2.14 Defects of welding.

3. Metal Shop

6 Hours

- 3.1 Introduction to metalling processes and the equipments used in the metal shop.
- 3.2 Kinds of tools and machines.
- 3.3 Hand tools.
- 3.4 Measuring and layout tools.
- 3.5 Cutting tools.
- 3.6 Chisels
- 3.7 Files and filing.
- 3.8 Hack saw.
- 3.9 Hammers.
- 3.10 Hand drills.
- 3.11 Hand threading.
- 3.12 Drilling machines.
- 3.13 Pending machines.
- 3.14 Rolling machines.

4. Machine Shop

6 Hours

- 4.1 Related information and procedure to use the lathe machine.
- 4.2 Construction of lathe machine
- 4.3 Lathe machine tools and their operation.
- 4.4 Working of the drill machine.
- 4.5 Tool grinder.
- 4.6 Shaper work.
- 4.7 Planer.

LIST OF PRACTICALS

192 Hours

FITTING.SHOP:

- 1. Practice of threading.
- 2. Practice of thread cutting.
- 3. Practice of short nipple.
- 4. Practice of classed nipple.
- 5. Practice of long nipple.
- 6. Practice of union fitting of metallic pipes and plastic pipes.
- 7. Practice of elbow fitting of plastic pipes and metallic pipes.
- 8. Practice of joining the metallic and plastic pipes.
 - i) Practice of welded joints.
 - ii) Practice of flanged joints.
 - iii) Practice of screwed joints.
 - iv) Practice of coupled joints.

9. Compression and flare fitting.
10. A Practice of tubing and joining tubing
 - i) Practice of metallic tubing.
 - ii) Practice of seamless tubing
 - iii) Practice of welded tubing.
 - iv) Practice of flange joint for glass pipes.

WELDING SHOP:

A. Gas Welding

11. Flame making practice.
12. Pool making.
13. Bead making.
14. Butt joint.
15. Lap joint.
16. T-Joint
17. Corner joint.

B. Arc Welding

18. Arc making /current setting.
19. Bead making.
20. Butt joining.
21. Lap joint.
22. Corner joint.
23. Spot welding.

METAL SHOP:

24. Preparation of bottle opener.
25. Preparation of inside caliper.
26. Preparation of dove-tail joint.
27. Preparation of small size by try-square
28. Preparation of coat-roole.
29. Preparation of name plate.
30. Preparation of funnel (sheet).
31. Preparation of drawer raudle.
32. Preparation of level square.
33. Preparation of spanner.

MACHINE SHOP:

34. Practice of drilling on lathe machine.
35. Practice of centering the job by surface gage method
36. Practice of path cutting tool.
37. Practice of boring straight hole on drill -machine. .
38. Practice of boring taper hole.
39. Practice of taper turning by coropound test method.
40. Practice of Metric thread cutting.
41. Practice of tool grinding.
42. Practice of making flat surface on shaper machine.
43. Practice of angular work.
44. Practice of making flat surface on planer machine.
45. Drilling and taping practice.

BOOKS RECOMMENDED

1. Union Texas Pakistan Ltd., Technician Assistant, Part-3
2. Burghedt, Machine Tool Operations Vol 1 & II.
3. Lesue Bisth, “Foundry Calculation & Drawing”
4. Rossi, Welding Engineering.

INSTRUCTIONAL OBJECTIVES

1. Pipes and Pipe Fittings

A. Understand Shop Layouts; Rules, Pipe Materials, and Tools

- 1.1 Describe the basic concept of the pipe fitting.
- 1.2 Identify the shop tools.
- 1.3 Define the safety rules of the shop.
- 1.4 Give the piping classification.
- 1.5 Describe the process lines.
- 1.6 Describe the utility lines.
- 1.7 State the pipe size.
- 1.8 State the pipe schedule. .
- 1.9 Name the pipe materials.

B. Understand Various Methods of Joining the Pipes.

- 1.10 Understand the methods of joining two or more than two pipes.
- 1.11 Name the different pipe joints.
- 1.12 Define process of welded joints.
- 1.13 Define the process of flanged joints.
- 1.14 Define the process of screwed joints.
- 1.15 Explain the process of coupled joints.

C. Understand Different Procedures of Pipe Fitting.

- 1.16 Name the types of pipe fittings.
- 1.17 Explain the pipe supports used in the pipe fitting.
- 1.18 Describe the process of flared fitting.
- 1.19 Describe the process of flare less fitting

D. Understand Various Types of Tubing

- 1.20 Explain the purpose of tubing.
- 1.21 Enlist various types of tubing.
- 1.22 Describe metallic tubing.
- 1.23 Describe seamless tubing.
- 1.24 Describe welded tubing.

2. Understand Welding.

- 1.12 Describe the Welding Shop working policies.
- 1.13 Name the welding shop tools.
- 1.14 Explain the safety precautions and rules of welding.
- 1.15 Describe the care and maintenance of welding tools.
- 1.16 Describe the welding process and equipments.
- 1.17 Describe the welding process and name the welding materials.

- 1.18 Differentiate between arc welding and gas welding.
- 1.19 Identify gas welding tools.
- 1.20 State the defects of welding.

3. Understand the Metal Work Tools and Processes.

- 3.1 Describe the safety rules of the shop.
- 3.2 State common processes that are performed in the metal shop.
- 3.3 Identify the shop hand tools.
- 3.4 Identify power driven tools and machines.
- 3.5 Classify tools according to the metal shop processes.
- 3.6 Describe the measuring and layout tools.
- 3.7 Explain the use of cutting tools.
- 3.8 Explain the process of filing.
- 3.9 State the process of hammering.
- 3.10 State the process of hand drilling.
- 3.11 State the process of hand threading.

4. Understand the Functions and Procedures of Various Machines

- 4.1 Explain the rules and regulations of the machine shop.
- 4.2 State the function of Lathe machine.
- 4.3 Explain the safety precautions to use the Lathe machine.
- 4.4 Enlist the types of lathe cutting tools.
- 4.5 Explain the process to use the Drill machine.
- 4.6 State the working principle of the Drill machine.
- 4.7 State the process to use the tool Grinder.
- 4.8 Define the working principle of the Shaper.
- 4.9 Define the use of Planner.

OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT

CODE: PET – 132

T	P	C
2	0	2

TOTAL CONTACT HOURS:

Theory 64

Practical 0

SECTION – I

SAFETY PRACTICES AND PROCEDURES

AIMS:

At the end of this course the student will be able to adopt safety Standards, codes, rules etc. to be desired in various Workshops and industries. He will be able to understand method of Prevention, provide FIRST AID, and rescue in the case of any Accident.

COURSE CONTENTS

- | | | |
|-----------|---|----------------|
| 1. | Introduction and Importance of Safety | 2 Hours |
| | 1.1 Introduction.
1.2 Importance in institute shop
1.3 Importance in industry.
1.4 Accident cost. | |
| 2. | Accidents in Petroleum and Chemical Industry | 8 hours |
| | 2.1 Accident in Petroleum Industry.
2.2 Accident in mines.
2.3 Accident in power Plants.
2.4 Accident in paint shop/ Industry.
2.5 Explosive vapors and gases.
2.6 Accident in fertilizers and others chemical Industries.
2.7 Toxic materials and chemicals. | |
| 3. | Accidents in Mechanical Industry | 4 Hours |
| | 3.1 Material handling and transportation.
3.2 Accidents due to hand tools
3.3 Accidents in machine shop.
3.4 Accidents in metal work shop.
3.5 Accidents in wood working shop.
3.6 Accidents in foundry, welding & forging shop. | |

- | | |
|--|----------------|
| 4. Environmental Effect of Accidents. | 4 Hours |
| 4.1 Industrial ventilation. | |
| 4.2 Exhaust systems. | |
| 4.3 Industrial noise. | |
| 4.4 Illumination for safety and comfort. | |
| 4.5 Industrial hygiene and plant sanitation. | |
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| 5. Personal Protective Equipments | 2 Hours |
| 5.1 For face and hand protection. | |
| 5.2 For body protection. | |
| 5.3 For protection from chemical & gases. | |
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| 6. Safety on Plant | 2 Hours |
| 6.1 Plant layout for safety. | |
| 6.2 Housekeeping for safety. | |
| 6.3 Layout for safety. | |
| 6.4 Safety colors and signs. | |
|
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| 7. Fire Accidents | 4 Hours |
| 7.1 Fire hazard. | |
| 7.2 Causes. | |
| 7.3 Chemical fires. | |
| 7.4 Fire fighting Equipments. | |
| 7.5 Plant layout for fire safety. | |
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| 8. First Aid | 2 Hours |
| 8.1 Importance. | |
| 8.2 Procedure. | |
| 8.3 Extended medical services. | |
|
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| 9. Promoting Safety | 2 Hours |
| 9.1 Employees training. | |
| 9.2 Displays. | |
| 9.3 Guidance. | |
|
 | |
| 10. Safety Laws | 2 Hours |
| 10.1 Pakistan Factory Act (laws concerning to safety). | |
| 10.2 Workman Compensation Act. | |
| 10.3 Industrial Insurance. | |

BOOKS RECOMMENDED

1. Amir Bux Lashari, "Manual on Safety Practice and Procedure", Govt. Collage of Technology, Hyderabad.
2. Union Texas Pakistan, Inc., "Technical Assistant – Elementary and Intermediate Craft Skills, Part 3."

INSTRUCTIONAL OBJECTIVES

- 1. Know Importance of Safety Practices and its Necessity in the Industry**
 - 1.1 Describe safety, accident.
 - 1.2 Describe the importance of safety practices in institute workshops.
 - 1.3 Describe hazards for not observing safety.
 - 1.4 State necessity of observing safety in the industry.

- 2. Know Causes and Methods of Preventing Accident in Chemical Based Industry**
 - 2.1 State the type and causes of accidents in petroleum, fertilizer, paint, and Chemical based Industry.
 - 2.2 Describe causes and preventions for chemical based industry accidents.
 - 2.3 Describe causes and preventions for mining industry accidents.
 - 2.4 Describe causes and preventions for power plants accidents.
 - 2.5 Describe effects of explosive vapors and gases.
 - 2.6 List prevention for accidents caused by explosive gases and vapors.
 - 2.7 Give brief description of toxic and corrosive chemicals.
 - 2.8 Describe important points regarding safe handling of corrosive and toxic Chemicals.
 - 2.9 Show and describe the chemical warning signs.
 - 2.10 Describe the hazardous gases.
 - 2.11 Describe precautionary measures for chemical storage.

- 3. Know Causes and Methods of Preventing Accidents in Mechanical Industry**
 - 3.1 List the accidents in material handling and transportation.
 - 3.2 Describe the method of prevention of accidents in material handling and Transportation.
 - 3.3 State the types and causes of accidents in production shops.
 - 3.4 List methods of preventing accidents in mechanical industry.

- 4. Understand the Environmental Effect of Accidents and their Remedies**
 - 4.1 Know environmental effects on human beings and surroundings.
 - 4.2 Explain importance and purpose of industrial ventilation.
 - 4.3 Describe exhaust system in industry.
 - 4.4 Identify effects of noise on environment and accident.
 - 4.5 Identify the advantage of illumination for safety and comfort.
 - 4.6 Explain necessity of plant hygiene for safety and comfort.
 - 4.7 Explain necessity of plant sanitation for prevention of accidents.

- 5. Know Principles, Methods, and Importance of Personal Protective Equipments**
 - 5.1 State protective devices.
 - 5.2 List personal protective devices.
 - 5.3 State importance of personal protective devices.
 - 5.4 Describe protection devices for protecting hands and face.
 - 5.5 Describe protection devices for protecting human body.
 - 5.6 Describe protection devices for protection from chemical gases.

- 6. Know the Basic Concept of safety on Plant.**
 - 6.1 Identify the Safety Aspect for Plant layout.
 - 6.2 Describe the housekeeping procedure for safety on a plant.

- 6.3 Identify The Procedure to layout machines and equipment considering safety aspect.
- 6.4 Identify various safety colors and signs.

7. Fire Accident

- 7.1 Know the causes of fire hazard.
 - 7.1.1 Identify fire hazards.
 - 7.1.2 List the causes of accidents due to fire.
- 7.2 Enlist guideline to avoid chemical fire.
- 7.3 Give classification of chemical fire.
- 7.4 Classify methods of extinguishing four classes of fire.
- 7.5 Understand prevention of fire accidents on Plant.
 - 7.5.1 Describe prevention of fire accidents.
 - 7.5.2 Identify the fire point's layout for fire accident control.

8. Know the Method of Providing First Aid

- 8.1 Identify the importance of First Aid.
- 8.2 Explain the method of providing first aid.
- 8.3 Identify the step procedure for providing medical services.

9. Understand the Method of Procedures for Promoting Safety

- 9.1 Identify the importance of safety.
- 9.2 List method of promoting safety concept.
- 9.3 Describe methods to promote safety concept by display charts.

10. Understand Laws Regarding Safety

- 10.1 Describe clauses of Pakistan Factory Act related to safety.
- 10.2 Describe Workman Compensation Act.
- 10.3 Identify the procedure for Industrial Insurance.

SECTION – II

ENVIRONMENTAL POLLUTION CONTROL

AIMS:

After studying this course the student will know:

1. The fundamental knowledge of air pollution control, solid waste management, water pollution control, and noise pollution control.
2. Specific problems of environmental pollution at the petroleum fields and Refineries.
3. Environmental pollution control laws and regulation.

COURSE CONTENTS

1. Introduction

1 Hours

- 1.1 Environment.
- 1.2 Environment pollution.
- 1.3 Environment pollution control.

- | | |
|--|------------------------|
| <p>2. Air Pollution</p> <p>2.1 Composition of air.
 2.2 Sources of air pollution.
 2.3 Local and global effects of air pollution.
 2.4 Indoor air pollution and human health.
 2.5 Air pollution meteorology.
 2.6 Photochemical and industrial smog's.
 2.7 Pollution Control of suspended particulates, gaseous pollutants, and motor Vehicles exhaust.</p> | <p>10 Hours</p> |
| <p>3. Solid Waste Management</p> <p>3.1 Introduction to SWM.
 3.2 Characteristics of solid wastes.
 3.3 Storage and collection systems.
 3.4 Transfer station and processing techniques.
 3.5 Disposal methods.</p> | <p>5 Hours</p> |
| <p>4. Water Pollution Control</p> <p>4.1 Water borne diseases and remedial measures.
 4.2 WHO drinking water standards and their significance.
 4.3 Water pollutants and their sources.
 4.4 Water supply systems.
 4.5 Sewage and sewerage systems.
 4.6 Waste water treatment methods.</p> | <p>5 Hours</p> |
| <p>5. Noise Pollution Control</p> <p>5.1 Health implication.
 5.2 Remedial measures.</p> | <p>1 Horus</p> |
| <p>6. Environment Pollution Control Laws and Regulation</p> <p>6.1 National Environment Quality Standards (NEQS) for Gaseous and Liquid Wastes.
 6.2 Ambient Air Quality standards.</p> | <p>1 Hours</p> |
| <p>7. Land Resources and Conservation.</p> <p>7.1 Introduction to land resources.
 7.2 Conservation methods</p> | <p>1 Hours</p> |
| <p>8. Hazardous Waste Management.</p> <p>8.2 Industrial waste.
 8.3 Management options.</p> | <p>2 Hours</p> |
| <p>9. Environment Pollution Control at Petroleum Fields and Refineries</p> <p>9.1. Specific problem of oil and gas field.
 9.2. Environment pollution control at oil and gas field, and refineries.
 9.3. Renewable energy and conservation.
 9.4. Environment implications of mining.</p> | <p>6 Hours</p> |

BOOKS RECOMMENDED

- 1 Engineer Colonel Mumtaz Hussain “Environmental Degradation – Realities and Remedies”, First Edition Feroz sons (PVT) Ltd., Lahore 1998.

- 2 Arthur C. Stern ,Air Pollution Volume III, Sources of Air pollution and their control “, 2nd Edition ,Academic Press, N. Y.,1968
- 3 P .H .Raven ,et al, “Environment”, Saunders college publishing, fort worth London, 1993
- 4 H. C. Perkins,” Air Pollution “, McGraw-Hill, 1974.
- 5 W. L. Faith,” Air pollution “, Willey, 1972.
- 6 “Monthly EPA Bulletin”, A publication of the Environment protection agency Punjab, Lahore.

INSTRUCTIONAL OBJECTIVES

1. Introduction to Environmental pollution Control

- 1.1 Define environment.
- 1.2 Describe what is meant by environmental pollution.
- 1.3 Explain the objectives of environmental pollution control

2. Understand Air Pollution

- 2.1 Describe ambient air composition.
- 2.2 Enlist categorically the sources of Air pollution.
- 2.3 Briefly explain the following global effects of air pollution.
 - i) Acid Rain. ii) Greenhouse Effect.
 - iii) Ozone Depletion in the Stratosphere.
- 2.4 Outline the local effects of air pollution.
- 2.5 Introduction to the effects of air pollution on human health.
- 2.6 Summarize the sources and health effects of the major air pollutants.
- 2.7 Explain indoor air pollution.
- 2.8 Describe the sources and health effects of the following indoor pollutants.
 - i) Smoking. ii) Radon. iii) Asbestos.
- 2.9 Explain what is meant by ‘Air Pollution Meteorology’
- 2.10 Describe the use of wind roses.
- 2.11 Explain the impact of atmospheric stability on pollution dispersion.
- 2.12 Describe what is meant by Photochemical Air Pollution;
- 2.13 Explain the photochemical smog reactions.
- 2.14 Describe the effects of photochemical smog.
- 2.15 Outline the air pollution control methods of the following types of pollutants.
 - i) Suspended Particulates. ii) Gaseous Pollutants.
 - iii) Motor Vehicle Exhaust

3. Understand Municipal Solid Waste Management

- 3.1 Describe the health impacts of solid wastes.
- 3.2 Introduction to Solid Waste Management (SWM).
- 3.3 List the major components of the municipal solid wastes.
- 3.4 Outline the classification of solid wastes.
- 3.5 Explain the future trends in the composition of solid wastes.
- 3.6 Explain the onsite handling and onsite storage of solid wastes.
- 3.7 Describe the collection systems of solid wastes.
- 3.8 Define three types of transfer stations used to accomplish removal and Transfer of solid wastes.
- 3.9 Outline various processing techniques used in solid wastes.
- 3.10 Explain the following methods used for the disposal of solid wastes.
 - i) Composting. ii) Incineration.
 - iii) Sanitary Land filling

4. Understand Water Pollution Control

- 4.1 Introduction to the water borne diseases and remedial measures.
- 4.2 Outline the WHO drinking water standards and their significance.
- 4.3 Outline the types of water pollutants and their sources.
- 4.4 Explain the water supply systems
- 4.5 Describe the waste water treatment methods.

5. Understand Noise Pollution Control

- 5.1 Introduction to Noise Pollution'.
- 5.2 Explain how noise measurement is made.
- 5.3 Describe health implication of noise.
- 5.4 Describe how noise pollution can be controlled.

6. Know the Environmental Pollution Control Laws and Regulations

- 6.1 Outline the National Environmental Quality Standards (NEQS) for gaseous and liquid wastes.
- 6.2 Outline the ambient air quality standards.

7. Understand Land Resources and conservation

- 7.1 Introduction to land resources.
- 7.2 Outline the methods for conservation of land resources.

8. Understand Hazardous waste Management

- 8.1 Introduction to Hazardous Waste Management.
- 8.2 Enlist various hazardous wastes.
- 8.3 Describe various management options for hazardous waste.

9. Understand Environmental Pollution Control at Petroleum Fields and Refineries

- 9.1 Introduction to environmental pollution at petroleum fields and refineries.
- 9.2 Discuss specific problems of oil and gas fields regarding environmental pollution.
- 9.3 Describe methods of environmental pollution control at petroleum fields and refineries.
- 9.4 Explain renewable energy and conservation.
- 9.5 Discuss environmental implications of mining.

SECOND YEAR

اسلامیات / مطالعہ پاکستان

GEN 2II

مطب (سال دوئم)

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

موضوعات

ٹی پی سی

1 0 1

کل وقت: 20 گھنٹے

- 1- سورة المؤمنون ایک تا گیارہ آیات کا مع تاجمہ
- 2- دس منتخب احادیث مع ترجمہ و تشریح
- ☆ خياركم من تعليم القرآن وعلمه
- ☆ لا ايمان لمن لا امانته له ولا دين لمن لا عهد له
- ☆ وياكم والظن ان الظن اكرب الحديث
- ☆ من احدث في امرنا هذا ما ليس منه فهو رد
- ☆ من حمل علينا السلاح فليس منا
- ☆ انا وكافل اليتيم في الجنة
- ☆ لا ضرور ولا ضرار في السلام
- ☆ كلكم راع وكلكم راع وكلكم مسول عن رعيتہ
- 3- سيرة طيبة
- ☆ کئی زندگی۔ ولادت۔ بعثت۔ ہجرت
- ☆ مدنی زندگی۔ مواخات۔ بیثاق مدینہ۔ فتح مکہ (اسباب و نتائج)
- 4- حضور ﷺ بحیثیت
- ☆ خطبہ حجۃ الوداع
- معلم کامل، سربراہ خاندان
- 5- اسلامی معاشرہ
- نظام تعلیم اور اس کے مقاصد۔ عدل و انصاف۔ امر بلمعروف۔ نہی عن المنکر
- جہاد۔ کسب حلال۔ مسجد (اہمیت و فضیلت)
- 6- اسلامی ریاست کی تعریف۔ اسلامی ریاست کی خصوصیات۔ اسلامی حکومت کے فرائض۔ اسلامی طرز حکومت۔

اسلامیات

تدریس مقاصد

عمومی مقاصد: طالب علم یہ جان سکے کہ آیات قرآنی کی روشنی میں مومن کے اوصاف کیا ہیں
قرآن مجید

خصوصی مقاصد:

☆ قرآنی آیات کا ترجمہ بیان کر سکے۔

☆ قرآنی آیات کی تشریح کر سکے

☆ قرآنی آیات کی روشنی میں ایک مومن کے اوصاف بیان کر سکے

☆ قرآنی آیات میں بیان کردہ مومن کے اوصاف اپنے اندر پیدا کر سکے

احادیث نبویہ

☆ عمومی مقصد احادیث کی روشنی میں اسلامی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے

خصوصی مقاصد:

☆ احادیث کا ترجمہ بیان کر سکے

☆ احادیث کی تشریح کر سکے

☆ احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے

☆ ان احادیث کی دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے

سیرت طیبہ:

☆ عمومی مقصد: حضور ﷺ کی سیرت طیبہ کے بارے میں جان سکے

خصوصی مقاصد:

☆ حضور ﷺ کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے

☆ حضور ﷺ کی ہجرت کا واقعہ بیان کر سکے

☆ حضور ﷺ کی مدنی زندگی اختصار سے بیان کر سکے

☆ حضور ﷺ کی بطور معلم خصوصیات بیان کر سکے۔

☆ حضور ﷺ کی بطور سربراہ خاندان بیان کر سکے

اسلامی معاشرہ

عمومی مقصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے
خصوصی مقاصد:

- ☆ اسلامی معاشرہ کا معنی و مفہوم بیان کر سکے
- ☆ اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے
- ☆ اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے
- ☆ تبلیغ کے لغوی معنی بیان کر سکے
- ☆ تبلیغ کی اہمیت و ضرورت بیان کر سکے
- ☆ جہاد کے لفظی و اصطلاحی معنی بیان کر سکے
- ☆ جہاد کی اہمیت بیان کر سکے
- ☆ جہاد کی اور قتال میں فرق بیان کر سکے
- ☆ جہاد کی مختلف اقسام بیان کر سکے
- ☆ لفظ مسجد کی تعریف کر سکے۔

مسجد کی سابقہ حیثیت کو بحال کرنے کے بارہ میں اقدامات کو مان کر سکے

اسلامی ریاست

عمومی مقاصد: اسلامی ریاست کی خصوصیت بیان کر سکے
خصوصی مقاصد:

- ☆ ریاست کی تعریف بیان کر سکے
- ☆ اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے
- ☆ اسلامی ریاست کی خصوصیت بیان کر سکے
- ☆ اسلامی ریاست کے اغراض و مقاصد بیان کر سکے
- ☆ اسلامی ریاست کے قیام کیلئے جدوجہد کر سکے

نصاب مطالعہ پاکستان

ٹی پی سی
1 0 1
کل وقت 12 گھنٹے

- سال دوئم
حصہ دوئم
موضوعات
- ☆ دو قومی نظریہ
 - ☆ تحریک پاکستان
 - ☆ انڈین کانگریس
 - ☆ مسلم لیگ
 - ☆ تقسیم بنگال
 - ☆ میثاق لکھنؤ
 - ☆ تحریک خلافت
 - ☆ سندھو تحریک
 - ☆ تجاویز دہلی
 - ☆ نہر و رپورٹ
 - ☆ قائد اعظم کے چودہ نکات
 - ☆ خطبہ آلہ آباد
 - ☆ انتخابات 1938 اور انتقال اقتدار
 - ☆ قرارداد پاکستان

حصہ دوم
مطالعہ پاکستان

تدریسی مقاصد

تحریک پاکستان:

عمومی مقصد: قیام پاکستان کے اسباب و محرکات کو بیان کر سکے
خصوصی مقاصد:

- ☆ قومیت کے مفہوم کو بیان کر سکے
- ☆ دو قومی نظریہ کی تعریف و توضیح کر سکے
- ☆ دو قومی نظریہ کی اہمیت بیان کر سکے
- ☆ ہندوستانی مسلمانوں کی محرومیوں کو بیان کر سکے
- ☆ قومی تشخص کو بحال رکھنے کے لئے مسلمانان ہند کی مساعی بیان کر سکے
- ☆ آزادی ہند اور قیام پاکستان علامہ اقبال اور قائد اعظم کی مساعی بیان کر سکے
- ☆ قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لئے مسلم عوام کی کوششوں کو بیان کر سکے
- ☆ مسلم لیگ کے قیام پاکستان کے لئے جدوجہد بیان کر سکے

(غیر مسلم طلباء کے لئے)

ٹی پی سی
1 0 1
کل وقت: 20 گھنٹے

نصاب اخلاقیات

سال دوم

موضوعات

معاشرتی اقدار بلحاظ ہمسایہ۔ قوم۔ قومی سطح۔ شہری سطح۔ صنعتی ارادوں کی سطح۔ ضروریات۔ ورثہ

☆ حقوق و فرائض

☆ قوت برداشت

☆ قوت ارادی

☆ لگن و جذبہ

☆ وسیع النظری

☆ بے غرضی

☆ انسانی دوستی

☆ حفاظتی شعور

☆ پاس آزادی

☆ کامل اگاہی

☆ تغیرات قبول کرنا

☆ خود شناسی

نصاب اخلاقیات سال دوم

تدریس مقاصد:

عمومی مقاصد:

طالب علم: اخلاقیات کی اہمیت و ضرورت سے آگاہ ہو سکے اور بیان کر سکے

خصوصی مقاصد: طالب علم اس قابل ہو کہ

☆ موضوعات کا مطلب بیان کر سکے

☆ عملی زندگی سے مثالوں کی نشاندہی کر سکے

☆ اپنی شخصیت اور معاشرے پر موضوعات کے مطابق مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے

☆ اعلیٰ اخلاقی اقدار میں سے

قوت برداشت۔ قوت ارادی۔ لگن جذبہ۔ وسیع النظری۔ بے غرض۔ انسانی دوستی حفاظتی۔ شعور۔ پاس آزادی۔

کامل اگاہی اور خود شناسی کی اہمیت بیان کر سکے

☆ اخلاقیات سے متصف ہو کر قومی خدمت بہتر طور پر انجام دے سکے

APPLIED MATHEMATICS-II

CODE: Math-213

TOTAL CONTACT HOURS:		T	P	C
		3	0	3
Theory	96			
Practical	0			

PRE-REQUISITE: Must have completed Math-113 Applied Mathematics-I

AIMS:

After studying this course the students will be able to:

1. Solve problems of Calculus and Analytic Geometry.
2. Develop mathematical skill, aptitude, and logical perception in the use of Mathematical instruments.
3. Apply principles of Differential Calculus to work out rate measures, velocity, Acceleration, maxima and minima values.
4. Use principles of Integral Calculus to compute areas and volumes.
5. Acquire proficiency in solving technological problems with mathematical clarity and insight.

COURSE CONTENTS

- | | | |
|-----------|---|----------------|
| 1. | Functions and Limits | 6 Hours |
| | 1.1 Constant and Variable Quantities. | |
| | 1.2 Functions and their classification. | |
| | 1.3 The concept of Limit | |
| | 1.4 Limit of a Function. . | |
| | 1.5 Fundamental Theorems on Limit. | |
| | 1.6 Some important Limits. - | |
| | 1.7 Problems. | |
| 2. | Differentiation | 6 Hours |
| | 2.1 Increments. | |
| | 2.2 Differential Coefficient or Derivative. | |
| | 2.3 Differentiation ab-initio or by First Principle. | |
| | 2.4 Geometrical interpretation of Differential Coefficient. | |
| | 2.5 Differential Coefficient of $X^n (ax+ b)^n$. | |
| | 2.6 Three important rules. | |
| | 2.7 Problems. | |
| 3. | Differentiation of Algebraic Functions | 9 Hours |
| | 3.1 Explicit Functions. | |
| | 3.2 Implicit Functions. | |
| | 3.3 Parametric forms. | |
| | 3.4 Problems. | |
| 4. | Differentiation of Trigonometric Functions | 6 Hours |
| | 4.1 Differential Coefficient of Sin-x, Cos-x, Tan-x from First Principle. | |

- 4.2 Differential Coefficient of Cosec-x, Sec-x, Cot-x.
- 4.3 Differential Coefficient of Inverse Trigonometric Functions.
- 4.4 Problems.

- | | | |
|------------|---|----------------|
| 5. | Differentiation of Logarithmic & Exponential Functions | 6 Hours |
| | 5.1 Differentiation of $\text{Ln } x$. | |
| | 5.2 Differentiation of $\text{Log } a^x$ | |
| | 5.3 Differentiation of a^x . | |
| | 5.4 Differentiation of e^x . | |
| | 5.5 Problems. | |
| 6. | Rate of Change of Variables | 6 Hours |
| | 6.1 Increasing and Decreasing Functions. | |
| | 6.2 Maxima and Minima Values. | |
| | 6.3 Criteria for Maxima and Minima Values. | |
| | 6.4 Methods of Findings. | |
| | 6.5 Rate the Measure. | |
| | 6.6 Slope of a line. | |
| | 6.7 Velocity and Acceleration. | |
| | 6.8 Problems. | |
| 7. | Integration – Simple Basic Rules | 9 Hours |
| | 7.1 Concept. | |
| | 7.2 Fundamental Formulas. | |
| | 7.3 Important Rules. | |
| | 7.4 Problems. | |
| 8. | Methods of Integration | 9 Hours |
| | 8.1 Integration by Substitution. | |
| | 8.2 Integration by parts. | |
| | 8.3 Problems. | |
| 9. | Definite Integrals | 6 Hours |
| | 9.1 Properties. | |
| | 9.2 Application to Area. | |
| | 9.3 Problems. | |
| 10. | Differential Equations | 6 Hours |
| | 10.1 Introduction. | |
| | 10.2 Order and Degrees. | |
| | 10.3 First Order Differential Equation. | |
| | 10.4 Solution. | |
| | 10.5 Problems. | |
| 11. | Plane Analytic Geometry & Straight Line | 6 Hours |
| | 11.1 Coordinate System. | |
| | 11.2 Distance Formula. | |
| | 11.3 The Ratio Formulas | |
| | 11.4 Inclination and slope of a line. | |
| | 11.5 The slope formula. . | |

- 11.6 Problems
- 12. Equations of Straight Line** **6 Hours**
- 12.1 Some important forms.
- 12.2 General form.
- 12.3 Angle formula.
- 12.4 Parallelism and perpendicularity.
- 12.5 Problems.
- 13. Equations of Circle** **6 Hours**
- 13.1 Standard forms of equation.
- 13.2 Central form of equation.
- 13.3 General form of equation.
- 13.4 Radius and coordinates of center.
- 13.5 Problems.
- 14. Statistics** **9 Hours**
- 14.1 Concept of Mean, Median, and Mode.
- 14.2 Standard Deviation.
- 14.3 Laws of Probability.
- 14.4 Problems.

BOOKS RECOMMENDED

1. Thomas Finny, "Calculus and Analytic Geometry".
2. Ghulam Yasin Minhas, Technical Mathematics, "Vol-I & II" Ilmi Kitab Khana, Lahore.
3. Riaz Ali Khan, Polytechnic Mathematic Series, "Vol 1 & 11", Majeed Sons, Faisalabad.
4. Sana Ullah Bhatti, "Calculus and Analytic Geometry", Punjab Text Book Board, Lahore.

INSTRUCTIONAL OBJECTIVES

- 1. Use Concept of Functions and their Limits in Solving Simple Problems**
 - 1.1 Define a function. .
 - 1.2 List all types of functions.
 - 1.3 Explain the concept of limit and limit of a function.
 - 1.4 Explain fundamental theorems on limits.
 - 1.5 Derive some important limits.
 - 1.6 Solve problems on limits.
- 2. Understand the Concept of Differential Coefficient**
 - 2.1 Derive mathematical expression for a differential coefficient.
 - 2.2 Explain geometrical interpretation of differential coefficient.
 - 2.3 Differentiate a constant, a constant associated with a variable and the sum of finite number of motions.
 - 2.4 Solve related problems.
- 3. Use Rules of Differentiation to Solve Problems of Algebraic Functions**
 - 3.1 Differentiate ab-initio x^n and $(ax + b)^n$.
 - 3.2 Derive product, quotient, and chain rules.
 - 3.3 Find derivatives of implicit functions and explicit functions.

- 3.4 Differentiate parametric forms, functions w. r. t. another function, and by rationalization.
 - 3.5 Solve problems using these formulas.
- 4. Use Rules of Differentiation to Solve Problems Involving Trigonometric Functions**
- 4.1 Differentiate from first principle $\sin x$, $\cos x$, $\tan x$.
 - 4.2 Derive formulas for Derivatives of $\sec x$, $\operatorname{cosec} x$, $\cot x$.
 - 4.3 Find differential coefficients of inverse trigonometric functions.
 - 4.4 Solve problems based on these formulas.
- 5. Use Rules of Differentiation to Logarithmic and Exponential Functions.**
- 5.1 Derive formulas for differential coefficient of logarithmic and exponential functions.
 - 5.2 Solve problems using these formulas.
- 6. Understand Rate of Change of One Variable with respect to another**
- 6.1 Derive formulae for velocity, acceleration, and slope of a line.
 - 6.2 Define an increasing and a-decreasing function, maxima and minima values, and point of inflection.
 - 6.3 Explain criteria for maxima and minima values of a function.
 - 6.4 Solve problems involving rate of change of variables.
- 7. Use Rules of Integration in Solving Relevant Problems**
- 7.1 Explain the concept of integration.
 - 7.2 State basic theorems of integration.
 - 7.3 List some important rule of integration.
 - 7.4 Derive fundamental formulas of integration.
 - 7.5 Solve problems of integration based on these rules/ Formulas.
- 8. Understand Different Methods of Integration**
- 8.1 List standard formulas of integration.
 - 8.2 Integrate a function by substitution method.
 - 8.3 Find integrals by the method of integration by parts.
 - 8.4 Solve problems using these methods.
- 9. Understand Methods of Solving Definite Integrals**
- 9.1 Define definite integral
 - 9.2 List properties of definite integrals.
 - 9.3 Find areas under the curves using definite integrals.
 - 9.4 Solve problems of definite integrals.
- 10. Use Different Methods of Integration to Solve Differential Equations**
- 10.1 Define a differential equation, its degree and order.
 - 10.2 Explain method of separation of variables to solve differential equation of first order and first degree.
 - 10.3 Solve differential equations of first order and first degree.
- 11. Understand the Concept of Plane Analytic Geometry**
- 11.1 Explain the rectangular co-ordinate system.
 - 11.2 Locate points in different quadrants.
 - 11.3 Derive distance formula.

- 11.4 Prove section formulas.
- 11.5 Derive slope formula.
- 11.6 Solve problems using these formulas.

12. Use Equations of Straight Line in Solving Problems

- 12.1 Define straight lines.
- 12.2 Write general form of equation of a straight line.
- 12.3 Derive slope intercept and intercept forms of equations of straight lines.
- 12.4 Derive expression for angle between two straight lines.
- 12.5 Derive conditions of perpendicularity and parallelism of two straight lines.
- 12.6 Solve problems involving these equations/formulas.

13. Solve Technology Problems Using Equations of Circle

- 13.1 Define a circle.
- 13.2 Describe standard, central, and general forms of the equation of a circle.
- 13.3 Convert general form to the central form of equation of a circle.
- 13.4 Derive formula for the radius and the coordinates of the center of a circle from the general form.
- 13.5 Derive equation of the circle passing through three given points.
- 13.6 Solve problems involving these equations.

14. Understand the Basic Concept of Statistics

- 14.1 Define mean, median, and mode.
- 14.2 Explain standard deviation.
- 14.3 State laws of probability.
- 14.4 Calculate the above mentioned quantities using the proper formulas.

BUSINESS COMMUNICATION

CODE: Mgm-211

T	P	C
1	0	1

TOTAL CONTACT HOURS:

Theory 32
Practical 0

PRE-REQUISITE: The students shall already be familiar with the language concerned.

AIMS:

The course has been designed to enable the students to.

1. Develop communication skills.
2. Understand basic principles of good and effective business writing in commercial and Industrial fields.
5. Develop knowledge and skill to write technical report with confidence and accuracy.

COURSE CONTENTS

- | | |
|---|----------------|
| 1. Communication Process | 6 Hours |
| 1.1 Purposes of communication. | |
| 1.2 Communication process. | |
| 1.3 Distortions in communication. | |
| 1.4 Consolidation of communiqués | |
| 1.5 Communication flow | |
| 1.6 Communication of self-development. | |
| 2. Communication Skills | 6 Hours |
| 2.1 Significance of speaking. | |
| 2.2 Verbal and non-verbal messages. | |
| 2.3 Strategic steps of speaking. | |
| 2.4 Characteristics of effective oral messages. | |
| 2.5 Communication trafficking. | |
| 2.6 Oral presentation. | |
| 3. Questioning Skills | 3 Hours |
| 3.1 Nature of question. | |
| 3.2 Types of questions. | |
| 3.3 Characteristics of a good question. | |
| 3.4 Questioning strategy. | |
| 4. Listening Skills | 5 Hours |
| 4.1 Principles of active listening. | |
| 4.2 Skills of active listening. | |
| 4.3 Barriers to listening. | |
| 4.4 Reasons of poor listening. | |
| 4.5 Giving feedback. | |

- 5. Interviewing Skills** **3 Hours**
- 5.1 Significance of interviews.
 - 5.2 Characteristics of interviews.
 - 5.3 Activities in an interviewing situation.
 - 5.4 Types of interviews.
 - 5.5 Interviewing strategy.
- 6. Report Writing**
- 6.1 Goals of report writing.
 - 6.2 Report format.
 - 6.3 Types of reports.
 - 6.4 Report writing strategy
- 7. Reading Comprehension** **2 Hours**
- 7.1 Reading problems.
 - 7.2 Four reading skills.
- 8. Group Communication** **4 Hours**
- 8.1 Purposes of conducting meetings.
 - 8.2 Planning a meeting.
 - 8.3 Types of meetings.
 - 8.4 Selection of a group for meeting.
 - 8.5 Group leadership skills.
 - 8.6 Running a successful meeting.
 - 8.7 Active participation techniques.

BOOKS RECOMMENDED

1. Sh. Ata -ur-Rehman, “Effective Business Communication and Report Writing”.
2. Ulman J. N. Cloud J.R. “Technical Reporting”.

INSTRUCTIONAL OBJECTIVES

1. Understand the Communication Process

- 1.1 State the benefits of two way of communication. ,
- 1.2 Describe a model of communication process.
- 1.3 Explain the major communication methods used -in organizations.
- 1.4 Identify the barriers to communication and methods to overcome these Barriers.
- 1.5 Identify misconceptions about communication.

2. Understand the process of Oral

- 2.1 Identify speaking situations with other people. .
- 2.2 Identify the strategic steps of speaking. 3
- 2.3 Identify the characteristics of effective oral messages. ;
- 2.4 State the principles of one-way communication.
- 2.5 State the principles of two-way communication.
- 2.6 Identify the elements of oral presentation skills.
- 2.7 Determine the impact of non-verbal communication on oral communication.

3. Determine the Uses of Questioning skills to Gather and Clarify Information in the Oral Communication Process

- 3.1 Identify different types of questions.
- 3.2 Determine the purpose of each type of question and its application.
- 3.3 Identify the hazards to be avoided when asking questions. ,
- 3.4 Demonstrate questioning skills.

4. Demonstrate the Use of Active Listening Skills in the Oral Communication Process

- 4.1 State the principles of active listening.
- 4.2 Identify skills of active listening.
- 4.3 Identify barriers to active listening.
- 4.4 State the benefits of active listening.
- 4.5 Demonstrate listening skills.
- 4.6 Explain the importance of giving and receiving feedback.

5. Determine the Appropriate Interview Type for the Specific Work-Related Situation and Conduct a Work-Related Interview

- 5.1 State the significance of interviews.
- 5.2 State the characteristics of interviews.
- 5.3 Explain the activities in an interviewing situation.
- 5.4 Describe the types of interviews.
- 5.5 Explain the interviewing strategy.
- 5.6 Prepare instrument for a structured interview.

6. Prepare a Report Outline Based on Subject Matter and Audience

- 6.1 Identify the different types of reports.
- 6.2 Determine when to use an informal or formal report presentation. '
- 6.3 Identify the stages of planning a report.
- 6.4 Identify the parts of a report and chose the parts appropriate for each type of Report.
- 6.5 Draft a report outline.

7. Demonstrate Reading Comprehension

- 7.1 Identify major reading problems.
- 7.2 Identify basic reading skills.
- 7.3 State methods of previewing written material.
- 7.4 Identify methods of concentration when reading.
- 7.5 Demonstrate reading comprehension.

8. Understand the Principles of Group Communication

- 8.1 State the purposes and characteristics of major types of meetings.
- 8.2 Explain responsibilities of a meeting/committee.
- 8.3 Identify problems likely to be faced at meeting and means to overcome these Problems. .
- 8.4 Distinguish between content and process at meetings.
- 8.5 Explain the key characteristics of a good group facilitator.

APPLIED ELECTRICITY AND ELECTRONICS

CODE: ET-212

T	P	C
1	3	2

TOTAL CONTACT HOURS:

Theory	32
Practical	96

AIMS:

This course enables the students to understand the fundamentals of electricity, know the devices used for control of industrial equipments, their properties and uses. The course provides the knowledge of working principles and operation of A. C. and D. C. motors, transformers, and generators, interpret connection diagrams of various electrical devices, Students will be able to-observe safety rules and provide electric shock treatment.

COURSE CONTENTS

1. Fundamentals of Electricity.

3 Hours

- 1.1 Current, Voltage, Resistance, their units
- 1.2 Ohms law, simple calculations.
- 1.3 Laws of resistances, simple calculations.
- 1.4 Combination of resistances, simple calculations.
- 1.5 Electrical and mechanical power, their conversion, units, horsepower.
- 1.6 Heating effect of current, Joules law.
- 1.7 Electrical energy, units, energy bill.
- 1.8 Thermal relay.

2. Fundamentals of Electro-Magnetism

5 Hours

- 2.1 Magnetism, units, theory of magnetism.
- 2.2 Permeability, Ferromagnetic materials.
- 2.3 Electromagnetism fields around current-carrying conductors, coils, and Fleming right hand rule.
- 2.4 Force on current carrying conductor lying in magnetic field left hand rule.
- 2.5 Faraday laws of electromagnetic induction, basic AC generator.
- 2.6. Self and mutual induction, elementary transformer.
- 2.7 Magnetic relays and connectors.

3. Motors, Generators, and Transformers

5 Hours

- 3.1 Construction and working of AC and DC generators. '
- 3.2 Construction and working of transformers, emf and current equation types.
- 3.3 Welding transformers, ratings.
- 3.4 Types and working of -AC- motors; 1-Phase Induction Motor, 3-Phase Induction motors.
- 3.5 Principle of induction heating, construction, ratings of induction furnaces.

14. Batteries and Cells

- 4.1 Types -of cells; Primary, Secondary.
- 4.2 Types of secondary cells, Voltage ratings.
- 4.3 Charging and discharging of lead acid battery.

- 4.4 Precautions in handling batteries.
- 4.5 Alkaline batteries, ratings.

5 Fundamentals of Electronics 4 Hours

- 5.1 Semiconductor theory, doping, P & N type materials.
- 5.2 PN Junction diode, potential barrier, forward and reverse bias.
- 5.3 Use of PN diode as rectifiers.
- 5.4 Filtering.

6. Transistors 5 Hours

- 6.1 PNP & NPN transistors, -biasing, working.
- 6.2 Use of transistors as amplifiers, gains in CE, CB and CC amplifiers.
- 6.3 Field effect transistors, construction and uses.
- 6.4 Transistors as oscillators.

7 Special Purpose Diodes and Devices 5 Hours

- 7.1 Zener diodes, uses, ratings.
- 7.2 Photodiodes uses.
- 7.3 DIAC, uses.
- 7.4 TRIAC, uses.
- 7.5 Saturable core reactor.

8. Thyristors 3 Hours

- 8.1 UJT, working, uses as oscillators.
- 8.2 SCR, working, uses as control devices.
- 8.3 Phase control of SCR

PRACTICALS

96 Hours

1. Study of electrical measuring instruments, handling precautions, methods of connection.
2. Verification of Ohm law.
3. Verification of laws of combination of resistances.
4. Measurement of power by volt-ammeter and wattmeter.
5. Measurement of energy.
6. Study of thermal and magnetic relays/contractors.
7. Study of magnetic fields due to current carrying conductors, coils
8. Verification of Faradays laws of electromagnetic induction.
9. Verification of self and mutual induction.
10. Study of magnetic relays.
11. Study of A.C. and D.C. generators, voltage build-up-excitation. .
12. Study of transformers, determination of voltage ratio.
13. Study of welding transformers.
14. Starting single phase induction motors, reversal.
15. Starting three phase induction motors, reversal.
16. Connections of magnetic starters with motors.
17. Connections of 3-point (forward-stop-reverse) starters.
18. Study of induction furnaces, their controls.

19. Study of primary and secondary cells.
20. Charging of lead -acid batteries, safety precautions, preparation of electrolyte.
21. Study and connections of PN diodes as rectifiers.
22. Connecting PN diode as half-wave and full-wave.
23. Connecting PN diode- as bridge rectifiers with filter.
24. Study connections and biasing of PNP and NPN transistors.
25. Determination of current and voltage gains of CE amplifier.
26. Study and connections of Zener diode as voltage regulator.
27. Study and connections of photodiode as light sensing device.
28. Study and connections of DIAC and TRIAC as switch circuits.
29. Determination of intrinsic stand-off ratio of UJ T.
30. A Connections of UJ T as relaxation oscillator.
31. Study and connections of SCR as a power switch.
32. Study of phase control of SCR.

BOOKS RECOMMENDED

1. Examples of Electrical Calculations, by Admiralty.
2. Reed Basic Electro-Technology for Marine Engineers, KRAAL.
3. Electrical Technology, B. L. Theraja. .
4. A. C. & D. C. Circuits, B. Grob.
5. Basic Electronics, B. Grob.

INSTRUCTIONAL OBJECTIVES

- 1. Understand Basic Concepts-and Laws of Electricity.**
 - 1.1 Define units of Current, Voltage, and Resistance.
 - 1.2 Explain Ohms law
 - 1.3 Solve simple problems on Ohm Law. ,
 - 1.4 Substitute two of the three variables to find the third unknown in equation $V = IR$.
 - 1.5 Calculate the equivalent resistances for resistors joined in series.
 - 1.6 Calculate electrical and mechanical power and the interrelation between the two systems.
 - 1.7 Calculate the electrical energy consumption in an installation and prepare the energy bill.
 - 1.8 State the action of different types of thermal relays.
- 2. Understand the Fundamental Concept of Electro-Magnetism**
 - 2.1 State molecular theory of magnetism.
 - 2.2 Define various units involving magnetism.
 - 2.3 State the magnetic properties of materials and permeability.
 - 2.4 State the magnetism associated with current carrying conductors and coils.
 - 2.5 State Fleming's right hand rule.
 - 2.6 Explain the force experienced by the current carrying conductors in magnetic Fields according to Fleming's right hand rule.
 - 2.7 State Faraday's laws of electromagnetic induction.
 - 2.8 Explain-the production of A. C. in a simple coil rotating in a uniform magnetized. .
 - 2.9 State the self induction in a coil and the mutually induced voltage in a nearby coil due to fuse -linkage. '
 - 2.10 Explain the working of magnetic relays and contractors.
- 3. Understand Working of Electric Motors, Generators, and Transformers**
 - 3.1 State the main parts of D. C. electric motors and D. C. generators.

- 3.2 State the construction of alienator.
- 3.3 State the construction of three phase and single phase induction motors.
- 3.4 Explain the working principle of transformers.
- 3.5 State various parts of a transformer.
- 3.6 State the emf equation of transformer and transformation ratio equation.
- 3.7 Explain the working of transformer specially designed for welding purpose and its settings.
- 3.8 Explain the working of different types of electric furnaces.
- 3.9 Explain the working of electric spot welding machine.

4. Understand the Electrochemical Effect and its Application in Various Types of Batteries and Cells.

- 4.1 Define the primary and secondary cells.
- 4.2 State different types of secondary cells and their voltage ratings.
- 4.3 Explain the method of charging of a lead acid battery.
- 4.4 Enlist the precautions in handling batteries.
- 4.5 State the construction of alkaline batteries and their ratings.

5. Understand the Fundamentals of Electronics

- 5.1 State the semiconductor theory.
- 5.2 State how P-type and N-type material is produced.
- 5.3 State the action of potential barrier in a PN junction and the effect of forward and reverse bias on the junction.
- 5.4 Draw the circuit diagram for half wave and full wave rectifier.
- 5.5 Draw the bridge rectifier circuit with filter circuit.

6. Transistors.

- 6.1 State the biasing working of PNP & NPN type of transistor.
- 6.2 Draw the circuit indicating the method of biasing the NPN and PNP transistors.
- 6.3 Draw the different types of amplifier connections (C.B, C.B, and C.C.)
- 6.4 State the working of field effect transistors. .
- 6.5 Enlist the comparative properties and usage of two types of transistors (Bipolar versus F.E.T.)
- 6.6 State the working of a transistor oscillator and draw its circuit diagram.

7. Understand the Working of Special Purpose Devices

- 7.1 State the working of zanier diode.
- 7.2 Draw the connection for a practical regulated power supply.
- 7.3 State the working of photodiode and its uses.
- 7.4 State the working of DIAC and its uses. ,
- 7.5 State the working of TRIAC and its uses.
- 7.6 State the working of saturable core reactor and its use.

8. Understand the Application of Thyristors in Control Circuits.

- 8.1 Explain the working of Unijunction Transistor and its -use as an oscillator.
- 8.2 Draw circuit of a UJT relaxation oscillator.
- 8.3 Explain the working of silicon controlled rectifier and its uses as a controlling device.
- 8.4 Explain the phase control with the help of S.C.R. for A.C Loads.
- 8.5 Draw circuits using phase control by SCR

PETROLEUM GEOLOGY

CODE: Pet-213

T	P	C
2	3	3

TOTAL CONTACT HOURS:

Theory 64

Practical 96

AIMS:

After studying this course the students will be able to acquire the fundamental knowledge of the geology of petroleum in the following areas.

1. Occurrence of petroleum in the subsurface rocks.
2. Reservoir fluids and their gross distribution in the reservoir.
3. Types of subsurface structures containing petroleum.
4. Origin and subsequent migration of petroleum into modern pools.
5. Useful information possible to be obtained from a single test well.

COURSE CONTENTS

- | | |
|--|-----------------|
| 1. The Occurrence of Petroleum | 5 Hours |
| 1.1 Mode of occurrence; Surface Occurrence, Subsurface Occurrence. | |
| 1.2 Geographic location. | |
| 1.3 Geologic age of reservoir rocks. | |
| 2. Origin of Petroleum | 6 Hours |
| 2.1 Limiting conditions. | |
| 2.2 Inorganic origin. | |
| 2.3 Organic origin. | |
| 2.5 Transformation of organic matter in to petroleum. | |
| 2.6 Conclusions regarding the origin of petroleum. | |
| 3. Subsurface Geology | 12 Hours |
| 3.1 Information from a test well. | |
| 3.2 Subsurface geologic maps. | |
| 3.3 Classification of reservoir rocks. | |
| 3.4 Nomenclature of reservoir rocks. | |
| 3.5 Particle size classification of clastic rocks. | |
| 3.6 Importance of clay in petroleum geology. | |
| 3.7 Cementation. | |
| 3.8 Chemical reservoir rocks. | |
| 3.9 Miscellaneous reservoir rocks. | |
| 3.10 Marine and non-marine reservoir rocks. | |
| 4. Migration and Accumulation of Petroleum. | 6 Hours |
| 4.1 Geologic framework of migration and accumulation. | |
| 4.2 Short or long migration. | |
| 4.3 Primary migration. | |
| 4.4 Secondary migration. | |
| 4.5 Accumulation. | |
| 4.6 Vertical migration. | |

4.7 Time of accumulation.

5. Reservoir Traps **6 Hours**

- 5.1 The anticlinal theory.
- 5.2 Classifications of Traps.
- 5.3 Traps caused by Folding.
- 5.4 Traps caused by Faulting.
- 5.5 Traps caused by Fracturing.

6. Reservoir Conditions - Pressure, Temperature **6 Hours**

- 6.1 Reservoir pressure.
- 6.2 Pressure gradients.
- 6.3 Sources of reservoir pressure.
- 6.4 Pressure anomalies.
- 6.5 Geothermal temperature gradient.
- 6.6 Sources of heat energy.
- 6.7 Effects of heat.

7. The Reservoir Fluids **8 Hours**

- 7.1 Fluid content of reservoirs.
- 7.2 Sources of data on reservoir fluids
- 7.3 Gross distribution of reservoir fluids
- 7.4 Oilfield waters.
- 7.5 Water saturation.
- 7.6 Concentration of dissolved salts.
- 7.7 Chemical composition of oilfield waters.
- 7.8 Origin of oilfield waters.

8. Core Analysis **15 Hours**

- 8.1 Routine core analysis.
- 8.2 Porosity and its measurement.
- 8.3 Permeability and its measurement.
- 8.4 Fluid saturations and their measurement.
- 8.5 Practical uses of core analysis data.
- 8.6 Relevant numerical problems.

PRACTICALS

96 HOURS

GUIDELINES FOR INSTRUCTOR:

A. Relevant Audio-Visual programs demonstrating different geological concepts and Processes should be shown to the students.

B. Instructional tours should be arranged to visit various oil and gas fields where the students can observe various oil and gas field operations, processes, equipment's, and safety Precautions.

Every student should be advised to prepare in writing a different set of questions (at least three) on various relevant topics to be asked during the tour. The teacher should assist the students in selecting and formulating questions;

1. To study various types of subsurface geologic maps.
2. To examine marine and non-marine fossils.
3. Differentiation and identification of rock types.
4. Identification and description of clastic rocks.
5. Identification and description of carbonate rocks.
6. Microscopic examination of crushed rock samples.
7. To examine and study the properties of the following types of reservoir rocks in the Laboratory.
i) Sand stones. ii) Limestone. iii) Dolomite. iv) Clay.
8. To study different types of folds and faults by means of simple wooden models.
9. Determination of porosity of a cylindrical core by using Helium Porosimeter.
10. Determination of air permeability of a clean and dried core by means of a gas Permeameter.
11. Determination of liquid permeability (water as flowing fluid) by means of a liquid Pentameter.
12. Determination of oil, water, and air (gas) saturations of a core sample by means of the modified ASTM distillation apparatus.

BOOKS RECOMMENDED

1. A. I. Levorsen, "Geology of Petroleum", CBS Publishers & Distributors.
2. Carl Gatlin, "Petroleum Engineering - Drilling and Well Completions", Prentice-Hall, Inc"
3. W. F. Rogers, "Composition and Properties of Oil Well Drilling Fluids", Gulf Publishing Co.
4. Union Texas Pakistan Inc, "Production Operator II Manual, Part II".
5. M. A. Quraishi, "Basic Production Course" Oil & Gas Training Institute, Islamabad.

INSTRUCTIONAL OBJECTIVES

1. Understand Occurrence of Petroleum

- 1.1. Enlist different categories of the petroleum deposits of the world.
- 1.2. Explain classification of surface occurrences of petroleum; Live, Dead, Kerogen Shales or Oil Shales.
- 1.3. Describe seepages, springs, and bitumen exudates.
- 1.4. Describe mud volcanoes and mud flows.
- 1.5. Describe briefly the classification of the outcrops of solid petroleum Disseminated Deposits, Veins or Dike-like Deposits.
- 1.6. Describe Kerogen Shales or Oil Shales and give ranges of the chemical composition of a Kerogen.
- 1.7. Describe the importance of minor subsurface occurrences.
- 1.8. Define Pool, Field, and Province
- 1.9. Explain geographic location of petroleum
- 1.10. Explain two parallel classifications of geologic time; geologic-time units, time-stratigraphic units.
- 1.11. Show and explain the geologic time scale.
- 1.12. Outline the reasons for domination of the rocks of Tertiary Age in total productivity.

2. Understand the Origin of Petroleum

- 2.1. Outline the framework of limiting conditions for the formation of petroleum.
- 2.2. Describe theories of inorganic origin of petroleum
- 2.3. Outline the reasons for believing inorganic origin of petroleum
- 2.4. Describe the salient features of the current theory of the origin of petroleum.

- 2.5. Describe various sources of energy for the transformation of organic matter into petroleum
 - a) Bacterial Action.
 - b) Heat and Pressure.
 - c) Catalytic Reactions.
 - d) Radioactive Bombardment.
- 2.6. Summarize the ideas on the origin of petroleum.

3. Understand Subsurface Geology

- 3.1. Present in a tabular form the kinds of information that it is possible to obtain from a single hole or test well and the ways of its determination.
- 3.2. Enlist the kinds of subsurface geologic maps.
- 3.3. Describe the following types of subsurface geologic maps.
 - a) Structural Maps and Sections.
 - b) Isopach Maps.
- 3.4. Outline classification of reservoir rocks
- 3.5. Describe nomenclature of reservoir rocks.
- 3.6. Outline particle size classification of clastic rocks according to U. S. Bureau of Solids.
- 3.7. Describe graphic method (Ternary Diagram) showing the composition of Sediment having three components.
- 3.8. Explain importance of clay in the geology of petroleum
- 3.9. Describe the phenomenon of cementation of fragmental reservoir rocks.
- 3.10. Describe various types of chemical reservoir rocks.
- 3.11. Explain various miscellaneous types of reservoir rocks.
- 3.12. Outline the points suggesting differentiation between marine and non-marine rocks.

4. Understand Migration and Accumulation of Petroleum

- 4.1. Outline the salient points of the geologic framework of migration and accumulation.
- 4.2. Discuss Short and Long Migration.
- 4.3. Outline the points supporting distant migration of petroleum.
- 4.4. Discuss various possibilities in support of primary migration of petroleum
 - a) Water squeezed Out of Clay and Shales.
 - b) Normal Water Circulation
 - c) Sedimentary Oil - Recycled Oil.
- 4.5. Enlist various facets of secondary migration of petroleum.
- 4.6. Describe some of the important facets of secondary migration of petroleum.
 - a) Entrained Particles.
 - b) Capillary pressure.
 - c) Buoyancy
 - d) Dissolved Gas Effects.
- 4.7. Discuss accumulation of petroleum and enlist factors which limit the size of the accumulation.
- 4.8. Outline the three pathways of vertical migration of fluids
- 4.9. Describe the two approaches supporting idea of deducing the conditions under which migration took place
 - a) The law of Gases.
 - b) The time Trap formed

5. Understand the Reservoir Traps

- 5.1. Describe the anticlinal theory.
- 5.2. Outline the Clapp's classification of reservoir traps.
- 5.3. Outline the broad classification of reservoir traps.
- 5.4. Define
 - a) Structural Traps.
 - b) Stratigraphic Traps.
 - c) Combination Traps.
- 5.5. Describe structural traps caused by Folding.
- 5.6. Outline the causes of discrepancies between the shallow and deep folding.
- 5.7. Describe Normal Faulting.

- 5.8. Describe Reverse and Thrust Faulting.
- 5.9. Describe Traps caused by Fracturing.

6. Understand Reservoir Pressure and Temperature

- 6.1 Describe various terms used in connection with reservoir pressure.
- 6.2 Describe static and dynamic pressure gradients.
- 6.3 Outline the sources of reservoir pressure
 - a) Pressure due to a column of water.
 - b) Compaction phenomena.
 - c) Osmosis.
 - d) Temperature changes.
 - e) Secondary precipitation or Cementation.
 - f) Earthquakes.
 - g) Tides, Tsunamis, Atmospheric Pressure.
 - h) Chemical and Biochemical causes
- 6.4 Outline causes of Pressure anomalies.
- 6.5 Explain the geothermal temperature gradient.
- 6.6 Describe sources of heat energy.
- 6.7 Outline the effects of heat in geology of petroleum.

7. Understand the Reservoir Fluids

- 7.1. Outline the fluids contents of gas and oil reservoirs indicating the two important physical properties of oil and gas responsible for gross distribution of reservoir fluids
- 7.2. Enlist various sources of data on reservoir fluids
- 7.3. Describe with the help of a diagram the distribution of water, oil, and gas in Reservoir
- 7.4. Describe genetic classification of oilfield waters.
- 7.5. Describe the classification of oilfield waters based on the mode of occurrence.
- 7.6. Enlist the measurements which are made to determine characteristics of oilfield waters.
- 7.7. Briefly outline the methods for measuring interstitial water saturation.
- 7.8. Briefly describe concentration of dissolved salts in interstitial water.
- 7.9. Describe character of brine in terms of its reaction value by the combination of four properties.
- 7.10. Briefly outline the uses of water analysis.
- 7.11. Outline the explanation given for the difference between oilfield waters and modern sea waters.

8. Understand the Fundamentals of Core Analysis

- 8.1 Discuss routine core analysis; measurement of porosity, absolute permeability, and fluid saturation.
- 8.2 Discuss formula and the variables used in the formula for calculating porosity.
- 8.3 Discuss sample preparation; cleaning procedure for whole core and plug samples.
- 8.4 Derive formula for a two-cell Boyle's law Porosimeter for measuring grain volume of a core sample.
- 8.5 Describe the saturation method for grain volume determination.
- 8.6 Explain a method for bulk volume determination.
- 8.7 Solve numerical problems regarding porosity determination.
- 8.8 Write Darcy equation for linear flow of gases and discuss units of each variable.
- 8.9 Describe procedure for measurement of permeability of plug type and whole core samples.
- 8.10 Solve numerical problems relating to permeability calculations.
- 8.11 Describe methods for determining fluids saturations; Retort method, distillation method.
- 8.12 Discuss practical uses of core analysis data

FLUID MECHANICS AND THERMODYNAMICS

CODE: Pet-223

T	P	C
2	3	3

TOTAL CONTACT HOURS:

Theory 64

Practical y 96

AIMS:

This course is designed to assist the students:

1. To gain basic knowledge of fluid mechanics and its application in fluids flow problems of practical interest.
2. To understand the types and operating principles of pumps and compressors.
3. To understand the fundamental knowledge of thermodynamics and heat transfer and its application to problems of practical interest.

COURSE CONTENTS

Part-I: FLUID MECHANICS.

1. Classification of Fluids and Flow Regimes

12 Hours

- 1.1 Introduction to Fluid Mechanics.
- 1.2 Nature of fluids.
- 1.3 Fluid properties.
- 1.4 Classification of fluids; Newtonian and Non-Newtonian fluids
- 1.5 Fluid Statics.
- 1.6 Static fluids pressure.
- 1.7 Pressure versus height of fluids.
- 1.8 Absolute and gauge pressures.
- 1.9 Pipe flow of Newtonian Liquids.
- 1.10 Laminar and Turbulent flow
- 1.11 Reynolds criterion.

2. Transportation of Fluids

18 Hours

- 2.1 Pumps.
- 2.2 Classification of pumps.
- 2.3 Operating principles, Construction, and problems of Centrifugal Pumps.
- 2.4 Operating principles, and classification of positive displacement pumps.
- 2.5 Operating principles, and types of reciprocating pumps.
- 2.6 Operating principles and types of rotary pumps.
- 2.7 Compressors.
- 2.8 Compressor classification.
- 2.9 Operating principles, parts, and types of reciprocating compressors.
- 2.10 Controlling reciprocating compressor output.
- 2.11 Compressor starting and operating principles.
- 2.12 Rotary compressors.

Part-II: THERMODYNAMICS

- | | |
|---|-----------------|
| 1. Introduction to Thermodynamics | 8 Hours |
| 1.1 Thermodynamics. | |
| 1.2 Dimensions and units. | |
| 1.3 Thermodynamic Pressure. | |
| 1.4 Thermodynamic Systems. | |
| 1.5 Thermodynamic Properties. | |
| 1.6 Thermodynamic Equilibrium and Equilibrium States. | |
| 1.7 Temperature and the Zeroth Law of Thermodynamics. | |
| 1.8 Thermodynamic Processes. | |
|
 | |
| 2. Laws of Thermodynamics | 4 Hours |
| 1.4 First law of Thermodynamics. | |
| 1.5 Definition. | |
| 1.6 Derive Equation. | |
|
 | |
| 3. Heat Transfer and Heat Exchange Equipment | 14 Hours |
| 3.1 Introduction. | |
| 3.2. Principles of heat transfer. | |
| 3.3 Temperature | |
| 3.4 Heat Exchangers, construction & types | |
| 3.5 Air-cooled heat exchangers. | |
| 3.6 Heaters. | |
|
 | |
| 4. Heat Losses and Insulation | 6 Hours |
| 4.1 Heat loss from the pipe insulation. | |
| 4.2 Temperature pattern in heat exchangers. | |
| 4.3 Factor affecting heat loss. | |
| 4.4 Heat transfer with change of phase. | |
| 4.5 Cryogenic insulation. | |
| 4.6 Multi-layer insulation. | |
| 4.7 Materials used for insulation (evacuated powder, porous material) | |

PRACTICALS

96 HOURS

1. Introduction to the fluids mechanics and thermodynamics laboratory.
2. Study the construction and parts of a centrifugal pump by dismantling and assembling.
3. Study the operating characteristics and performance of a centrifugal type pump.
4. Study the construction and parts of a reciprocating pump by dismantling and assembling.
5. Study the operating characteristics and performance of a reciprocating type pump.
6. Study the construction and parts of a rotary pump by dismantling and assembling.
7. Study the operating characteristics and performance of a rotary type pump.
8. Calibrate a storage tank to obtain weight and volume relationship per unit height.
9. Prepare a graph of coefficient of discharge of an orifice versus Reynolds Number.
10. Study flow measurement by a venturimeter.
11. To practice measurement of gage pressure by means of a Bourdon Pressure Gage.
12. To practice measurement of pressure by means of a simple manometer in inches of. Convert this pressure to inches of H₂O.

13. To determine the speed of air by means of a pitot tube.
14. To determine the velocity profile of water ,flowing at a low rate (laminar flow) through glass tube by means of inserting a slug of colored indicator.
15. To study the construction and parts of a heat exchanger.
16. To study the performance of simple tube condenser of a distillation apparatus.

BOOKS RECOMMENDED

1. W. L. McCabe, J. C. Smith, and P. Harriott, Unit Operations of Chemical Engineering McGraw-Hill, Inc.
2. B. C. Craft and W. R. Holden, Well Design - Drilling and Production, Prentice Hall, Inc
3. R. L. Daugherty and J. B. Franzini, Fluid Mechanics with Engineering Applications, McGraw-Hill, Inc.
4. Union Texas Pakistan Inc., Technician Assistant, Elementary and Intermediate Craft I Skills, Part II.
5. Virgil Moring Faires, Thermodynamics, Collier Macmillan.

INSTRUCTIONAL OBJECTIVES

Part-I: FLUID MECHANICS

1 Understand classification of Fluids and Flow Regimes

- 1.1 Identify and state various branches of fluids mechanics; Fluid Statics Kinematics, Hydrodynamics, Hydraulics, Fluid Mechanics.
- 1.2 Distinguish between a solid and fluids.
- 1.3 Distinguish between a gas and liquid.
- 1.4 State interrelationship of Fluid Mechanics and Thermodynamics.
- 1.5 Enlist important properties of fluids; Density, Specific Weight, Specific Volume, Specific Gravity, Compressibility of Liquids, Compressibility of Gases, Viscosity, Vapor pressure of Liquids.
- 1.6 Define and discuss each of the above noted fluid properties.
- 1.7 Distinguish between Newtonian and Non-Newtonian Fluids and give examples of each type.
- 1.8 Outline classification of Non-Newtonian fluids
- 1.9 Define Average pressure intensity.
- 1.10 Explain the equation which expresses pressure in terms of height of fluids.
- 1.11 Explain the equation which expresses pressure occurring in one fluid in terms of height of other fluids.
- 1.12 Explain Absolute Pressure and Gage Pressure.
- 1.13 Discuss pipe flow of Newtonian liquids and describe velocity profiles in case of laminar and Turbulent.
- 1.14 Explain Reynolds criterion for laminar and turbulent flow region
- 1.15 Solve relevant numerical problems.

2. To Understand Transportation of Fluids

- 2.1 State the functions of pumps.
- 2.2 State the classification of pumps.
- 2.3 Explain the operating principles of centrifugal pumps.

- 2.4. Identify and name the main parts of centrifugal pumps.
- 2.5 Explain the functions of parts of a centrifugal pump.
- 2.6 Identify and state the names of common types of impellers.
- 2.7 State the functions of multistage centrifugal pumps.
- 2.8 State the difference between series and parallel pump connections.
- 2.9 Explain the operating principles and state the classification of positive displacement pumps
- 2.10 Explain the operating principles and types of reciprocating pumps.
- 2.11 State the functions of compressors.
- 2.12 State the classification of compressor.
- 2.13 Explain the operating principles and state the names of the basic parts of reciprocating compressors.
- 2.14. State methods of controlling reciprocating pumps output.
- 2.15 Explain the operating principles of unloading reciprocating compressors.
- 2.16 Identify and state the names of three types of reciprocating compressors.
- 2.17 Explain construction and working of rotary compressor.

Part-II: THERMODYNAMICS.

1 To Understand the Fundamentals of Thermodynamics

- 1.1 Define Thermodynamics.
- 1.2 Tabulate basic Units and Symbols of primary physical quantities.
- 1.3 Tabulate Derived Units and Symbols of important Thermodynamic Quantities in the SI System of Units. .
- 1.4 Tabulate Dimensions and Units of different Dimensional Systems.
- 1.5 Describe the Units of Thermodynamic Quantities in different Dimensional Systems.
- 1.6 Define Thermodynamic Pressure and describe relationship among Absolute Pressure, Atmospheric Pressure, Gage Pressure, and Vacuum.
- 1.7 Solve relevant numerical problems to understand -and practice different units of thermodynamic quantities.
- 1.8 Define a System and Surroundings
- 1.9 Define and identify with examples .various types of Systems; Open System, Closed System, and Isolated System.
- 1.10 Identify and define various types of Walls, Rigid Wall, and Diathermal Wall Adiabatic Wall.
- 1.11 Define and discuss Thermodynamic Properties.
- 1.12 Identify three properties which are unique to thermodynamics.
- 1.13 Define and give examples of the following;
 - a) Point Function.
 - b) Path Function.
 - c) Intensive Properties.
 - d) Extensive Properties.
- 1.14 Define Thermodynamic Equilibrium,, and various Equilibrium States.
 - a) Mechanical Equilibrium
 - b) Thermal Equilibrium
 - c) Chemical Equilibrium
- 1.15 State Zeroth Law of Thermodynamics.
- 1.16 Explain the concept of Temperature and various Scales of Temperature.
- 1.17 Define the Thermodynamic Process and various types of thermodynamic processes
 - i) Isothermal Process.
 - ii) Isobaric Process
 - iii) Isometric Process
 - iv) Adiabatic Process
 - v) Cyclic Process
 - vi) Quasi-static Process

- vii) Non-Quasi-static Process A
 - viii) Reversible Process
 - ix) Irreversible Process
- 1.18 Solve relevant numerical problems.

1. To Understand First Law of Thermodynamics

- 2.1 Define First Law of Thermodynamics.
- 2.2 Explain and give expression of First Law of Thermodynamics.
- 2.3 Explain Thermodynamic work.
- 2.4 Define Enthalpy.

3. To Understand Basics of Heat Transfer and Heat Exchange Equipment

- 3.1 State and describe three ways in which the transfer of heat takes place.
- 3.2 Sketch a simple diagram to illustrate the basic function of a heat exchanger.
- 3.3 State and explain three physical factors that affect the rate of heat transfer Between Fluids.
- 3.4 Draw a diagram to show the comparison of absolute temperature scales.
- 3.5 Define the British thermal unit (Btu).
- 3.6 Draw a single pass shell and tube type heat exchanger to show ten parts of Construction.
- 3.7 Name four common types of shell and tube heat exchanger.
- 3.8 Define Construction & Working of four types of Shell & Tube Heat Exchangers
- 3.9 Describe Double Pipe Heat Exchanger, Baffles, Construction & working
- 3.10 Describe the two functions of Baffles installed in shell and tube type of heat Exchangers.
- 3.11 Explain how tube surface area is extended in air cooled heat exchangers.
- 3.12 Draw a diagram of a forced draught air cooler and describe its operation.
- 3.13 Explain the fundamental difference between direct and indirect fired heaters
- 3.14 List three operational applications of indirect heaters at UT P gas Production Facilities.
- 3.15 Describe the function of the fire tube in an indirect fired heater.
- 3.16 Draw three diagrams to show the basic construction of the
 - i) Condensate Heater Reactor
 - ii) Condensate Stabilizer Reboiler
 - iii) Glycol Reboiler.

4. To Understand Heat Losses and Insulation.

- 4.1. Explain the heat losses through pipe insulations.
- 4.2. Describe the temperature pattern in heat exchangers.
- 4.3. Define Optimum Thickness of Insulation.
- 4.4. Explain local heat transfer coefficient.
- 4.5. Describe free convection average stream temperature. .
- 4.6. Define forced stream temperature.
- 4.7. Explain heat transfer with change of phase.
- 4.8. State various factors that affect the heat transfer.
- 4.9. State the effect of direct deposits.
- 4.10. Describe effect of scale formation.
- 4.11. Describe temperature gradient during heat transfer.
- 4.12. Define condensation.
- 4.13. Describe cryogenic insulation.
- 4.14. Describe multilayer insulation.
- 4.15. Describe materials used for insulation.

PETROCHEMICALS AND INDUSTRIAL STOICHIOMETRY

CODE: Pet-233

T P C
2 3 3

TOTAL CONTACT HOURS

Theory 64
Practical 96

AIMS:

1. To assist the student in understanding fundamental Principles of petrochemicals
2. To impart knowledge from basic principles of industrial stoichiometry.
3. To help the student in understanding procedures for stoichiometric of industrial products.

COURSE CONTENTS

- | | | |
|----|--|-----------------|
| 1. | Introduction To Petrochemical Industry | 4 Hours |
| | 1.1 Chemicals derived from methane; methanol. | |
| | 1.2 How and where the petrochemical come from. | |
| | 1.3 Raw materials used for petrochemicals. | |
| 2. | Manufacturing of the Petrochemicals | 12 Hours |
| | 2.1 Acetylene. | |
| | 2.2 Vinyl chloride. | |
| | 2.3 Vinyl acetate. | |
| | 2.4 Hydrogen cyanide. | |
| | 2.5 Ethyl oxide. | |
| | 2.6 Ethylene glycol. | |
| 3. | Chemicals Derived from Propylene | 6 Hours |
| | 3.1 Isopropyl alcohol. | |
| | 3.2 Acetone. | |
| 4. | Chemicals Derived from Polyethylene | 6 Hours |
| | 4.1 Polyvinyl Chloride. | |
| | 4.2 High- pressure process of Polyethylene. | |
| | 4.3 Low pressure process of Polyethylene. | |
| 5. | Methods of Polymerization | 4 Hours |
| | 5.1 Solution polymerization | |
| | 5.2 Addition polymerization. | |
| 6. | Fundamental Principles of Stoichiometry | 8 Hours |
| | 6.1 Mathematical principles. | |
| | 6.2 Fundamental physical laws. | |
| 7. | Chemical Equation | 12 Hours |
| | 7.1 Chemical formulas. | |

- 7.2 Chemical equations.
- 7.3 Limiting and excess reactants.
- 7.4 Degree of completion of a reaction.
- 7.5 Limitation of a chemical equation.
- 7.6 Numerical problems.

8. Material Balance

12 Hours

- 8.1 Classification of Industrial Process
- 8.2 Concepts of bypass and recycle processes
- 8.3 Numerical based on material balances

PRACTICALS 96 OURS

1. Verification of Pressure-Volume relationship by piston and Cylinder arrangement.
2. Verification of Boyle's law for gases.
3. To determine heat of combustion of a fuel.
4. To calculate material balance on a fuel and flue gas.
5. Determination of level by weight mechanical and electrical methods by using strain gauges.
6. Determination of pressure difference by means of simple tube type manometer.
7. Preparation of methanol.
8. Preparation of Acetylene.
9. Preparation of Acetic Acid.
10. Preparation of Acetone.
11. Preparation of Ammonia.
12. Preparation of Vinyl Chloride.
13. Preparation of Vinyl Acetate.
14. Preparation of Ethylene Oxide.
15. Preparation and Properties of Ethylene Glycol.
16. Preparation of Isopropyl Alcohol.
17. To determine the practical example of the following.
 - i) Addition Polymerization.
 - ii) Solution Polymerization.
 - iii) Bulk Polymerization.

BOOKS RECOMMENDED

1. B.K Bhaskararao, "A Text on Petrochemicals", Khanna Publishers, New Delhi.
2. Iqbal Memon, "Manual on Stoichiometry", for Chemical Technology, Sindh board of Technical Education, Karachi.
3. M.L Smith and K.W. Stinson, "Fuels and Combustion", Mc Graw –Hill Book Co.
4. E. Williams and C.Johnson, "Stoichiometry for Chemical Engineers", McGraw –Hill Book Co.

INSTRUCTIONAL OBJECTIVES

- 1. Understand Fundamentals of Organic Chemicals**
 - 1.1 Define organic chemicals.
 - 1.2 Name common synthetic chemicals.
 - 1.3 Name most common petrochemicals derived from methane.
 - 1.4 Name different synthetic gases
 - 1.5 Name the raw materials used for the manufacture of Methanol.
 - 1.6 Describe the manufacturing process of Methanol.
 - 1.7 Describe the properties of Methanol.

- 2. Understand the Manufacturing of Methane and Acetylene**
 - 2.1 Name the raw materials used for the manufacturing of Chlorinated Methane.
 - 2.2 Describe the manufacturing of Chlorinated Methane.
 - 2.3 Name the raw materials used for the manufacture of Acetylene.
 - 2.4 Draw flow sheet of manufacturing of Acetylene.
 - 2.5 Describe the manufacturing of Acetylene.
 - 2.6 Name the raw material used for the manufacture of Vinyl Chloride.
 - 2.7 Describe the manufacture of Vinyl Chloride.
 - 2.8 Name the raw material used for the manufacture of Vinyl Acetate.
 - 2.9 Describe the manufacture of Vinyl Acetate.
 - 2.10 Name the raw material used for the manufacture of Hydrogen Cyanide.
 - 2.11 Describe the manufacture of Hydrogen Cyanide.
 - 2.12 Name the chemical derived from Ethylene,
 - 2.13 Name the chemical used for the manufacture of Ethylene oxide.
 - 2.14 Describe the preparation of Ethylene oxide.
 - 2.15 Name the raw material used for the manufacture of Ethylene Glycol.

- 3. Understand Petrochemicals from Propylene**
 - 3.1 Give the formula of Propylene.
 - 3.2 Name the common chemicals derived from propylene.
 - 3.3 Describe the preparation of Isopropyl Alcohol.
 - 3.4 Give the uses of Isopropyl Alcohol.
 - 3.5 Describe preparation of Acetone from Propylene.
 - 3.6 Give the uses of Acetone.
 - 3.7 Explain the production of Dodecene from Propylene.
 - 3.8 Give the uses of Dodecene.
 - 3.9 Explain the production of Nonene from Propylene.
 - 3.11 Give the uses of Nonene.
 - 3.11 Explain the production of Cumene from Propylene.
 - 3.12 Give the uses of Cumene.

- 4. Understand Polymerization**
 - 4.1. Define Polymerization.
 - 4.2. Give the importance of Polymerization.
 - 4.3. Outline different types of Polymerization.

- 4.4. Explain Addition Polymerization.
- 4.5. Explain Condensation Polymerization.
- 4.6. Explain Bulk Polymerization.
- 4.7. Explain Solution Polymerization.
- 4.8. Explain Emulsion polymerization.
- 4.9. Explain Suspension Polymerization

5. Understand Chemicals Derived from Polyethylene

- 5.1 Distinguish between two types of polyethylene.
- 5.2 Describe High Density Polyethylene (HDPE) produced by low pressure methods.
- 5.3 Describe low Density polyethylene (LDPE) produced by high pressure methods.
- 5.4 Give the uses of high density polyethylene (HDPE).
- 5.5 Give uses of low density polyethylene (LDPE).
- 5.6 Describe the preparation of Polyvinyl Chloride (PVC).
- 5.7 Give uses of Polyvinyl Chloride (PVC).
- 5.8 Describe the method for the preparation of Polyvinyl Acetate (PVA).
- 5.9 Give the uses of Polyvinyl Acetate (PVA).

6. Understand Fundamentals of Mathematical and physical principles used in Stoichiometric Calculations

- 6.1 Describe Dimension, Units, Labels, and Conversion Factors with reference to Primary and Secondary quantities.
- 6.2 Differentiate between primary Quantities and secondary Quantities.
- 6.3 Enlist dimensions, symbols and units of primary & secondary quantities in tabular form.
- 6.4 Solve numerical problems involving the use of conversion factors.
- 6.5 Describe the significance of 'Ratios' and 'Fractions' in stoichiometric calculations.
- 6.6 Differentiate between pound mass and pound force.
- 6.7 Define and discuss the following the physical terms.
 - a) Conservation of mass . b) Conservation of energy.
 - c) Law of combining weights d) Ideal gas law.
 - e) Avogadro's law. f) Dalton's law.
 - g) Amagat's law.
- 6.8 Solve numerical problem illustrating the use of above mentioned physical laws.

7. Understand Fundamental Chemical Principle used in Stoichiometry

- 7.1 Define 'Chemical Formula.
- 7.2 Describe the use of chemical formula in calculating the percentage by weight of each element in a Compound.
- 7.3 Solve numerical problem illustrating the use of chemical formulas.
- 7.4 Describe the main functions of chemical Equations in stoichiometry.
- 7.5 Enlist the important terms which are useful in calculation based on chemical equations.
- 7.6 Define each of the following terms.
 - a) Limiting Reactant
 - b) Excess Reactant
 - c) Degree of completion of a reaction
 - d) Percent conversion
- 7.7 Solve relevant numerical problems.
- 7.8 Enlist the limitations of a chemical equation.

8. Understand Material Balance

- 8.1 Describe material balance.
- 8.2 Give classification of industrial processes.
 - i) 'Steady-state' and 'Unsteady-state' processes.
 - ii) 'Batch' and 'Continuous' Processes.
- 8.3 Enlist important steps suggested for the solution of problems based on material Balance.
- 8.4 Describe 'Key Component' and its significance in material balance Calculations.
- 8.5 Indicate two different algebraic approaches of solving material balance Problems.
- 8.6 Illustrate the use of simultaneous equations in solving material balance Problems.
- 8.7 Describe the concepts of Bypass and Recycle.
- 8.8 Solve relevant numerical problems.

COMPUTER APPLICATION SOFTWARE

CODE:	Comp-213	T	P	C
		1	6	3

TOTAL CONTACT HOURS:

Theory	32
Practical	192

AIMS:

This course is designed to get the students quickly up to speed with Microsoft Office In as short a time as possible. After studying this course the students will know the Useful features of Microsoft Office and Excel and will be able to use them productively and efficiently. The students will learn and practice in the following topics.

1. Common elements of Microsoft Office , from the basics of working with Applications and files to object Linking and Embedding (OLE).
2. How to create spreadsheet workbooks that use formulas and charts and how to Customize Excel with macros and menus.

COURSE CONTENTS

PART 1: Microsoft Office

- | | | |
|-----------|---|----------------|
| 1. | Getting Started with Office | 4 Hours |
| | 1.1 The applications in Microsoft office. | |
| | 1.2 Starting and Exiting the Office Applications. | |
| | 1.3 The Office Shortcut Bar. | |
| 2. | File Operations in the Office Applications | 3 Hours |
| | 2.1 Creating a New File. | |
| | 2.2 Saving a File. | |
| | 2.3 Opening a File. | |
| | 2.4 Closing a File. | |
| | 2.5 Exiting the Application. | |
| | 2.6 Managing your Files with the Office. | |
| 3. | Shared Tools in the Office Applications | 4 Hours |
| | 3.1 Key Combinations. | |
| | 3.2 Cut, Copy, and Paste. | |
| | 3.3 Drag-and –Drop Editing. | |
| | 3.4 Menu Bars and Toolbars. | |
| | 3.5 Undo and Redo. | |
| | 3.6 Spell-Checking. | |
| | 3.7 Auto Correct. | |
| | 3.8 Find and Replace. | |
| | 3.9 Help and the Office Assistants. | |
| | 3.10 Templates and Wizards. | |

- 4. OLE and Office Binders** **4 Hours**
- 4.1 Object Linking and Embedding.
 - 4.2 Linking.
 - 4.3 Embedding.
 - 4.4 Office Binders.

Part 2: Excel

- 5. Creating Worksheets and Entering Data** **4 Hours**
- 5.1 Spreadsheets, Worksheets, and Workbooks.
 - 5.2 Part of the Excel Screen.
 - 5.3 Working with Worksheets.
 - 5.4 Creating a Spreadsheet.

- 6. Editing and Formatting a Workbook** **5 Hours**
- 6.1 Viewing the Worksheet.
 - 6.2 Working with Ranges.
 - 6.3 Editing Data in a Worksheet.
 - 6.4 Formatting Your Data.
 - 6.5 Auto Formatting Worksheets.
 - 6.6 Using Styles.
 - 6.7 Restructuring the Worksheet.
 - 6.8 Sorting Data.
 - 6.9 Adding Comments.
 - 6.10 Adding Headers and Footers.
 - 6.11 Printing from Excel.

- 7. Charting** **3 Hours**
- 7.1 Chart Terms and Basics.
 - 7.2 Choosing the Right Type of Chart.
 - 7.3 Creating a Chart.
 - 7.4 Modifying a Chart.
 - 7.5 Creating User- Defined Chart Types.

- 8. Working with Formulas and Functions** **3 Hours**
- 8.1 What are Formulas and Functions?
 - 8.2 The Parts of a Formula.
 - 8.3 Creating a Formula.
 - 8.4 Working with Functions.
 - 8.5 Copying and Moving Formulas.
 - 8.6 Recalculating formulas.
 - 8.7 Viewing Formula in the workbook.
 - 8.8 Understanding and Dealing with Errors in Formulas.

- 9. Creating Macros and Customizing Excel** **2 Hours**
- 9.1 Macros.
 - 9.2 Choosing Environment Options.
 - 9.3 Using Templates to Save Time

PRACTICALS

192 HOURS

In line with the instructional Objectives the teacher will demonstrate in the computer lab. And the students will practice the relevant operations/ tasks under supervision of the teacher.

BOOKS RECOMMENDED

- 1- Guy Hart-Davis, "The ABCs of Microsoft Office 97", BPS Publications, New Delhi, India.

INSTRUCTIONAL OBJECTIVES

192 HOURS

Part 1: Microsoft Office

1. Understand and Practice the Following Topics to KNOW 18 HOURS.

How to get started with office

- 1.1 The applications in Microsoft Office.
- 1.2 Starting and Exiting the Office Applications.
- 1.3 Using the Office Shortcut Bar.
- 1.4 Customizing the Office Shortcut Bar.
- 1.5 Getting rid of the office Shortcut Bar.

2. Understand and Practice the Following File Operations 21 Hours

In the office Applications

- 2.1 Creating a New File.
- 2.2 Saving a File for the first time.
- 2.3 Saving a File again.
- 2.4 Saving a File under Another Name.
- 2.5 Saving a File in a Different Format.
- 2.6 Opening Files Using Windows 97 and NT Techniques.
- 2.7 Finding Files.
- 2.8 Finding a File from Outlook.
- 2.9 Opening a File created in Another Application.
- 2.10 Closing a File.
- 2.11 Exiting the Application.
- 2.12 Renaming a file or Folder.
- 2.13 Copying a File or Folder.
- 2.14 Moving a File or Folder.
- 2.15 Deleting a File or Folder.
- 2.16 Creating a Shortcut to a File or Folder.
- 2.17 Checking a File Properties.
- 2.18 Searching for a File.

3. Understand and Practice the Following Operations for 24 Hours

Using Shared Tools in the Office Applications

- 3.1 Key Combinations.
- 3.2 Cut, Copy, and Paste.
- 3.3 Drag-and-Drop Editing.

- 3.4 Displaying Toolbars.
- 3.5 Moving and Reshaping Toolbars and Menu Bar.
- 3.6 Customizing Toolbars and the Menu Bar.
- 3.7 Displaying and Hiding the Status Bar and Scroll Bars.
- 3.8 Undo and Redo.
- 3.9 Regular Spell-Checking.
- 3.10 On-the-Fly Spell-Checking and Grammar-Checking in Word.
- 3.11 Working with Dictionaries.
- 3.12 Replace Text as you Type in Auto Correct.
- 3.13 Find and Replace.
- 3.14 Help and the Office Assistants.
- 3.15 Templates and Wizards.
- 3.16 Auto Correct.

4. To Understand and practice the following operation 24 Hours

For OLE and office binders

- 4.1 Object linking and embedding.
- 4.2 Updating links.
- 4.3 Breaking links.
- 4.4 Deleting linked objects.
- 4.5 Embedding an existing object.
- 4.6 Embedding a new object.
- 4.7 Deleting an embedding object.
- 4.8 Creating a binder.
- 4.9 Adding items to a binder.
- 4.10 Adding section to a binder.
- 4.11 Moving items around in the binder.
- 4.12 Removing items from a binder.
- 4.13 Editing in the binder.
- 4.14 Creating consistent headers and footers.
- 4.15 Printing a binder.

Part 2: Excel

**5. Understand and practice creating worksheets and 24 Hours
Entering data under the following topics**

- 5.1 Spreadsheets, worksheets, and workbooks.
- 5.2 Parts of the excel screen.
- 5.3 Moving about the worksheets.
- 5.4 Moving among worksheets.
- 5.5 Selecting worksheets
- 5.6 Editing Worksheets.
- 5.7 Deleting a worksheets
- 5.8 Renaming a worksheet.
- 5.9 Rearranging the worksheets in a workbook.
- 5.10 Starting a new spreadsheet.
- 5.11 Types of data in excel.
- 5.12 Entering data.
- 5.13 Saving and Closing a Workbook.

6 To Understand and Practice the Following Operations 30 Hours

For Editing and Formatting a Workbook

- 6.1 Viewing the Worksheet.
- 6.2 Zoom.
- 6.3 Split
- 6.4 Freezing Panes
- 6.5 Full-Screen View.
- 6.6 Selecting a Range.
- 6.7 Naming a cell or Range.
- 6.8 Changing and Deleting Range Names.
- 6.9 Going to a Range
- 6.10 Copying and Moving Data,
- 6.11 Deleting the Contents of Cells.
- 6.12 Number Formatting.
- 6.13 Alignment.
- 6.14 Font Formatting.
- 6.15 Border Formatting
- 6.16 Using patterns and Colors.
- 6.17 Protection.
- 6.18 Auto Formatting Worksheets.
- 6.19 Creating a New Style.
- 6.20 Applying a Style.
- 6.21 Modifying a Style.
- 6.22 Deleting a Style.
- 6.23 Merging styles between Workbooks.
- 6.24 Inserting and Deleting Rows or Columns.
- 6.25 Inserting and Deleting Blocks of Cell.
- 6.26 Formatting Rows and columns.
- 6.27 Simple Data Sorting.
- 6.28 Complex Data Sorting.
- 6.29 Adding Comments.
- 6.30 Adding Headers and Footers.
- 6.31 Printing from Excel.
- 6.32 Choosing a Paper Type.
- 6.33 Setting margins.
- 6.34 Setting Worksheet Printing Options.
- 6.35 Using Print Preview.
- 6.36 Moving Page Breaks.
- 6.37 Printing.

7. Understand and Practice the Following Operations to Learn Charting

18 Hours

- 7.1 Chart Terms and Basics.
- 7.2 Choosing the Right Type of Chart.
- 7.3 Creating a chart.
- 7.4 Modifying a Chart.
- 7.5 Moving a Chart.
- 7.6 Resizing a Chart.
- 7.7 Deleting a Chart.
- 7.8 Editing a Chart.
- 7.9 Removing an Element from a Chart.
- 7.10 Inserting Elements in a Chart.

- 7.11 Changing a Chart to Another Type.
- 7.12 Using the Chart Toolbar.
- 7.13 Creating User-Defined Chart Types

8. To Understand and Practice the following Topics to learn 21 Hours

Working with Formulas and Functions

- 8.1 What are Formulas and Function?
- 8.2 The Parts of a Formula: Constants, references, Operators.
- 8.3 Creating a Formula.
- 8.4 Entering a Function by Hand.
- 8.5 Entering a Function with the Function Wizard.
- 8.6 Copying and Moving Formulas; Absolute, Relative and Mixed References.
- 8.7 Recalculating Formulas.
- 8.8 Viewing Formulas in the Workbook.
- 8.9 Understanding and Dealing with Errors in Formulas.

9. To Understand and Practice the Following Operations to Learn 12 Hours

Creating Macros and Customizing Excel

- 9.1 Macros, Recording a Macro, Running a Macro, Editing a Macro, Global Macros.
- 9.2 Choosing Environment Options, View Options, Calculation Options, Edit Options, General Options, Transition Options Custom Lists, Chart Options, Color Options.
- 9.3 Using Templates to Saved Time.

DRILLING TECHNOLOGY

CODE: Pet 243

T P C
2 3 3

TOTAL CONTACT HOURS:

Theory **64**
Practical **96**

AIMS:

1. To impart the fundamental knowledge of drilling techniques.
2. To familiarize the students with the equipment used for drilling.
3. To develop in the student the understanding for acquiring skills for handling the equipment.
4. To enable the student to understand the fundamental terminology of drilling technology and apply knowledge to solve drilling technology problems.

COURSE CONTENTS

- | | |
|---|-----------------|
| 1. Petroleum Exploration Methods
1.1 Direct Indications.
1.2 Geological Methods.
1.3 Geophysical Methods. | 6 hours |
| 2. Cable Tool Drilling
2.1 Basic equipments
2.1 Drilling technique
2.3 Merits. | 2 Hours |
| 3. Rotary Drilling
3.1 Basic rig components.
3.2 Basic rotary drilling operations.
3.2.1 Hoisting System
3.2.2 Rotating System
3.2.3 Circulating System
3.2.4 Well Control System
3.2.5 Power System
3.3 Calculations. | 19 Hours |
| 4. Drilling Fluids
4.1 Functions of drilling fluids.
4.2 Properties of drilling fluids.
4.3 Types of drilling fluids.
4.4 Drilling hazards
4.5 Drilling mud calculations
4.6 Maintenance of mud system | 16 Hours |
| 5. Coring
5.1 Coring methods and equipments. | 6 Hours |

5.2 Handling and sampling of cores.

6. **Casing and Cementing**

15 Hours

- 6.1 Function of casing.
- 6.2 Types of casing.
- 6.3 Casing specification.
- 6.4 Casing accessories.
- 6.5 Introduction to cementing.
- 6.6 Important factors for good cementing.
- 6.7 Primary cementing.
- 6.8 Cement Bonding.
- 6.9 Squeeze cements.
- 6.10 Special Cements.
- 6.11 Evaluation of Cementing Operations.

PRACTICAL'S
96 HOURS

NOTE:

- A. Overhead transparencies will be an important part of each lesson in the classroom presentation.
 - B. Audio-Visual programs of relevant lesson's will be shown to the students during theory/practical class as and when required.
 - C. Field visits of the students will be arranged enabling them:
 - a) To observe various drilling operation's.
 - b) To identify and understand function of various equipments and tools.
 - c) To familiarize themselves with the environment of the field and importance of safety rules.
1. To draw sketch of a standard cable tool rig and label main components.
 2. To practice measurement of nominal diameter of different wire ropes (Fiber, Core, Independent Wire Rope Center) with varying size and stand specifications using a vernier caliper.
 3. To draw a sketch of rotary drilling rig indicating all the basic components and to practice identify different component.
 4. To draw schematic diagrams of drill string components and bit and to practice identify each component with its relative position.
 5. To prepare Clay-Fresh Water Mud of given density in the laboratory.
 6. To increase the density of a given mud of known amount and density by calculating the required amount of clay to be added in the mud.
 7. To decrease the density of a given mud of known amount and density by calculating the required fresh water required to be added in the mud.
 8. To measure density of mud with the help of Mud Balance.
 9. To determine viscosity of mud with the help of Marsh Funnel.
 10. To determine filtrate volume and mud cake thickness by using a standard Filter press.
 11. Practice some numerical problems regarding mud calculations.

BOOKS RESCOMMENDED

1. Carl Gatlin, “Petroleum Engineering –Drilling and Well Completion”, Prentice-Hall Inc.
2. W.F.Rogers, composition and Properties of Oil Well Drilling Fluids,,Gulf Publishing Co.
3. Union Texas Pakistan Inc ., “Production Operator” II Manual, Part,II
4. M.A.Quraishi, “Basic Production Course” Oil & Gas Training Institute, Islamabad

INSTRUCTIONAL OBJECTIVES

1. Understand Petroleum Exploration Methods

- 1.1 Introduction to petroleum exploration methods.
- 1.2 Enlist the petroleum exploration methods.
- 1.3 Describe the direct indications
- 1.4 Describe the geological exploration methods.
- 1.5 Enlist the geophysical exploration methods.
- 1.6 Explain magnetic methods.
- 1.7 Explain gravitational methods.
- 1.8 Explain seismic methods.

2. Understand Cable Tool Drilling Method and Equipment

- 2.1 Describe the basic technique of cable tool drilling.
- 2.2 Enlist the principal components of a cable tool drilling rig including drilling tool in the hole and show a sketch of the drilling rig indicating all the components.
- 2.3 Describe the main parts of a cable tool drill string.
- 2.4 Describe the types of rig lines used in standard cable tool rig.
- 2.5 Describe steel cable and it’s construction types.
- 2.6 Give typical strand constructions of oil field wire ropes.
- 2.7 Describe measurement of nominal diameter of a wire line.
- 2.8 Calculation of Net metallic are of a cable.
- 2.9 Give typical sizes and constructions of wire ropes for oil field services.
- 2.10 Explain various components of surface equipment of cable tool drilling.
- 2.11 Describe Portable cable tool rigs.
- 2.12 Enlist relative merits of cable tool drilling.
- 2.13 Enlist disadvantages of cable tool drilling.
- 2.14 Enlist various applications of cable tool drilling.

3. Understand Rotary Drilling Method and Equipment.

- 3.1 State general description of rotary drilling method.
- 3.2 Enlist basic components of rotary rig:
 - Derricks, mast, and substructures.
 - Draw works
 - Mud Pumps.
 - Prime movers.
 - Drill String.
 - Rotary Bits.
 - Drilling line.
 - Miscellaneous and auxiliary equipment.
- 3.3 Describe functions and types of derricks.
- 3.4 Distinguish between derrick and mast.

- 3.5 Enlist applications of standard derricks.
- 3.6 Describe factors which control the size of a derrick.
- 3.7 Explain derrick loads and solve numerical problems on derrick Loads.
- 3.8 State function of substructures.
- 3.9 Describe functions of draw works.
- 3.10 State function of mud pumps and nomenclature to specify the types i-e duplex & triplex pumps
- 3.11 Enlist important qualities (features) of piston type mud pumps.
- 3.12 Explain functions of prime movers and briefly describe types of prime movers.
- 3.13 Enlist components of drill string and briefly describe each components.
- 3.14 Classify rotary bits and briefly describe each type.
- 3.15 State function of drilling line.
- 3.16 Describe miscellaneous rig equipment; rotary table, traveling block, hook, Swivel, Blowout preventer.

4. Understand Composition and functions of Rotary Drilling Fluids

- 4.1 Describe basic functions of a drilling fluid.
- 4.2 Enlist important properties of drilling mud's which are tested routinely; density Viscosity, gel strength, filtration loss, pH (acidity or alkalinity), Filtrate Analysis, sand content, and oil, water, solids contents.
- 4.3 Describe measurements of mud density with the help of mud balance.
- 4.4 Describe flow behavior of plastic and Newtonian fluids with the help of a typical plot between rate of shear versus shearing stress.
- 4.5 Enlist the instruments used for the measurement of viscosity.
- 4.6 Describe measurements of viscosity with each of the instruments referred to Above.
- 4.7 Solve numerical problems involving calculation of viscosity and filter loss from the data (Measurements) obtained from the relevant instruments.
- 4.8 Describe components of a typical mud.
- 4.9 Classify drilling muds.
- 4.10 Describe composition and specific function of each type.
- 4.11 Enlist drilling hazards dependent on mud control.
- 4.12 State problems associated with salt section hole enlargement and point out method to avoid these problems.
- 4.13 Enlist problems associated with heaving shales.
- 4.14 Describe various treatments to avoid heaving shale problems.
- 4.15 Describe main cause and principle factor to avoid blowout.
- 4.16 Define lost circulation and describe its main causes.
- 4.17 Describe problems associated with lost circulation.
- 4.18 Describe methods of combating lost circulation.
- 4.19 Derive the fundamental equation used for calculating changes of mud volume and density caused by the addition of various solids or liquids to the system
- 4.20 Solve numerical problems related with the uses of the above referred Equation.
- 4.21 State important points regarding the field maintenance of mud systems

5. Understand coring methods.

- 5.1 Introduction to coring; coring during drilling, and coring after drilling.
- 5.2 Describe various methods of coring Conventional coring, conventional core head, diamond corehead, wire line coring.
- 5.3 Briefly describe the general operational considerations recommended for conventional coring.
- 5.4 Describe the core handling and sampling procedures recommended by core laboratories Inc.

6. Understand Oil Well Casing and Cementing Practices

- 6.1 Describe general function of casing strings.
- 6.2 Show a sketch of typical completed well and describe casing strings and cementing points.
- 6.3 Describe basic functions of primary cementing.
- 6.4 Describe pressure unbalance between cement slurry and mud and give it's possible consequences.
- 6.5 Explain various types of cement describing the specification and additives used.
- 6.6 Briefly Describe the following:
 - Density of cement slurry.
 - Thickening time.
 - Strength-time requirements
 - Filtration properties.
 - Permeability of set cement.
 - Perforating Qualities.
 - Corrosion resistance.
- 6.7 Enlist and discuss briefly the purpose of auxiliary cementing equipment:
 - Guide Shoe
 - Cementing Plugs
 - Wall Scratchers.
 - Casing Centralizers.
 - Floating Equipment.
- 6.8 State squeeze cementing.
- 6.9 Enlist the situations in which squeeze cementing is applied.
- 6.10 State the conditions a squeeze cementing should satisfy.
- 6.11 Describe cement Bonding; pipe-cement bond, formation-cement bond.
- 6.12 Give briefly introduction to the evolution of cementing operation
- 6.13 Describe various types of casings with their function.
- 6.14 Enlist principal factors, which are used to specify casings; range length type of construction, coupling type steel grade outside diameter weight per foot.
- 6.15 Give briefly description of the specifications of casing.

WORKSHOP PRACTICE-II

CODE: Pet-261

T	P	C
0	3	1

TOTAL CONTACT HOURS:

Theory	0
Practical	96

AIMS:

The course is aimed for providing skill in the use of tools and machines of common usage, to enable the student to develop simple project related to wiring, welding and metal work. Related safety concerns while working on the job forms an integrated part of the course. Necessary information about the materials, and machines may be provided as shop-talk. However, for wiring shop separate theory classes will provide the essential background knowledge of electrical rules and regulations.

COURSE CONTENTS

- | | | |
|------------|---|----------------|
| 1 | Electrical wiring | 10Hours |
| 1.1 | House Wiring | |
| | 1.1.1 Types and sizes of wiring cables according to voltage, grade, core and strands, insulation. | |
| | 1.1.2 Wiring accessories and cables current carrying capacity. | |
| | 1.1.3 Wiring system; cleat, batten, conduit. | |
| | 1.1.4 Protections of house wiring | |
| | a) Fuses; rewirable, cartridge, H.R.C. | |
| | b) Miniature circuit breaker. | |
| | c) Earthing. | |
| | 1.1.5 Distribution boards. | |
| | 1.1.6 Testing of wiring. | |
| | 1.1.7 Electricity rules about domestic wiring and earthing. | |
| | 1.1.8 Voltage drop in cables and its simple calculation. | |
| 1.2 | Industrial and Commercial Wiring | 5 Hours |
| | 1.2.1 Power Wiring System | |
| | 1.2.1.1 Steel conduit. | |
| | 1.2.1.2 Trunking and Ducting system. | |
| | 1.2.1.3 Catenary system. | |
| | 1.2.1.4 Tough sheathed cable system. | |
| | 1.2.1.5 Special purpose cables; heat resistant, fire retarding welding cables etc. | |
| | 1.2.2 Three phase power distribution board. | |
| | 1.2.3 Multistory distribution board. | |
| | 1.2.4 Cable and fuse size for motors. | |
| | 1.2.5 Study and use of magnetic contractors, push button, and thermal relay. | |
| 2 | Safety | 5 HOURS |
| | 2.1 Fir causes and its prevention, classes of fire | |
| | 2.2 Safety in electrical shops safety belt gloves clothing | |

PRACTICALS

Guidelines for Conduct of Practical's

Following guidelines are suggested for the teachers before/while conducting or supervising Lab/shop activities.

The Teacher Should:

- I) Draw project circuit diagram and explain the main concept(s).
- II) Demonstrate / identify safety precautions to be taken while conducting practicals.
- III) Discuss the procedure for the conduct of exercise by the students.
- IV) Identify key points to be specially observed / noted by the students while conducting the experiments.
- V) Help students to select tools, equipment, and other material for the practical especially in the context of ratings and sizes.
- VI) Guide the students in drawing conclusions / results.
- VII) Arrange a general discussion session at the end of practical to summarize the experiment.
- VIII) Try to ensure and inculcate safety habits in the students.

List of Practical's (Electrical Wiring)

1. To study wiring accessories.
2. To study tools used in Wiring.
3. To study types of cables.
4. Demonstration of treatment against electrical shock
5. To Control one lamp with single way switch .
6. To Control two lamps individually by 1- one way switches.
7. To control three lamps individually by 3 one way switches and install a fuse.
8. To Control two lamps individually by two -way switch.
9. To Control one lamp from two different places (staircase circuit).
10. To control one lamp from three different places.
11. To control three lamps in series and measure voltage drop across each lamp.
12. To construct a test board.
13. To construct fuse indication circuit.
14. To control two lamps by 2- two-way switches both in parallel and individual control.
15. To control a bell through indicator by push button.
16. To prepare bell indicator circuit (Hotelling Circuit).
17. To prepare goodown circuit.
18. To Study wiring boxes and sealing.
19. To prepare single twist joint.
20. To prepare married joint.
21. To prepare duplex joint.
22. To prepare rat -tail joint.
23. Demonstration of electric shock treatment.

INSTRUCTIONAL OBJECTIVES

Wiring:

1. **Understand about the type & sizes of common cables used in domestic Wiring**
 - 1.1 Classify cables with respect to insulation, core voltage, grade and carrying capacity.
 - 1.2 Explain different systems for calculation of cable size.
 - 1.3 Calculate size of cable for a given load.

2. **Understand the wiring System (Cleat, Batten, Casing, Conduit)**
 - 2.1 Distinguish between different wiring systems.
 - 2.2 Name the necessary materials for each type of wiring.
 - 2.3 Explain the uses of each type of wiring.

3. **Understand the Need for Protection of House Wiring and Know Different Protection Devices for House Wiring**
 - 3.1 Define fuse, miniature circuit breaker.
 - 3.2 Distinguish between fuse and miniature circuit breaker.
 - 3.3 List the advantage and disadvantage of fuse and M.C.B.

4. **Understand the Earthing System used in House Wiring**
 - 4.1 Name components of earthing systems.
 - 4.2 Define earth electrode, earth continuity conductor, and earthing lead.
 - 4.3 Draw the earthing circuit.
 - 4.4 Explain the earth fault current.
 - 4.5 Calculate the size of earth continuity conductor, earthing lead, and earth electrode.
 - 4.6 Draw scheme of earthing system.

5. **Understand the Construction, Need, and Application of Distribution Boards.**
 - 5.1 Define distribution boards.
 - 5.2 Name/ label parts of distribution boards.
 - 5.3 Prepare the distribution boards.

6. **Understand the Writing Test and Test Instruments (Continuity Testers, Test Lamp, Meggar)**
 - 6.1 Name different wiring tests.
 - 6.2 Explain the procedure of tests.
 - 6.3 Enlist the result of tests.

7. **Know about the Wiring Accessories (Switches, Socket Outlets, Ceiling Rose, Lamp Holders etc.)**
 - 7.1 Distinguish between wiring accessories.
 - 7.2 List purpose of each accessory.
 - 7.3 Connect accessories.

8. **Understand the Procedure of Jointing and Soldering; Make a joint & solder it.**
 - 8.1 Make the cable joints (Britannia, Straight, Tee) on single core single strand, single core multi strand and multi core cables.
 - 8.2 Solder the joint.
 - 8.3 Describe the correct procedure of jointing and soldering.

9. **Understand the Lighting Circuits - Connect Different circuits**
 - 9.1 Connect one lamp with one way switch.
 - 9.2 Connect staircase circuit.
 - 9.3 Connect lamps in series and parallel with switches.
 - 9.4 Label parts of fluorescent lamp and its circuit.
 - 9.5 Connect fluorescent lamp in different fashions.
 - 9.6 Draw the circuit diagram of each circuit.
 - 9.7 Discuss procedure to read the wiring circuit diagrams.

10. **Install a Domestic Wiring (Batten Wiring & P.V.C. Conduit Wiring)**
 - 10.1 Select the material for wiring.
 - 10.2 Design the layout.
 - 10.3 Draw the circuit.
 - 10.4 Select the tools.
 - 10.5 Install the wiring.
 - 10.6 Test the wiring.
 - 10.7 Commission the wiring.
 - 10.8 Locate and rectify the faults.

11. **Construct Electrician Test Board of Switch Board.**
 - 11.1 Select the material and accessories.
 - 11.2 Fix the accessories on board.
 - 11.3 Connect the accessories.
 - 11.4 Test the performance of board.

Safety and Regulations:

1. **Understand the Hazards of Life and Equipment from Electricity, Electrical and Related Equipments. Understand Precautions with Preventive Methods.**
 - 12.1 State hazards to life from electric rotating machines.
 - 12.2 Explain preventive methods.
 - 12.3 Describe fire and its types.
 - 12.4 Name fire fighting and extinguishing equipments.
 - 12.5 Explain methods of fire prevention.

THIRD YEAR

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کل وقت: 20 گھنٹے

نصاب (سال سوئم)

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

موضوعات:

- 1- قرآن مجید
سورۃ الفاتحہ۔ ایتہ الکرسی۔ سورۃ البقرۃ کی آخری آیات از امن الرسول سے تا آخر اور سورۃ اخلاق مع ترجمہ و تشریح
- 2- دس منتخب احادیث مع ترجمہ و تشریح
- ☆ بنی الاسلام علی خمس شہادت انا الہ الا الہ الاموال صلواتہ وایتا الزکوۃ و حج بیت و صوم رمضان
- ☆ الدین النصیحتہ
- ☆ المنشاء موتمن
- ☆ للمومن علی المومن سنت خصال یعود ماذا مرض و تشہدہ اذامات و یجیبہ اذا دعا
- ☆ لیسلم علیہ اذالقیہ ولیثمتہ اذا عطس و فصیحلہ اذا غاب او شہد
- ☆ لا تخن من خانک
- ☆ لا یدخل الجنۃ قاطع
- ☆ ان اللہ حرم علیکم عقوق المہات و اضاغۃ المال
- ☆ لیسر او لا تعسر او لا تنفرا
- ☆ ذاق طعم الایمان من مرضی باللہ و بالاسلام دینا بمجمد نبیا
- ☆ افضل الذکر لا الہ الا اللہ
- 3- حقوق و فرائض
- ☆ حصول تعلیم بطور فرس۔ والدین اور اولاد کے حقوق و فرائض۔ ہمسایہ کے حقوق
- 4- اسلام کی اخلاقی اقدار
- ☆ صبر و استقلال۔ غفور و درگزر۔ ایفاء عہد۔ اخوت۔ ایثار و قربانی

تدریس مقاصد

قرآن حکیم

عمومی مقصد: منتخب سورتوں اور آیات کی روشنی میں اسلام کے بنیادی مقاصد اور عبادات جان سکے

خصوصی مقاصد: طالب علم اس قابل ہو جائے گا کہ

سورۃ الفاتحہ: آیتہ الکرسی۔ سورۃ بقرہ کی آخری آیات از امن الرسول سے اور سورۃ اخلاق کا ترجمہ و تشریح کر سکے

طالب علم درج ذیل کا مفہوم بیان کر سکے

☆ رب العالمین صرف اللہ تعالیٰ ہے

☆ اللہ رحم کرنے والا ہے

☆ قیامت کے دن بادشاہی اللہ کی ہوگی

☆ عبادت اور استغاثت کا حقدار صرف اللہ ہے

☆ طالب علم درج ذیل کا مفہوم بیان کر سکے

☆ اللہ پاک ہر عیب سے پاک ہے

☆ اللہ کے اسمائے حسنہ حق اور قیوم ہیں

☆ تعلیم انبیاء پر ایمان لانا ضروری ہے

☆ رسول، ملائکہ، کتب سماویہ پر ایمان لانا فرض ہے

☆ اطاعت حقیقی صرف اللہ کے لیے ہے

☆ اسلامی احکامات پر عمل کرنا انسانی بساط میں ہے

☆ کفر کو اللہ کی مدد کے بغیر شکست نہیں دی جاسکتی

☆ اللہ ایک ہے

☆ اللہ کسی کا محتاج نہیں نہ اس کا کوئی شریک ہے

☆ منتخب احادیث

☆ عمومی مقصد: احادیث کی روشنی میں اسلامی تعلیمات پر عمل پیرا ہو سکے

☆ خصوصی مقصد:

☆ احادیث کا ترجمہ بیان کر سکے

- ☆ احادیث کی تشریح کر سکے
- ☆ معاشرتی اور انفرادی زندگی میں احادیث سے راہنمائی حاصل کر سکے
- حقوق و فرائض**
- عمومی مقصد: اسلامی معاشرے کا ایک اچھا فرد بن سکے
- خصوصی مقاصد:
- ☆ والدین کے حقوق و فرائض بیان کر سکے
- ☆ ہمسایوں کے حقوق بیان کر سکے
- ☆ اسلام میں حقوق و فرائض کی گاہی کی صورت میں اپنے اندر خدمتِ خلق کا جذبہ پیدا کر سکے
- اسلامی اقدار
- عمومی مقصد: طالب علم جان سکے گا کہ تعلیم کا مقصد حسنِ اخلاق سے متصف ہونا ہے
- خصوصی مقاصد
- ☆ اخلاق کے معنی و مفہوم کو بیان کر سکے
- ☆ اسلام میں حسنِ اخلاق کی اہمیت بیان کر سکے
- ☆ قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے
- ☆ اسلام میں عفو و درگزر کی اہمیت بیان کر سکے
- ☆ ایقائے عہد کی اہمیت بیان کر سکے
- ☆ اخوت کے معنی و مفہوم کو بیان کر سکے
- ☆ اخوتِ اسلامی کی اہمیت بیان کر سکے
- ☆ اسلام کی اعلیٰ اقدار کو اپنا کر مثالی معاشرہ پیدا کر سکے

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کل وقت: 20 گھنٹے

GEN 311

موضوعات

نصاب (سال سوئم)
مطالعہ پاکستان
حصہ دوئم

- ☆ قیام پاکستان
- ☆ باؤنڈری کمیشن
- ☆ ریڈ کلف ایوارڈ
- ☆ تقسیم بنگال و کلکتہ
- ☆ تقسیم پنجاب
- ☆ مسئلہ مہاجرین
- ☆ ریاست کا الحاق
- ☆ ریاست جموں و کشمیر
- ☆ نہری پانی کا تنازعہ
- ☆ قرار داد مقاصد
- ☆ علماء کے بائیس نکات
- ☆ 1956-1962 اور 1973 کے دساتیر کی اسلامی دفعات
- ☆ پاکستان کا محل وقوع اور اس کی جغرافیائی اہمیت
- ☆ قدرتی وسائل (تیل-گیس-کونکرہ)

مطالعہ پاکستان (حصہ دوم)
قیام پاکستان

تدریس مقاصد

عمومی مقاصد: قیام پاکستان کے بعد درپیش مسائل سے آگاہی حاصل کرے اور بیان کرے
خصوصی مقصد:

- ☆ باؤنڈری کمیشن تشکیل اور اس کے فرائض بیان کر سکے
- ☆ ریڈ کلف اور اس کے ایوارڈ کے بارے میں بیان کر سکے
- ☆ بنگل اور کلکتہ کی تقسیم کی وجوہات بیان کر سکے
- ☆ پنجاب کی تقسیم کی تفصیل بیان کر سکے
- ☆ مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے
- ☆ ریاستوں کے الحاق کے بارے میں تفصیل بیان کر سکے
- ☆ ریاست جموں کشمیر کے بارے میں بیان کر سکے
- ☆ نہری پانی کے تنازعہ کو بیان کر سکے
- ☆ قرار داد مقاصد کی تفصیلات بیان کر سکے
- ☆ 22 علماء کے متفقہ اسلامی نکات بیان کر سکے
- ☆ قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے
- ☆ پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے
- ☆ پاکستان میں قدرتی وسائل (تیل-گیس-کولڈ) کے بارے میں بیان کر سکے

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(غیر مسلم طلباء کے لئے)

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Gen 3II

- نصاب اخلاقیات
سال سوئم
موضوعات
- ☆ احساس ذمہ داری
 - ☆ مثبت ذہن
 - ☆ عدل و انصاف
 - ☆ قومی خدمت کا جذبہ
 - ☆ ذکر و نظر کی پاکیزگی
 - ☆ احترام آدمیت
 - ☆ شائستگی
 - ☆ غفور و درگزر
 - ☆ بردباری
 - ☆ خود انحصاری
 - ☆ اثر و نفوذ
 - ☆ جامعیت
 - ☆ اپنی ذات کی معرفت (بذریعہ ہم عمر طلباء۔ اساتذہ۔ اہم شخصیات ادارہ)

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(غیر مسلم طلباء کے لئے)

نصاب اخلاقیات

سال سوئم

تدریس مقاصد

عمومی مقصد: ملکی ترقی کے لیے اعلیٰ اوصاف کے ساتھ بہتر طور پر ملک و ملت کی خدمت کر سکے
خصوصی مقاصد: طالب علم اس قابل ہو گا کہ

- ☆ موضوعات کا مطلب بیان کر سکے
- ☆ عملی زندگی سے مثالوں کی نشاندہی کر سکے
- ☆ موضوعات کی اہمیت بیان کر سکے
- ☆ اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے
- ☆ مثبت ذہن کے ساتھ کام کر سکے
- ☆ عدل و انصاف سے ادارہ میں دفتر میں بہتر ماحول پیدا کر سکے
- ☆ ماحول کو اخلاقی طور پر پاکیزہ بنائے
- ☆ کارکنوں کی بہتر طور پر دل جوئی کر سکے
- ☆ کارکردگی میں اضافہ کر سکے
- ☆ باہمی احترام کی برکت سے استفادہ کر سکے

PETROLEUM REFINING**CODE: Pet-313**

T	P	C
2	3	3

TOTAL CONTRACT HOURS:

Theory	64
Practical	96

AIMS:

1. To help the students in understanding the refining processes.
2. To acquaint the students with the refinery
3. products obtained from crude petroleum and their testing procedures.
4. To impart the knowledge of refining units and equipments.

COURSE CONTENTS

- | | |
|--|----------------|
| 1. Introduction | 6 Hours |
| 1.1 Importance of refining in petroleum industry. | |
| 1.2 History and development of refining. | |
| 1.3 Production of crude oil in Pakistan. | |
| 1.4 Leading crude oil producing countries of the world. | |
| 1.5 Classification of petroleum. | |
| 1.6 Types of refinery | |
| 1.6.1 Lube refinery. | |
| 1.6.2 Fuel refinery. | |
| 2. Crude Oil Processing Units and Processing Principles. | 5 Hours |
| 2.1 Crude tower and its strippers, splitter tower etc. | |
| 2.2 S.R. Gasoline stabilizer | |
| 2.3 High Speed Diesel. | |
| 2.4 High Diesel Oil. | |
| 2.5 Heavy Diesel Oil. | |
| 3. Processes; Distillation, Absorption, Adsorption, Filtration. | 8Hours |
| 3.1 Function of distillation. | |
| 3.2 Equipment used in distillation furnaces. | |
| 3.3 Fractionating tower. | |
| 3.4 Atmospheric tower. | |
| 3.5 Vacuum tower. | |
| 3.6 Crude oil refining, desalting. | |
| 3.7 Types of distillation processes. | |
| 3.8 Atmospheric distillation process. | |
| 3.9 Different fractions. | |
| 4. Tower Operating Condition | 6 Hours |
| 4.1 Tower Pressure top temperature | |
| 4.2 Temperature gradient. | |
| 4.3 Control of tower operation. | |

- 4.4 Pressure Control.
 - 4.5 Temperature Control
 - 4.6 Flow Control
 - 4.7 Level Control
 - 4.8 Over loading
- 5. Lubricating Oil Processes** **8 HOURS**
- 5.1 Lubricating Oil Processing Vacuum
 - 5.2 Propane de asphaltting, furfural extraction.
 - 5.3 Methyl Ethyl Ketone Dewaxing.
 - 5.4 Blending of lube oil.
 - 5.5 Desulfurization process.
 - 5.6 Plat forming process.
 - 5.7 Benzene Toluene Xylene extraction process
- 6. Corrosion Problems in Refinery** **7 HOURS**
- 6.1 Corrosion.
 - 6.2 Sulfide corrosion.
 - 6.3 Acid corrosion
 - 6.4 Low temperature Services
 - 6.5 Non sparking metals.
 - 6.6 Neutralization chemical
- 7. Reforming Processes** **4 HOURS**
- 7.1 Cracking Process & its types
 - 7.2 Polymerization
 - 7.3 Alkylation.
 - 7.4 Hydrogenation
 - 7.5 Hydrocraking
 - 7.6 Isomeriztion
 - 7.7 Esterification and hydration
 - 7.8 Platforming process.
- 8. Gasoline** **3 HOURS**
- 8.1 Additives of natural gasoline.
 - 8.2 Alkyation process for high octane gasoline.
 - 8.3 Hydrogen processing of petroleum.
 - 8.4 Hydrodesulfurization.
- 9. Refinery Products** **6 HOURS**
- 9.1 Volatile products, liquefied gases, natural gasoline.
 - 9.2 Light oils; rocket and jet fuels
 - 9.3 Motor, Engine, Machine, Spindle, and Gear Oils.
 - 9.4 Greases and waxes: paraffin wax, petrolatum.
 - 9.5 Residue: fuel oil, coke, asphalt carbon black.
 - 9.6 Specialties: medical products.
 - 9.7 Chemical: insecticides.
- 10. Quality Control** **2 Hours**
- 10.1 Quality control of crude oil.
 - 10.2 Quality control of intermediate products.
 - 10.3 Quality control of end products.
- 11. Test for Petroleum** **5 Hours**
- 11.1 Cloud and Pour point, Color.

- 11.2 ASTM Distillation.
- 11.3 Dropping point of lubricating grease.
- 11.4 Corrosiveness of petroleum products.
- 11.5 Sulfur tests.
- 11.6 Test for bituminous and semisolid materials.
- 11.7 Electric strength of transformer oil, Diesel Index

PRACTICALS

96 Hours

- 1 To study the operation of crude oil distillation of oil with approximate boiling range.
2. To study the operation of distillation process by using a manually Controlled or computer controlled Batch Distillation column.
3. To study continuous fractionating column operation and perform Distillation at constant reflux ratio with flammable liquids of oil.
4. Determination of API gravity and specific gravity of oil.
5. Determination of flash point of petroleum products by Cleveland Apparatus.
6. Determination of flash point petroleum products by pesky –martens Closed cup apparatus.
7. Determination of point by equilibrium method.
8. Determination of fire point of petroleum by Cleveland Apparatus.
9. Determination of Reid vapor pressure of volatile non- viscous products by Reid method
- 10 Determination of aniline point of oil by aniline point apparatus.
- 11 Determination of the burning properties of kerosene for use in railway Signal lamps by burning test lamp.
12. Determination of carbon residue of petroleum products.
13. Perform con penetration test on lubricating grease by electrometer.
14. Determination of viscosity of an oil by viscometer.
15. Study the separation of different fraction by vacuum distillation.
16. Study the effect of vacuum on rate of distillation.
17. Determination of cloud point of petroleum oils
18. Determination of pour point of petroleum oil.
19. Determination of color (ASTM) of petroleum products by color comparator.
20. Pre form ASTM distillation test on petroleum products.
21. Determination of sulfure in petroleum products.
22. Determination of breaking point of bitumen by bending apparatus.
23. Determination of diesel index.
24. Determination of initial and final boiling point of petroleum products.
25. Determination of viscosity index of lube oil.
26. Determination of total salt content of crude by conductivity method.
27. Determination of melting point of grease.
28. Determination of the amount of water and sediment in crude oil.

BOOKS RECOMMENDED

1. W.L. Nelson, petroleum Refinery Engineering, McGraw Hill.
2. James A. kent, Riegl,S Handbook of industrial Chemistry Nostraned Reihold Co. N.Y.
3. ASTM- Testing for fuels.

INSTRUCTIONAL OBJECTIVES

1. Understand the importance of petroleum Refining Industry

- 1.1 Introduce the importance of Petroleum refinery industry.
- 1.2 State the history and development of refining.
- 1.3 Describe the production of crude oil in Pakistan.
- 1.4 Outline the crude oil production in different oil fields of Pakistan.
- 1.5 State total requirement of crude oil in Pakistan.
- 1.6 State the imports of petroleum in Pakistan.
- 1.7 Name the leading oil producing countries of the World.
- 1.8 Introduction to OPEC.
- 1.9 Define crude oil.
- 1.10 Describe the classification of crude petroleum according to its base.
- 1.11 Give types of refineries, & define lube refinery, fuel refinery.

2 Understand the Crude oil processing Units

- 2.1 Define crude tower and its Strippers.
- 2.2 Explain stripper tower.
- 2.3 Explain S.R gasoline stabilizer.
- 2.4 Describe high speed diesel oil.
- 2.5 Describe light diesel oil.
- 2.6 Describe heavy diesel oil.

3 Understand the process of distillation

- 3.1 Define distillation.
- 3.2 Define absorption.
- 3.3 Define adsorption.
- 3.4 Explain filtration.
- 3.5 Define cracking.
- 3.6 State the function of distillation.
- 3.7 Describe the fractionating tower.
- 3.8 Name the types of fractioning towers,
- 3.9 Describe atmospheric distillation tower.
- 3.10 Describe vacuum distillation tower.
- 3.11 Draw the diagram for atmospheric crude distillation unit.
- 3.12 Name various fractions obtained from atmospheric crude distillation with approximate boiling range.

4. Understand Tower Operating Troubles

- 4.1 Describe tower's pressure top temperature
- 4.2 Describe temperature gradient.
- 4.3 Describe control of tower operation.
- 4.4 Describe flow and level controls.
- 4.5 Explain over loading and off loading of tower.
- 4.6 Explain causes and control of off-loading.
- 4.7 Explain the addition of sodium hydroxide during the process.

- 4.8 Explain the addition of de-emulsifier during desalting process.
- 4.9 Explain the addition of ammonia during the process.

5. Understand the Lubricating Oil Processes

- 5.1 State the source of lubricating oil.
- 5.2 State the characteristics of lubricating oil.
- 5.3 Explain vacuum distillation process.
- 5.4 Describe the production of lubricating oil by vacuum distillation process.
- 5.5 Name the fraction obtained as in 5.4.
- 5.6 Draw the general flow sheet for the production of lubricating oil by vacuum Distillation process.
- 5.7 Describe propane de-asphalting process for lubricating oils.
- 5.8 Define sweetening process.
- 5.9 Describe common ways of sweetening.
- 5.10 Describe benzene, toluene, xylene extraction process.

6. Understand the Corrosion Problems of Refineries

- 6.1 Define corrosion.
- 6.2 Describe sulfide corrosion.
- 6.3 Describe processing sour crudes.
- 6.4 Explain acid corrosion.
- 6.5 Describe low temperature services.
- 6.6 Describe the use of different metals for refinery chemicals.
- 6.7 Name non sparking metals.
- 6.8 Name non sparking alloys.
- 6.9 Describe the uses of non sparking metals and alloy materials in Petroleum Refining.
- 6.10 Explain the uses and application neutralizing chemicals in refinery units.

7. Understand Reforming Processes

- 7.1 Name different conversion process used in petroleum refining industry.
- 7.2 Define cracking process.
- 7.3 Name different type of polymerization process.
- 7.4 Define alkylation.
- 7.5 Explain alkylation
- 7.6 Define hydrogenation
- 7.7 Define isomerization process.
- 7.8 Explain polymerization process.
- 7.9 Explain reforming process.
- 7.10 Give examples of reforming process.
- 7.11 Explain esterification with examples
- 7.12 Explain hydration process with example.
- 7.13 Name different types of cracking process
- 7.14 Define thermal cracking.
- 7.15 Define catalytic cracking
- 7.16 Explain plat forming process.
- 7.17 State operating conditions for plat former.

8. Understand Improvement of Gasoline by Additives

- 8.1 Name different types of gasoline available
- 8.2 Explain the improvement of gasoline by the addition of foreign substance.
- 8.3 Describe antiknock compounds.

- 8.4 Identify other additives for the improvement.
- 8.5 Describe the alkylation process for high octane gasoline.

9. Understand petroleum Refinery products

- 9.1 State petroleum refinery products.
- 9.2 State common names of refinery products of volatile group.
- 9.3 State common names of refinery products of light oil group.
- 9.4 Describe rocket and jet fuels solvents and kerosene.
- 9.5 State name of refinery distillates.
- 9.6 Describe diesel fuel and gas oil.
- 9.7 Describe paraffin wax petrolatum and greases.
- 9.8 State name of refinery products of residual group.
- 9.9 Describe fuel oil coke asphalt and carbon black.

10. Understand Quality Control of Petroleum

- 10.1 Define quality control of petroleum.
- 10.2 Describe quality control of crude oil.
- 10.3 Describe quality control of intermediate petroleum products.
- 10.4 Describe quality control of end products.

11. Understand Different Test Methods For Petroleum.

- 11.1 State the importance of petroleum testing.
- 11.2 Name different types of tests practiced in petroleum industry.
- 11.3 State the importance of Cloud Point and Pour Point tests.
- 11.4 Describe ASTM distillation tests.
- 11.5 Describe the test for corrosiveness of petroleum products.
- 11.6 Define Softening Point.
- 11.7 Explain procedure to test for bituminous and semisolid materials.
- 11.8 Define diesel index.

12. Understand Storage of Petroleum

- 12.1 Understand tankage of petroleum.
- 12.2 State importance of safe storage tanks in petroleum industry.
- 12.3 Name various types of tanks used in petroleum industry.
- 12.4 Describe atmospheric storage tanks.
- 12.5 Describe cone roof tanks.
- 12.6 Describe breather roof tanks.
- 12.7 Describe floating roof tanks.
- 12.8 Describe lifter roof tanks.
- 12.9 Describe spheroids and vessels.

WELL LOGGING AND TESTING**CODE: Pet-323**

T	P	C
2	3	3

TOTAL CONTRACT HOURS:

Theory	64
Practical	96

Aims:

1. To assist the students in gaining the fundamental knowledge of the well logging Techniques.
2. To help the students in understanding the important features and procedures of oil And gas well testing.

COURSE CONTENTS

- | | |
|---|-----------------|
| 1. Introduction to Well Logging & Well Testing | 10 Hours |
| 1.1. Well Logging in Oilfields | |
| 1.2. Well logging in Gas Fields | |
| 1.3. Introduction to well testing | |
| 1.4. Well testing of oilfields | |
| 1.5. Well testing of gas fields | |
| 2. Well logging Techniques | 27 Hours |
| 2.1 Types of well logs. | |
| 2.2 Driller's logs. | |
| 2.3 Sample logs. | |
| 2.4 Mud logs. | |
| 2.5 Electric logs. | |
| 2.6 Radioactivity logs. | |
| 2.7 Conventional Resistivity Log | |
| 2.8 Density Log | |
| 2.9 Neutron Log | |
| 2.10 Formation Log | |
| 2.11 Production Log 'PLT' | |
| 2.12 Induction Log | |
| 2.13 Temperature Log | |
| 2.14 Sonic Log | |
| 2.15 Nuclear Magnetism Log | |
| 3. Oil Well Testing | 18 Hours |
| 3.1 Purposes of well testing. | |
| 3.2 Types of well tests. | |
| 3.3 Potential test of oil wells. | |
| 3.4 Productivity Index. | |
| 3.5 Specific Productivity Index. | |
| 3.6 Stock Tank Measurement. | |
| 3.7 Portable well testers. | |
| a) Batch Type Meters. | |
| b) PD Meters. | |
| 3.8 Gas Oil Ratio (GOR). | |

- 3.9 Drill Stem Test (DST).
- 3.10 Problems.

4. Gas Well Testing

15 Hours

- 4.1 Introduction.
- 4.2 Types of gas well testing
- 4.3 Point-Tube gauging of low-pressure wells.
- 4.4 Back-pressure testing.
- 4.5 Determination of Absolute Open Flow Potential (AOF).
- 4.6 Multiple test.
- 4.7 Isochronal test.
- 4.8 Specific gravity of flowing fluids.
- 4.9 Causes of deterioration in performance of gas wells.
- 4.10 Problems.

PRACTICALS

96 Hours

LABORATORY TECHNIQUES:

1. To make resistivity measurements on the following in order understand the electrical properties of oilfield rocks and fluids:
 - i) Saline water.
 - ii) Distilled water.
 - iii) Crude oil sample.
 - iv) Clean dry core sample.
 - v) Core sample 100% saturated with saline water.
 - vi) Core sample saturated with saline water and crude oil.
2. To determine Formation Resistivity Factor of a core sample.
3. To determine Formation Resistivity Index of a core sample.
4. To determine porosity of a rock sample by means of its Formation Resistivity Factor and comparing this value of porosity with that measured by Helium Porosimeter.
5. To determine water and oil saturations of a core sample by means of resistivity Measurements.

FIELD TECHNIQUES:

1. To arrange field visits of students where they can observe various types of logging techniques in operation as to understand the procedures and working principles of different logging tools such as:
 - i) Driller's log at the time of drilling a well.
 - ii) Sample log by the geologist.
 - iii) Electric logging.
 - iv) Radiation log.
 - v) Caliper log.
 - vi) Temperature log.
 - vii) Sonic log.
2. To arrange field visits of the students where they can:
 - a) Observe various well testing operations of oil and gas wells.

- b) Observe and understand the function of the following equipments used for well testing.
- i) Packer.
 - ii) Safety Seal.
 - iii) Safety Joint.
 - iv) Jars.
 - v) Bypass Valve.
 - vi) Test Valve.
 - vii) Reversing Out Sub.
 - viii) Pressure Recorder.
 - ix) Temperature Recorder.

BOOK RECOMMENDED

1. Carl Gatlin, "petroleum Engineering, Drilling and Well Completions", Prentice-Hall, Inc.
2. s. J. pirson, "Handbook of Well Log Analysis, for Oil and Gas Formation Evaluation", Perntice-Hall, Inc.
3. J.W. Amyx, D.M. Bass, Jr., and R. L. Whiting, "Petroleum Reservoir Engineering, physical Properties", McGraw-Hill Book Co.
4. M.A Quraishi, "Basic Production Course", Oil and Gas Training Institute, Islamabad.
5. Howard B, Bradley, "Petroleum Engineering Handbook", SPE, Richardson, TX, USA.

INSTRUCTIONAL OBJECTIVES

1. Introduction to Well Logging & Well Testing

10 Hours

- 1.1 Well Logging in Oilfields
- 1.2 Well logging in Gas Fields
- 1.3 Introduction to well testing
- 1.4 Well testing of oilfields
- 1.5 Well testing of gas fields

2 Understand basics of Important Well Logging Techniques

- 2.1. Define Well Logging.
- 2.2. Enlist common Logs.
- 2.3. Describe important features of Driller's Log.
- 2.4. Describe important features of sample log.
- 2.5. Describe important features of mud logging.
- 2.6. Describe the principles of measurement of Spontaneous or Self Potential (SP) log.
- 2.7. Identify tow principles sources of SP deflection.
- 2.8. Illustrate objectives and property measured in SP log.
- 2.9. Enlist principal uses of SP curve.
- 2.10. Describe principal of measurement of Normal Curves.
- 2.11. State objectives and property measured by Normal Curves.
- 2.12. Describe principal of measurement of Lateral Curves.

- 2.13. State objectives and property measured by Lateral Curves.
- 2.14. Describe Conventional Resistivity Log
- 2.15. Describe Density Log
- 2.16. Describe Neutron Log
- 2.17. Describe Formation Log
- 2.18. Describe Production Log 'PLT'
- 2.19. Describe Induction Log
- 2.20. Describe Temperature Log
- 2.21. Describe Sonic Log
- 2.22. Describe Nuclear Magnetism Log
- 2.23. Enlist other resistivity logging devices; Limestone Sond, Micro log, Laterl log, Microlaterl log, Induction Log.
- 2.24. Briefly describe Gamma Ray Log. Briefly describe neutron Log.
- 2.25. Identify the principal objective of the following logging devices.
 - i) Acoustic logs. ii) Calliper logs.iii) Temperature logs. iv) Dipmeter surveys.

3. Understand Fundamentals of Oil Well Testing

- 3.1 State well testing.
- 3.2 State purposes of well testing.
- 3.3 State two categories of well testes.
- 3.4 Enlist tests to measure deliverability of oil wells.
- 4.5 Introduction to potential test of oil well.
- 4.6 Define Productivity Index.
- 4.7 Describe the method for calculation PI for a radial system under steady-state flow
- 4.8 Define Specific Productivity Inbox.
- 4.9 State how PI is useful in identifying various well problems.
- 4.10 Describe important features of Stock Tank Measurement.
- 4.11 State the point to ensure the accuracy of stock tank gauges.
- 4.12 Describe portable well testers.
- 4.13 State advantage and disadvantage of batch type meter.
- 4.14 State advantages and disadvantages of positive Displacement (PD) meter.
- 4.15 Define GOR.
- 4.16 Describe method for calculation average GOR.
- 4.17 Introduction to Drill Stem Testing.
- 4.18 Solve relevant numerical problems.

5. Understand Fundamentals of Gas Well Testing

- 5.1 Introduction to gas well testing.
- 5.2 State type of gas well testing.
- 5.3 Describe Pitot-Tube gauging of low pressure wells.
- 5.4 Describe various type of Back pressure testing.
- 5.5 Describe the determination of Absolute open flow potential AOFE).
- 5.6 Describe multipoint test.
- 5.7 Describe Isochronal test.
- 5.8 Describe equation for computing specific gravity of flowing fluid.
- 5.9 Describe equation for computing specific gravity and approximate vapor Volume of the hydrocarbon liquid.
- 5.10 Enlist the principle causes of deterioration in gas well performance.
- 5.11 Briefly describe each of the principle causes of deterioration in gas well Performance
- 5.12 Solve relevant

GAS TECHNOLOGY

CODE:	Pet-333	T	P	C
		2	3	3

TOTAL CONTACT HOURS:

Theory	64
Practical	96

AMIS:

After studying this course the student will understand:

1. Fundamentals of gas reservoirs.
2. Processes such as separation, dehydration, sweetening, and transmission and the equipments involved.
3. Safety practices and procedure required in a gas producing field and processing plants.

COURSE CONTENTS

- | | | |
|-----------|--|-----------------|
| 1. | GAS Reservoirs | 16 Hours |
| | <ol style="list-style-type: none"> 1.1 Introduction to natural gas industry. 1.2 Mole or pound mole. 1.3 Perfect gas law. 1.4 Non-ideal or real gases. 1.5 Specific Gravity, Volume Factor, Density, and Gradient. 1.6 Unit recovery form gas reservoirs. 1.7 Gas condensate reservoirs. 1.8 Radial flow of gas towards production well. 1.9 Production problems. | |
| 2. | Separation and separators. | 10 Hours |
| | <ol style="list-style-type: none"> 2.1 Introduction. 2.2 Principles of separation. 2.3 Separator functions. 2.4 Separator requirements. 2.5 Internal fittings of a separator. 2.6 Four sections of a separator. 2.7 Operation of a separator. 2.8 Separator types. | |
| 3. | Glycol Dehydration and sweetening of Natural Gas | 14 Hours |
| | <ol style="list-style-type: none"> 3.1 Introduction. 3.2 The water content of natural gas. 3.3 Hydrates. 3.4 Dehydration – Absorptions by liquid descants. 3.5 Glycol dehydration process flow. 3.6 Glycol dehydration process equipment.
 3.7 Glycol dehydration unit controls. 3.8 Glycol dehydration process operations. | |

- 3.9 Process operating problems.
- 3.10 Sweetening of natural gas.
- 3.11 Conversions of H₂S to Sulfur.

4. Transmission to Market 14 Hours

- 4.1 Design of pipelines.
- 4.2 Flow Formulas.
- 4.3 Engineering design and specifications.
- 4.4 Laying a pipeline.
- 4.5 Compressor stations.
- 4.6 City gate stations.
- 4.7 Odorization.
- 4.8 Distribution systems

5. Gas Production Safety 10 Hours

- 5.1 Introduction.
- 5.2 The properties of fire.
- 5.3 Preparation of gas plant equipment for maintenance.
- 5.4 Safety Factors in process equipment.
- 5.5 Fired heaters.
- 5.6 Separators.
- 5.7 Wellhead assemblies.
- 5.8 Rotating equipment.
- 5.9 Atmosphere storage tanks.
- 5.10 Pressure
- 5.11 Leaks.
- 5.12 Electricity.
- 5.13 Toxic Materials

PRACTICALS 96 HOURS

GUIDELINES FOR INSTRUCTOR:

- A. Every week a Laboratory Session be arranged to familiarize students with the equipment studied in the previous theory class during the same week. For this purpose the teacher should first show the schematic diagram /sketch of the equipment labeled with important parts on an overhead projector and give brief description of the equipment. Then copies of the same sketch without labels should be distributed among the students asking them to label the sketches.
 - B. Relevant Audio- Visual programs demonstrating different oil field operations, processes and equipments should be shown to the students.
 - C. Instructional tours should be arranged to visit various oil and gas fields where the students can observe various oil and gas field operations, processes equipments, and safety precautions. Every student should be advised to prepare in writing a different set of questions (at least three) on various relevant topics to be asked during the tour. The teacher should assist the student in composing and formulating .
1. To determine volume of a gas reservoir from its spacious map by the following methods:
 - a) Using Pyramidal Rule .
 - b) Using Trapezoidal Rule.
 2. To calculate the amount of gas -in -place in MMSCF using the known data of the field.

3. To determine the following types of average reservoir pressures of a gas reservoir from the isobaric and spacious map.
 - a) Well average pressure.
 - b) Aerial average pressure.
 - c) Voluminous average pressure.
4. To determine the gas reserves and water influx from the known production of a gas reservoir.
5. Draw a two and three -phase horizontal separator to show the typical and external fittings and devices.
6. Draw diagrams of five specific types of separator vessels utilized on the field gas plant facilities to show the basic construction details.
7. Determine the water content of the gas in lb /MMSCF at a given pressure and temperature using the Water Content of Gas Graph.
8. Draw a glycol dehydration process flow block diagram to show the basic absorption and regeneration phases
9. Draw the basic construction and describe the principles of the major vessel and equipment in a Glycol dehydration process unit.
10. To draw a layout sketch of a typical city gate station and identify various processes.
11. To measure outer and inner diameters, and wall thickness of pipes.
12. To calculate the pressure drop in a gas line.
13. Given the composition and pressure of gas stream, calculate the temperature at which hydrates will form.
14. To draw a layout sketch of gas processing plant.
15. To practice the use of various tables which are used in determining various factors while designing a pipeline.

BOOKS RECOMMENDED

1. D.L katz and others, “ Handbook of Natural Gas Engineering”, Mc Graw- Hill Book co.
2. B.C Craft and M.F Hawkins, “ Applied Petroleum Reservoir Engineering”, Prentice Hall Inc.
3. “ Production Operation III Manual” , Union Texas . Pakistan Inc.

INSTRUCTIONAL OBJECTIVE

1. To Understand Important Features of Gas Reservoirs

- 1.1 Describe subdivision of natural gas industry.
- 1.2 Define “ Mole of Pound Mole”.
- 1.3 Describe signification of the definite of Mole in volumetric calculations of gases.
- 1.4 Explain Compressibility Factor for non-ideal or real gases.
- 1.5 Two forms of perfect gas law.
- 1.6 Define specific gravity of gases.
- 1.7 Define Gas Reservoir Volume Factor.
- 1.8 State three averaging techniques to obtain average reservoir pressure.
 - i) Well Average Pressure.
 - ii) Areal Average Pressure.
 - iii) Volumetric Average Pressure.
- 1.9 Define Unit Recovery or Initial Unit Reserve.
- 1.10 Differentiate between oil reservoirs, gas reservoirs, and gas-condensate reservoirs.
- 1.11 Describe two main problems of gas wells;
 - a) Corrosion.
 - b) Water in gas Wells.
- 1.12 Solve relevant numerical problems.

2. To Understand Separation and Separators

- 2.1 State the three basic principles of gas-liquid separation as related to gas field production facilities.
- 2.2 State the three basic functions of separator vessels applied in gas field production operations
- 2.3 Draw a two and three-phase horizontal separator to show the typical internal and external fittings and devices.
- 2.12 Describe the function of eight common separator internal devices as listed below.
 - Deflector/diverter plates.
 - Weirs.
 - Centrifugal devices.
 - Vortex breakers.
 - Mist or demister pads.
 - Coalescing plates.
 - Straightening vanes
 - Float shields.
- 2.13 List the four basic sections of a horizontal type separator as applied in gas field production operations.
- 2.6 Describe the operation of both two phases and three-phase gas field production separators.
- 2.7 Explain the function of five specific types of separator vessels utilized on the field gas plant facilities.
- 2.9 Draw diagrams of five specific types of separator vessels utilized on the field gas plant facilities to show the basic construction details

3. To Understand Glycol Dehydration and sweetening of Natural Gas

- 3.1 State the three reasons why water must be removed from produced gas before it enters a Pipe line.
- 3.2 Describe the saturation of natural gas under reservoir pressure and temperature conditions.
- 3.3 Determine the water contents of gas in l_d/MMSCF at a given pressure and temperature using the "Water Content of gas graph".
- 3.4 Calculate how much water vapor condenses as liquid in lines and equivalent, expressed in Lbs of water.
- 3.5 Define the dew point temperature of gas related to water and hydrocarbon vapor content.
- 3.6 Determine the water dew point temperature of gas, using the "Water Content and Dew Point Temperature Graph".
- 3.7 Describe the parts and operation of a dew point tester.
- 3.8 Draw a simple diagram to show the part and operation of an on-line electrolytic hygrometer.
- 3.9 Describe the formation and structure of gas field hydrates and the operational problems they can cause.
- 3.10 Determine the conditions of pressure temperature in which hydrates will form in natural gas.
- 3.11 Name three methods of removing hydrates that have formed in gas lines and equipment.
- 3.12 State the most effective method of preventing hydrates forming.
- 3.13 List the properties of a liquid desiccant.
- 3.14 State the advantages of using tri ethylene glycol desiccant in gas field liquid absorption dehydration systems.
- 3.15 Draw a glycol dehydration process flow block diagram to show the basic absorption and regeneration phases.
- 3.16 Follow and describe the gas and glycol solution flowing through a detailed glycol dehydration process flow diagram.

- 3.17 Identify and describe the function of the major vessels and equipment in glycol dehydration process unit.
- 3.18 Draw the basic construction and describe the principles of operation of the major vessels and equipment in a glycol dehydration process unit.
- 3.19 State the operational process parameters of the glycol dehydration process equipment.
- 3.20 Determine the glycol flow rate in gal/day to the contactor tower.
- 3.21 Indicate the importance of the reboiler operation in controlling the purity of glycol Solution, expressed in weight percent.
- 3.22 Identify and state the function of the major instrument control loops in a glycol Dehydration process unit
- 3.23 Describe the basic steps in the start-up procedure of a glycol. dehydration unit.
- 3.24 Describe the basic steps in the shutdown of a glycol dehydration unit.
- 3.25 list the ten routine operator checks during normal operations of a glycol Dehydration unit.
- 3.26 Explain how glycol foaming is caused and how it can be prevented
 - a. Explain causes of puking in the stripper column and how it can be prevented.
- 3.28 Identify and state the causes of corrosion in a glycol dehydration unit.
- 3.26 Identify the causes of glycol losses and how they can be kept at a minimum in a glycol dehydration unit.
- 3.27 Describe what is meant by sweetening of natural gas.
- 3.28 State conversion of H₂S to sulfur

4. Understand the Transmission of Natural Gas to Market

- 4.1 List the steps in completing a pipeline project.
- 4.2 Show and describe the following tables.
 - a) Classification of location.
 - b) Longitudinal Joint Factor, E.
 - c) Temperature Derating Factor T for Steel Pipe.
- 4.3 List the operations in laying a pipeline.
- 4.4 Give and describe formula for calculating the theoretical work or Horsepower required to compress natural gas.
- 4.5 identify purposes of a city gate station.
- 4.6 List the characteristics of an ideal odorant.
- 4.7 Describe main components of a distribution system.
- 4.8 Show a schematic diagram identifying principal equipment of an automatic odorization plant.
- 4.9 Describe Spitz glass formula used in sizing of street mains.

5, To understand Gas Production Safety Practices and Procedures

NOTE FOR TEACHERS:

Photocopies of the complete detailed material on Gas Production Safety should be given to the students one week before taking the theory class on this topic advising the students to read the material before coming to class. Brief discussion of the following topic will suffice to develop understanding of the safety equipments and precautions. A working session may be held in the practical class asking each

student to explain one subtopic to develop in group discussion regarding safety. This would help student to develop in them the safety attitude.

- 5.1 State the most hazardous aspect of working with petroleum fluids related to a gas facility operation.
- 5.2 State the three basic components of fire.
- 5.3 Describe how fire is prevented in all gas field equipment operations.
- 5.4 Define Flash point Temperature of hydrocarbons in relationship to ignition
- 5.5 Describes the flammability limits of hydrocarbons and air mixture and define a too rich and a too lean mixture.
- 5.6 Expiation the ignition temperature of hydrocarbons in relationship to fire Preventions
- 5.7 Identify various sources of ignition on a gas production facility.
- 5.8 Determine the fire or explosion hazard from a leak of specific gas from gas Plants process equipment, given the percent gas : air mixture and the heat Source temperature.
- 5.9 State the two main hazards from opening gas process vessels and equipment to the Atmosphere.
- 5.10 Draw and describe three common safe methods of isolating vessels and Equipment in operation for maintenance.
- 5.11 Describe the correct and safe procedure to prepare vessels for personnel entry.
- 5.12 State functions of a hydrocarbon gas test and O₂ test in vessels prior to entry.
- 5.13 Describe the correct and safe procedure to prepare vessels and equipment for Start-up after completion to maintenance.
- 5.14 Indicate the importance of 'flammability limits' when purging air from vessels And equipment using natural gas
- 5.15 Draw and describe the three gas purging patterns employed on gas plants using Light and heavy purge gas.
- 5.16 Describe the correct and safe procedure for purging air from vessels and Equipment using natural gas
- 5.17 Explain the pressure testing methods employed on gas plants equipment.
- 5.18 State the hazards involved pressuring and depress ring gas plant process Equipments.
- 5.19 Describe safe vesting practices.
- 5.20 Define and explain the safety factors built into process vessels and equipment In relationship to design and operating pressures and temperatures.
- 5.21 Identify the major potential hazardous equipment on field Gas production facilities.
- 5.22 Identify and describe the five principle hazardous conditions in the operation Of fire tube type heaters, and how they are corrected.
- 5.23 State the most dangerous period of operation of a salt bath type heater and How this danger can be overcome?
- 5.24 List two operational safety problems caused by incorrect level indication on Separators.
- 5.25 Describe the method used to clean sight glasses on separators and columns.
- 5.26 Describe the safety hazards involved in wellhead assembly operations.
- 5.27 Identify the major operational safety hazards involved in rotating equipment.
- 5.28 Describe the fire hazards involved in pumping and filling operations on Atmospheric storage tanks.
- 5.29 State the fire function of flame arresters and blanket gas system in the safe Operation of atmospheric storage tanks.
- 5.30 Explain how a vacuum is pulled on atmospheric storage tanks and how vacuum condition can be prevented.
- 5.31. Identify the hazards of leaks on a gas plant, how they can be detected and topped.
- 5.32. Identify the major hazards from electricity and electrical equipment on a gas plant.

- 5.33. Describe the dangers to personal from H₂S and state the correct and safe method of handling H₂S leaks.
- 5.34. Identify the major personal hazards of exposure to gas field chemical and state the correct action in handling chemical.

PETROLEUM PRODUCTION TECHNOLOGY

CODE:	Pet-343	T	P	C
		2	3	3

TOTAL CONTACT HOURS:

Theory 64

Practical 96

AMIS:

1. To impart the basic knowledge of the production and well operations.
2. To familiarize the students with the surface and sub surface production equipments.

COURSE CONTENTS

- | | | |
|---|---|-----------------|
| 1. Introduction | | 3 Hours |
| 1.1 | Organization of petroleum Production Company. | |
| 1.2 | Production Systems. | |
| 2. Well completions and perforations. | | 8 Hours |
| 2.1 | Introduction to well completion. | |
| 2.2 | Methods of production well completion. | |
| 2.3 | Completion equipments | |
| 2.4 | Production completion procedures | |
| 2.5 | Perforation well. | |
| 3. Work over and well services. | | 8 Hours |
| 3.1 | Introduction | |
| 3.2 | Production logging. | |
| 3.3 | Reservoir performance | |
| 3.4 | Well problems. | |
| 3.5 | Production Problem. | |
| 4. Wire line | | 7 Hours |
| 4.1 | Introduction | |
| 4.2 | Surface Equipments | |
| 4.3 | Down Hole service Tools | |
| 4.4 | Sub surface well equipments. | |
| 5. Oil field surface Production equipments | | 12 Hours |
| 5.1 | Well Head | |
| 5.2 | Surface Gathering system. | |
| 5.3 | Production separator | |
| 5.4 | Test Separators | |
| 6. Oil field surface processors | | 10 Hours |
| 6.1 | Crude oil desalting | |
| 6.2 | Crude oil dewatering | |
| 6.3 | Crude oil storage. | |
| 6.4 | Produced water treatment. | |
| 6.5 | Pipeline scraper launcher/receiver | |

7. Well Stimulation**4 Hours**

- 7.1 Information
- 7.2 Stimulation methods.
- 7.3 Selecting stimulating candidates.
- 7.4 Benefits and limitations of well stimulation.

8. Artificial Lift Methods**6 HOURS**

- 8.1 Introduction.
- 8.2 Sucker rod pumping.
- 8.3 Gas lifting.
- 8.4 Subsurface electrical pumping.
- 8.5 Subsurface hydraulic pumping.
- 8.6 Selection of artificial lift methods.

9. Oil Production Safety**6 HOURS**

- 9.1 Introduction.
- 9.2 Flammability limits of hydrocarbons.
- 9.3 Preparation limits of hydrocarbons for maintenance.
- 9.4 Safety factors in process equipment.
- 9.5 Electricity.

PRACTICALS**96 HOURS**

1. Every week a laboratory Session should be arranged to familiarize students with the equipments studied in the previous theory class during the same week. For this purpose the teacher should first show the schematic diagram / sketch of the equipment labeled with important parts on an overhead projector and give brief description of the equipment. Then copies of of the same sketch without labels be distributed among the students.
2. Relevant Audio-visual programs demonstrating oil field operations, processes, and equipments should be shown to the students.
3. Instructional tours should be arranged to visit various oil and gas fields where the students can observe various oil and gas field operations, equipments, and safety Precautions Every students should advised to prepare in writing a different set of questions (at least there) on various relevant topics to be asked during the tour The teacher should assist the students in composing and formulating questions.

Books Recommended

1. Carl Gatlin, "petroleum engineering- drilling and well completions", prentice-Hall, Inc,
2. B,C, Craft W , R Holden, "Well Design –drilling and production", prentice-Hall Inc,
3. Bp Pakistan Exploration production inc and "production operator Manual, part 2.
4. M.A Qureshi :Basic production course" Oil & Gas Training institute, Islamabad

Instructional Objective**1. Understanding Organization of petroleum Company**

- 1.1 State the objective of an oil exploration and production company
- 1.2 Describe the organizational setup of typical petroleum Production Company.
 - 1.2.1 Operating Department.
 - 1.2.2 Advisory to operating Departments
 - 1.2.3 Technical Service Department.

- 1.2.4 Administrative Service Departments.
- 1.3 Introduction to a petroleum production system; components

2. Understanding to well completion and Perforation

- 2.1 Introduction to well completion
- 2.2 Enlist the methods (categories) of production well completion
- 2.3 Describes each of the following categories of well completion with the help of Schematic diagrams and state advantages and disadvantages as well.
 - 2.3.1 Open hole completion
 - 2.3.2 Screen liner Completion.
 - a) Screen and Liner Completion
 - b) Perforated Liner completion
 - 2.3.3 Perforated casing completion
- 2.4 Enlist various completions equipment.
- 2.5 Briefly describe each of the following completion equipments.
 - 2.5.1 Tubing; tubing strength rating, tubing movement.
 - 2.5.2 Packer; packer applications
 - 2.5.3 Types of packers; mechanical-set packers, hydraulic-set packers, Permanent-set packers.
 - 2.5.4 Seating Nipple
 - 2.5.5 Flow control Equipment sliding sleeves, check valves, subsurface safety valves.
- 2.6 Introduction to completion procedures.
- 2.7 Describe procedure of the following types of completions with help of relevant schematic diagrams.
 - a) Single completion (with packer)
 - b) Dual zone single completion
 - c) Single selective completion.
 - d) Multiple completions.
- 2.8 Introduction to perforating wells.
- 2.9 Describes bullets perforators. And jet perforators.

3. Understand workover and Well Services

- 3.1 Introduction to workover and well services.
- 3.2 State the objective of production logging and enlist its potential benefits.
- 3.3 State what is meant by production logging and enlist various production Logging tools.
- 3.4 Describe the specific purposes of production logging.
- 3.5 Describe the use of production logging with reference to reservoir Performance.
- 3.6 Identify well problems that can be solved with the help of production logging.
- 3.7 Briefly describe the following production problems identifying the methods of their solution.
 - a) Watering-out/Gassing-out
 - b) Sand control.
 - c) Isolating depleted production zones.
 - d) Paraffin deposition.
 - e) Hydrate formation.

4. Understand Wire line Tools and their Functions

- 4.1 Introduction to wire line.

- 4.2 Explain the arrangement of wireline equipments with the help of a sketch.
- 4.3 Briefly describe the following equipments starting their functions. Draw sketches where necessary.
- Surface Equipments; reels, weight indicators, line speed indicators, Wire line, stuffing boxes, blowout preventers or wireline valves, lubricators, wireline wipers, oil traps.
 - Downhole Service Tools: Impression block, tubing swage, paraffin Cutter (gauge cutter), sand bailer, spear, kickover tool, bottom hole Pressure pump, sidewall cutter, shifting or positioning tools
Subsurface Wel Equipment : landing nipples, sliding sleeve valve, locating and locking mandrels, blast joint, flow coupling, tubing safety (storm choke) ,bottom hole regular, pack off anchor polished nipple retrievable valve mandrel

5. Understand and familiarize with Oil field surface production equipment

- 5.1 Give brief description of the following topics show sketches where necessary,
- 5.1.1 Functions of wellhead.
 - 5.1.2 Types of Christmas tree.
- 5.2 Enlist Christmas tree equipment.
- 5.3 Describe following types of valves
- Globe Valve
 - Gate Valve
 - Ball Valves
 - Buterfly valves
 - No-return valve
- 5.4 Describe various types of chokes.
- 5.5 Describe Various types of Safety values.
- 5.6 Briefly describe a gathering system.
- 5.7 Explain Arrival Manifold with the help of a sketch.
- 5.8 Enlist auxiliary equipment of a gathering system
- 5.9 Enlist main factions of separators
- 5.10 Enlist physical factors necessary for separators to work.
- 5,11 Describe the following.
- Primary Separation.
 - Coalescence.
 - Secondary Separation.
 - Mist Extraction.
 - Dissolved gas separation.
- 5.12 Give types of separators.
- 5.13 Describe function of test separators.

6. Understand Oil Field Surface Processes

- 6.1 Describe crude oil desalting process with the help of a schematic diagram of a Desolater.
- 6.2 Describe operating variables of desalting process.
- 6.3 Describe a typical field desalting process flow with the help of a sketch.
- 6.4 Explain the function and principles of a gun barrel for crude oil dewatering showing a schematic diagram.
- 6.5 Describe principles of operation of a gas boot.
- 6.6 Describe function of a gas boot and flow tank combination showing a Schematic diagram.

- 6.7 Describe the two categories of atmospheric fixed roof tanks.
a) Production Flow Tank. b) Custody Transfer tank.
- 6.8 Enlist various equipments and systems of the atmospheric fixed roof tank.
- 6.9 Describe construction of an atmospheric fixed roof tank by showing a sketch.
- 6.10 Explain function of the pressure/vacuum safety valve with help a Schematic sketch.
- 6.11 Introduction to produced water treatment,
- 6.12 Describe various equipments for water treatment. Show diagrams of skim tanks, oil skimmer pit, and floatation unit.
- 6.13 Describe the function and types of pipeline scrapper launcher-receiver.
- 6.14 Illustrate the procedure for launching and receiving pipeline scrapper

7. **Understand Methods of Well Stimulation**

- 7.1 Introduction to stimulation techniques.
- 7.2 State various acid zing and hydraulic fracturing treatments and their applications.
- 7.3 State the basis for selecting stimulation candidates.
- 7.4 Narrate the rules-of-thumb which are useful in selecting stimulation Candidates.
- 7.5 Describe important generalizations to be made concerning the potential benefit of stimulation.
- 7.6 List the benefits and limitation of Nitro-Shooting, Acid zing, and Hydraulic Fracturing.

8. **Understand Artificial Lift Methods**

- 8.1 Enlist the most common methods of artificial lift.
- 8.2 Enlist the component parts of a sucker rod pumping installation and give brief Introduction to each part with the help of schematic sketches.
- 8.3 Introduction of gas lifting.
- 8.4 Introduction to subsurface electrical pumping.
- 8.5 Describe types of subsurface hydraulic pumping.
- 8.6 Describe other artificial lift methods; turbine pump, plunge lift, progressive cavity pump.
- 8.7 Enlist factors to be considered for selection of artificial lift method.

9. **Understand Oil Production Safety**

NOTE FOR TEACHERS:

Photocopies of the complete detailed material on Oil Production Safety should be given to the students one week before talking the theory class on this topic advising the students to material before coming to class. Brief discussion of the following topics will suffice to develop understanding of the safety equipments and precautions. A working session may be held in the practical class asking each student to explain one subtopic and participate in group discussion regarding safety. This would help students to develop in them the safety attitude.

- 9.1 Enlist important components that a safety attitude should include.
- 9.2 Enlist basic components of fire in an oil field.
- 9.3 Describe flammability limits and ignition temperature of hydrocarbon. Clarify the concept with the help of an operational example.
- 9.4 List the important actions necessary to make the oil plant equipment “safe to Work” for maintenance purposes.
- 9.5 Describe safety factors that are built into all field equipment to prevent failure.

BASIC COMPUTER IN PETROLEUM TECHNOLOGY

CODE AR:133

T P C

1 6 3

TOTALLE CONTACT HOURS

THEORY 32

PARACTICAL 192

AIMS

After studying the subject student will be able to familiarize with the drawing in computers

COURSE CONTENTS

1 Introduction to computer

1.1 Definition of computer

1.2 Input

1.3 Processing

1.4 Output

1.5 Hardware

1.6 Software'

1.7 Program

1.8 Magnetic disk

1.9 Floppy disk

DOS

1.10 Introduction to dos

1.11 DOS command

3 AutoCAD menus

2 Hours

4 Coordinate system

2 Hours

5 Display Commands

2 Hours

2.1 plan

5.1 Redraw

5.2 Regen

5.3 Viewvers

2.4 Zoom

6 Draw Commands

4 Hours

6.1 Line

6.2 Arc

6.3 Circle

6.4 Ellipse

6.5 Polyline

6.6 Point

6.7 Polygon.

6.8 Text.

6.9	Hatch.	
6.10	Insert.	
6.11	Dimensioning.	
7.	CONSTRUCT & EDIT Commands	4 Hours
7.1	Array.	
7.2	Break.	
7.3	Change.	
7.4	Copy.	
7.5	Divide.	
7.6	Erase.	
7.7	Explode.	
7.8	Extend.	
7.9	Entity.	
7.10	Move.	
7.11	Rotate.	
7.12	Poly edit.	
7.13	Offset.	
7.14	Fillet.	
7.15	Chamfer.	
7.16	Trim.	
8.	File Commands	1 Hours
8.1	Open File.	
8.2	Save File.	
9.	Settings	3 Hours
9.1	Grid.	
9.2	Snap.	
9.3	Limits.	
9.4	Osnap.	
9.5	Unit Control.	
9.6	Layers.	
9.7	Dimension.	
10.	3-D Development Style Using Different Angles	2 Hours
11.	Presentation Techniques Thought Computer	2 Hours
12.	Plotting	2 Hours
13.	Diagrams of Interest to Petroleum Technology	4 Hours
31.1	Machine drawing; basic simple components.	
31.2	Piping drawing; pipe network, coupling and joints.	
31.3	Electrical circuits,	
31.4	Plant layout.	

PRACTICALS

192 Hours

1. Practice of DOS commands.
2. Practice of Auto CAD menus.

3. Practice of Display commands.
4. Practice of Draw commands.
5. Practice of Construct commands.
6. Practice of File commands.
7. Practice of File setting.
8. Practice of 3-D development in CAD.
9. Practice of different presentation techniques on CAD.
10. Practice of loading sheets, pen assignments, and plot a sheet with different seals.
11. Preparing a house plan in CAD and plotting.

BOOKS RECOMMENDED

1. Syed Shahid Afzal, "Teachers' Notes on Computer Architecture".
2. Syed Shahid Afzal, "Teachers' Notes on Computer Application".
3. Syed Shahid Afzal, "TLRs on Computer Application".

INSTRUCTINAL OBJECTIVES

1. Know the Basics of Computers

- 1.1 Define computer.
- 1.2 Describe brief history of computer.
- 1.3 Describe input.
- 1.4 Describe Output.
- 1.5 Explain Hardware.
- 1.6 Explain Software.
- 1.7 Explain Programs.
- 1.8 Explain Magnetic Disk.
- 1.9 Explain Floppy Disk.

2. Understand the Working of DOS

- 2.1 Explain the DOS.
- 2.2 Explain the utility of following DOS commands.
 - i) Format.
 - ii) Take Directory.
 - iii) Change Directory.
 - iv) Make Directory.
 - v) Delete Directory.
 - vi) Remove Directory.
 - vii) Copy File.
 - viii) Delete a File.
 - ix) Disk Copy.

3. Understand AUTO-CAD Menus

- 3.1 Define Auto cad.
- 3.2 Explain the screen menus.
- 3.3 Explain the pull down menus.

4. Understand Co-ordinate System Used in Architectural Computer Drawings

- 4.1 Explain the UCS.
- 4.2 Explain the co-ordinate system.

5. Understand the Display Commands

- 5.1 Explain the application of the following display commands.
- i) Plan.
 - ii) Redraw.
 - iii) Regen.
 - iv) Viewers.
 - v) Zoom.

6. Understand Draw Command

- 6.1 Explain different types of lines.
- 6.2 Explain different method to draw.
- i) Arc.
 - ii) Circle.
 - iii) Ellipse.
 - iv) Point.
 - v) Polygon.
- 6.3 Explain different text styles.
- 6.4 Apply different hatch styles.
- 6.5 Explain insertion styles.
- i) Blocks.
 - ii) Files.
- 6.6 Explain different types of dimensioning.

7. Understand the CONSTRUCT & EDIT Commands

Define the following commands.

- 7.1 Rectangular and polar array.
- 7.2 Break.
- 7.3 Copy.
- 7.4 Divide.
- 7.5 Erase.
- 7.6 Explode.
- 7.7 Extend.
- 7.8 Entity.
- 7.9 Move.
- 7.10 Rotate.
- 7.11 Poly edit.
- 7.12 Offset.
- 7.13 Fillet.
- 7.14 Chamfer.
- 7.15 Trim.

8. Understand Different File commands

- 8.1 Explain the file utility.
- 8.2 Explain different file commands.

9. Apply Different Settings to Produce Architectural Drawings

Explain the utility of following commands.

- 9.1 Grid.
- 9.2 Snap.

- 9.3 Limits.
- 9.4 Osnap.
- 9.5 Unit Control.
- 9.6 Layers.
- 9.7 Dimension Style.

10. Understand 3-D in CAD

- 10.1 Describe V points.
- 10.2 Explain the utility of UCS.
- 10.3 Explain 3-D development.

11. Understand Different Presentation Techniques in CAD

- 11.1 Explain different presentation techniques.

12. Understand Plotting of a Drawing

- 12.1 Explain loading of sheets.
- 12.2 Explain different sheet sizes.
- 12.3 Explain the pen assignments.
- 12.4 Explain the preview.

13. Understand how to Draw Diagrams of Interest to Petroleum Technology

- 13.1 Machine drawing; basic simple components.
- 13.2 Piping drawing; pipe network, coupling and joints.
- 13.3 Electrical circuits.
- 13.4 Plant layout.

FUELS AND COMBUSTION

CODE	Pet-353	T	P	C
		2	3	3
TOTL CONTACT HOURS:				
	Theory	64		
	Practical	96		

AIMS:

After studying this course the students will understand the following.

1. Fundamentals of the solid, liquid, and gaseous fuels.
2. Important properties of fuels.
3. Fundamentals of combustion process and combustion equipment.

COURSE CONTENTS

- | | | |
|-----------|---|-----------------|
| 1. | Types of fuels | 12 Hours |
| | 1.1 Solid fuels. | |
| | 1.2 Liquid fuels | |
| | 1.3 Gaseous fuels | |
| | 1.4 Synthetic fuels | |
| 2. | The process of Combustion | 15 hours |
| | 2.1 Specific heat. | |
| | 2.2 Average specific heat of mixture. | |
| | 2.3 Heating values of fuels | |
| | 2.4 Heat of formation. | |
| | 2.5. Applied combustion process. | |
| | 2.6. Elements of practical combustion. | |
| | 2.7. Excess air. | |
| | 2.8. Limits of inflammability. | |
| | 2.9. Ignition temperature. | |
| 3. | Physical properties of Fuels. | 15 Hours |
| | 3.1 Analysis of Solid Fuels. | |
| | 3.2 Miscellaneous coal tests. | |
| | 3.3 Classification of coal by rank. | |
| | 3.4 Grades of coal. | |
| | 3.5 Analysis of liquid fuels . | |
| | 3.6 Desirable properties of liquid fuels. | |
| | 3.7 Analysis of gaseous fuels. | |
| 4. | Combustion Equipment | 12 Hours |
| 4.1 | Classification of gas burners. | |
| 4.2 | Atmospheric gas burners. | |
| 4.3 | Design factors of gas burner. | |

- 4.4 Types and applications of high pressure gas burners.
- 4.5 Primary functions of liquid fuel burners.
- 4.6 Types of oil burners.
- 4.7 Combination burners.
- 4.8 Burner auxiliaries.

5. Coal Burning Equipment

10 Hours

- 5.1 Combustion of solid fuels.
- 5.2 Methods of burning solid fuels (Firing Methods).
- 5.3 Overfeed firing.
- 5.4 Underfeed firing.
- 5.5 Pulverized-coal firing.
- 5.6 Furnaces.

PRACTICAL 96 HOURS

1. To determine Specific Gravity and API Gravity (Degrees API) by means of hydrometers. Compute API Gravity from the measurement of Specific Gravity Using API formula and compute it with the measured value of API Gravity.
2. To determine API Gravity of two different gravity liquid fuels at 75 F and Compute its API Gravity at 60 F using the following coefficients of expansion
 - Up to 35 API= 0.004 per degree.
 - 35 to 50 API = 0.005 per degree.
3. To determine water and Sediment in petroleum fuels by Centrifuge Method.
4. To determine water content of petroleum fuels by standard ASTM method.
5. To determine Sediment in fuel oil by ASTM Extraction method.
6. To determine Pour Point and Cloud Point of different petroleum fuels.
7. To determine Ash by standard ASTM method.
8. To determine viscosity of a viscous oils at 122 F by Saybolt Furol Orifice Viscometer.
9. To determine viscosity of a relatively less viscous oil by means of Saybolt Universal Orifice Viscometer at 100° F.
- 10 Determine Flash Point of fuel oils by means of Pensky-Martens Tester.
- 11 To determine Vapor Pressure of fuels by Reid Vapor-Pressure Bomb method.
- 12 To determine Gum Content of gasoline by Evaporation method.
- 13 To determine Moisture Content of given sample of Coal.
- 14 To determine Volatile Matters in given sample of Coal.
- 15 To determine Ash Content of given sample of Coal.

BOOKS RECOMMENDED

- 1 M. L. Smith and K. W. Stinson, "Fuels and Combustion McGraw-Hill Book
- 2 J. M. Perry Chemical Engineering Handbook, McGraw-Hill Book Co.

INSTRUCTIONAL OBJECTIVES

NOTE: numerical problems relevant to each topic should be solved by the teacher in the class and some numerical should be given as homework to the students as well.

1. Understand fundamentals and classification of fuels

- 1.1 Define fuel.
- 1.2 Enlist types of solid fuels.
- 1.3 Enlist ranks of coal.
- 1.4 Describe types of coals: banded and no banded.
- 1.5 Describe chemical composition of solid fuels and enlist the methods of analysis.
- 1.6 Describe Ultimate Analysis and proximate Analysis
- 1.7 Describe the principal divisions of natural petroleum: distillates, residues, residuals.
- 1.8 Give brief description of fuel oils in tabular oils.
- 1.9 Give general classification of fuel oils in a tabular form.
- 1.10 Describe miscellaneous liquid fuels: coal tar, oil, gasoline, kerosene, alcohol, benzyl.
- 1.11 Enlist various gaseous fuels.
- 1.12 Give brief description of each type of gaseous fuel
- 1.13 Describe sulfur impurities of gaseous fuels.
- 1.14 Explain the compressibility of natural gas at high pressures and procedure for its calculation using the following formula.

$$D = aP + bP^2 + cP^3 + dP^4 + \dots$$
- 1.15 enlist the various types of synthetic fuels
- 1.16 Describe each type of synthetic fuels briefly with the help of process flow diagram

2. Understand The Process Of Combustion

- 2.1 Define specific heat
- 2.2 Describe specific heat and its variation with the help of its equation.
- 2.3 Describe the procedure for computing the specific heat of a mixture of gases
- 2.4 Describe heating value of fuels indicating the methods (type of instruments) for its determination
- 2.5 Describe heats of formation
- 2.6 Explain the combustion process of stationary flames and explosion flames
- 2.7 Describe various types of combustion process.
- 2.8 State the elements of practical combustion
- 2.9 Explain the determination of excess air
- 2.10 Explain the limit of inflammability
- 2.11 Describe the factors which affect the limit of inflammability
- 2.12 Define the ignition temperature.
- 2.13 Enlist experimental techniques used for ignition temperature determination

3. Understand Physical Properties Of Fuels

- 3.1 Enlist basis of solid fuels
- 3.2 Describe the method of computing fuels analysis to other bases
- 3.3 Describe briefly the ASTM test designed to aid in establishing accurate specification for coal and coke.
- 3.4 Describe classification of coal by rank according to ASME- ASTM methods.
- 3.5 Describe grades of coal according to ASTM standards
- 3.6 Describe various tests for analyzing liquid fuels according to the ASTM standards on Petroleum Products.

Heating Value	Volatility	Gravity
Viscosity	Flash and Fire Points	Pour Point

- | | | | |
|--|---------------------|--------------------------|--------------------|
| | Reid Vapor Pressure | Conradson Carbon Residue | Water and Sediment |
| | Gum Content | Corrosion test | Ash |
| | Sulfur | Octane Number | Cetane Number |
- 3.7 Describe desirable properties of some common fuels such as Fuel Oils, Gasoline, Jet Fuels, and Diesel Fuels.
- 3.8 State the physical tests required for analyzing a gaseous fuels.

4. Understand Combustion Equipment

- 4.1 Describe classification of gas burners.
- 4.2 Describe atmospheric gas burners
- 4.3 Describe some of the design factors of high pressure gas burners.
- 4.4 Describe type and classification of high pressure gas burners.
- 4.5 Describe main feature of a liquid fuel burner.
- 4.6 Enlist type of oil burners.
- 4.7 Describe each type of oil burners.
- 4.8 Describe combination oil burners.
- 4.9 Describe auxiliaries of oil burners.

5. Understand Coal Burning Equipment

- 5.1 Describe the combustion process of solid fuels stating the four stages of successful combustion of coal.
- 5.2 Enlist various firing method.
- 5.3 Describe overfeed firing methods.
- 5.4 Describe various method of overfeed firing; Hand firing, Traveling-Grate and Chain-grate Stokers, Inclined-Grate Stoker, Spreader Stokers.
- 5.5 Describe underfeed firing.
- 5.6 Describe pulverized-coal firing.
- 5.7 Describe various types of furnaces.
- 5.8 Narrate four points of good combustion in furnaces.

INSTRUMENTATION AND CONTROL

CODE	Pet-363	T	P	C
		2	3	3
TOTAL CONTACT HOURS				
	THEORY	64		
	PRACTICAL	96		

AIMS

1. To teach the principles and mechanisms of various control instruments used in petroleum and chemical industries.
2. To explain the function and working of control instrument used for controlling different process variable in chemical & allied industries.

COURSE CONTENTS

1. Introduction

- | | | |
|------|--|---------------|
| 1.1 | Importance of instrumentation. | 8Hours |
| 1.2 | How measurements are made. | |
| 1.3 | Important process variables. | |
| 1.4 | Basic principles involved in process instrumentation | |
| 1.5 | Pascal's Law. | |
| 1.6 | Bernoulli's Theorem | |
| 1.7 | Hook's Law | |
| 1.8 | Thermoelectric Effects. | |
| 1.9 | Whetstone Bridge circuit | |
| 1.10 | Capacitance, Resistance, Inductance, Impedance. | |

2. Temperature Measurement

12 Hours

- | | |
|-----|-----------------------|
| 2.1 | Fahrenheit Scales. |
| 2.2 | Celsius Scale. |
| 2.3 | Conversion of scales. |

3. Temperature Measuring Instruments

- | | |
|------|---|
| 3.1 | Bimetallic thermometers. |
| 3.2 | Bimetallic thermometers construction. |
| 3.3 | Types of bimetallic thermometers construction |
| 3.4 | Spiral bimetallic thermometers. |
| 3.5 | Helical bimetallic thermometers |
| 3.6 | Liquid-in-glass thermometer construction. |
| 3.7 | Types of liquids filled thermometers |
| 3.8 | Filled system thermometer construction. |
| 3.9 | Thermocouples. |
| 3.10 | Resistance thermometers. |
| 3.11 | Pyrometers Optical, Radiation. |
| 3.12 | Temperature transmitters |

4. Pressure Measurement

2 Hours

- | | |
|-----|--------------------|
| 4.1 | Units of pressure. |
|-----|--------------------|

- 4.2 Calculating pressure.
- 4.3 Inferred pressure.

- 5. Pressure Measuring Instruments. 10 Hours**
 - 5.1 U-tube manometer.
 - 5.2 Inclined tube manometer.
 - 5.3 Well type manometer.
 - 5.4 Inverted bell type manometer.
 - 5.5 Bourden tube pressure gauges.
 - 5.7 Types of Burden tube construction.
 - 5.8 C-shaped Burden tubes.
 - 5.9 Spiral Bourden tubes.
 - 5.10 Helical Bourden tubes.
 - 5.11 Pneumatic pressure transmitters.
 - 5.12 Pressure transducer.
 - 5.13 Types of pressure transducers.
 - 5.14 The Pirani gauges

- 6. Selection of Pressure Gauges 3 Hours**
 - 6.1 Scales.
 - 6.2 Accuracy & Calibration
 - 6.4 Interpolation

- 7. Pressure Gauges Usage 2 Hours**
 - 7.1 Pressure shock.
 - 7.2 Over Pressure.
 - 7.3 Stiction
 - 7.4 Parallax.

- 8. Pressure Sensors 4 Hours**
 - 8.1 Diaphragm pressure sensors.
 - 8.2 Diaphragm construction.
 - 8.3 Single diaphragm.
 - 8.4 Capsule diaphragm
 - 8.5 Capsule stack.
 - 8.6 Bellows pressure sensors

- 9. Flow Measurement 12 Hours**
 - 9.1 Displacement Meters
 - 9.2 Differential flow measurement.
 - 9.3 Differential pressure measurement.
 - 9.4 Flow recorder.
 - 9.5 Flow meters.
 - 9.6 Venturimeter.
 - 9.7 Orifice meter
 - 9.8 Flow nozzles.
 - 9.9 Rotameters
 - 9.10 Turbine meters
 - 9.11 Magnetic Meters
 - 9.12 Thermal meters
 - 9.13 Pitot tube

9.14 Laboratory wet-test meter

10. Liquid Level Measuring Instrument

4 Hours.

- 10.1 Methods of measuring level.
- 10.2 Point Gauge.
- 10.3 Dip Gauge.
- 10.4 Sight Glass.
- 10.5 Storage Tank Gauge.
- 10.6 Inferred Pressure.

11. Control Systems

5 Hours.

- 11.1 Control loop.
- 11.2 Pneumatic Control Valve
- 11.3 On-off control
- 11.4 Proportional control
- 11.5 Proportional derivative control
- 11.6 Proportional integral derivative control

PRACTICALS

96 Hours

1. Determine the measurement of pressure(in inches of Hg) by means of a U tube mercury
2. Take pressure reading at the bottom of a water column by means of a U- tube manometer and a Bourdon Gauge and compare the reading of both instruments in same units such as PSIG.
3. Determine pressure measurement by means of a manometer in inches of Hg. Convert this measurement to inches of H₂O and PSIG.
4. Determine pressure measurement by means of Bourdon Tube.
5. Determine water pressure by means of a Bourdon Gauge.
6. Determine gas pressure by means of a Bourdon Gauge.
7. Steady the measurement of low pressure by means of Vacuum Gauge.
8. Determine pressure of an oil column being exerted at the bottom of the column.
9. Determine pressure of water column being exerted at the bottom of the column.
10. Determine difference of pressure between two points in a water flow line.
11. Determine specific gravity of oil in a column by measuring column pressure and height of column above the pressure measuring point.
12. Determine gauge pressure of water in flow line and calculate absolute pressure.
13. Determine density of a water (in lb/ft³ and g/cc) in a column by measuring column pressure (lb/in²) and height of column (ft) above the pressure measuring point
14. Determine atmospheric pressure by means of barometer.
15. Determine atmospheric pressure in lb/in² and determine the height of atmospheric air column by using the density of air.
16. Practice measurement of temperature of hot water on Celsius Scale of a mercury Thermometer.
17. Practice measurement of temperature of hot water on Fahrenheit Scale of a mercury thermometer
18. Practice measurement of temperature by means of a bimetallic thermometer.
19. Determine pressure of a water column and calculate the level of water by using the Density of water.
20. Determine pressure of an oil column and calculate the level of oil by using the density of oil.

21. Determine water pressure at the bottom of water tank and calculate the weight of water in the tank by using the cross-sectional area of the tank.
22. Determine the velocity of flowing water in a pipe by using Pitot tube.
23. Determine the angular velocity of an electric motor (in rpm) by means of a Tachometer.
25. Determine the flow of gas in a low pressure gas pipe by means of a wet-test meter.

BOOKS RECOMMENDED

1. J.O. Higgins, "Basic Instrumentation (Industrial Measurement)", McGraw-Hill Book Co.
2. Austin E. Fribance, "Industrial Instrumentation Fundamentals", McGraw-Hill Book Co.
3. Union Texas Pakistan Inc., "Technician Assistant: Elementary and Intermediate Craft Skills part 3", Overseas Technical Service.
4. Union Texas Pakistan Inc., "'Production Operator I Manual"
5. Fraklyn W. Kirk and Nicholas Rinbo, "Instrumentation", American Technical Society, Chicago, Illinois.
6. Warren I. McCabe, J. C. Smith and peter Harriott, "Unit Operations of Chemical Engineering", McGraw-Hill Book Co.

INSTRUCTINAL OBJECTIVES

1. Understand Importance of Control Instruments

- 1.1 Briefly explain the importance if instrumentation
- 1.2 State why instruments are used in plants.
- 1.3 Name and explain important process variable used in petroleum and chemical Industry; Temperature, Pressure, Flow, Level
- 1.4 State the elements which are commonly measured in the plant.
- 1.5 Define Pascal's law.
- 1.6 Explain Pascal's law with examples.
- 1.7 Explain Bernoulli's theorem.
- 1.8 Explain Hook's law.
- 1.9 Define thermoelectric effect.
- 1.10 Draw a neat sketch of whetstone bridge circuit and explain it.
- 1.11 Define and explain each one of the following.
 - a) Capacitance.
 - b) Resistance.
 - c) Inductance.
 - d) Impedance.

2. Know Temperature

- 2.1 Define temperature.
- 2.2 Distinguish between heat and temperature.
- 2.3 State the two common temperature scales used in the industry
- 2.4 State the range of Fahrenheit and Celsius temperature scales.
- 2.5 Convert Celsius to Fahrenheit and vice versa.

3. Understand Temperature Measuring Instruments

- 3.1 State types of instruments commonly used in the plant to measu.re temperature.
- 3.2 Explain the principles of bimetallic thermometers.
- 3.3 State types of bimetallic thermometers.

- 3.4 Explain the construction and working principles of spiral bimetallic thermometer.
- 3.5 Explain the construction and working principles of Helical bimetallic thermometer.
- 3.6 Explain the construction and working principle of liquid-in-glass thermometer.
- 3.7 Name types of liquids used in the liquid-in-glass type thermometer.
- 3.8 Explain the construction and working principle of filled system thermometer.
- 3.9 Define thermocouple.
- 3.10 Explain the principle of thermocouple.
- 3.11 Enlist various types of thermocouples.
- 3.12 Identify the use of various thermocouples for different temperature ranges.
- 3.13 Define resistance thermometer.
- 3.14 Explain Wheatstone Bridge circuit and label its parts.
- 3.15 Define pyrometer.
- 3.16 Enlist types of pyrometers.
- 3.17 Describe the functioning of radiation pyrometer.
- 3.18 Describe the functioning of optical pyrometer.
- 3.19 Define temperature transmitter.
- 3.20 Enlist types of temperature transmitters.
- 3.21 Explain the principle of temperature transmitter.
- 3.22 Identify the transmitter's electronics on the basis of their operation and temperature range.

4. Understand Pressure

- 4.1 Define pressure.
- 4.2 Explain what the term, pressure, means.
- 4.3 State English and Metric units of pressure.
- 4.4 Calculate pressure in both English and Metric units.
- 4.5 Explain what the term, Inferred Pressure,, means.

5. Understand Pressure Measuring Instruments

- 5.1 State types of instruments used to measure pressure.
- 5.2 Enlist various pressure measuring instruments.
- 5.3 Describe U-tube manometer.
- 5.4 Explain Well type manometer.
- 5.5 Explain bell type and inverted bell type manometers.
- 5.6 Draw a neat sketch of a bourdon gauge and explain the principle of bourdon gauge with the help of this sketch.
- 5.7 Explain the principle of a "C" shaped bourdon tube.
- 5.8 State common forms of bourdon tubes.
- 5.9 Explain the principle of differential pressure instrument.
- 5.10 Differentiate between differential pressure and direct pressure measuring instruments.
- 5.11 List the uses of a differential pressure instrument.
- 5.12 Differentiate between pneumatic and electronic pressure transmitter.
- 5.13 Define transducer.
- 5.14 Enlist type of transducer.
- 5.15 Draw diagram of a transducer.
- 5.16 Differentiate between mechanical and electrical transducer.
- 5.17 Enlist five advantages of electrical transducers and three disadvantages of mechanical transducers.
- 5.18 Explain piezoelectric gauge.

6. Understand selection of pressure gauges

- 6.1 State common factors which are considered when selecting pressure gauges.
- 6.2 Explain the term "Scales".
- 6.3 Explain the term "Accuracy".
- 6.4 Explain the term "Calibration".
- 6.5 Explain the term "Interpolation".

7. Understand pressure gauge

- 7.1 Explain the term "Pressure shock".
- 7.2 Explain the term "Over pressure".
- 7.3 Explain the term "Stiction".
- 7.4 Explain the term "parallax".

8. Understand pressure sensors

- 8.1 State the principal of diaphragm pressure sensor.
- 8.2 State the type of diaphragm construction
- 8.3 Explain the working principal of single diaphragm.
- 8.4 Explain Capsule Diaphragm.
- 8.5 Explain the Capsule Stack.
- 8.6 Draw a neat diagram of Bellow Pressure Sensor.
- 8.7 Explain how a Bellow Pressure Sensor measures pressure.

9. Understand flow measurement devices

- 9.1 Describe flow of the fluid.
- 9.2 Name type of flow.
- 9.3 Enlist flow measuring instruments.
- 9.4 Describe orifice meter.
- 9.5 Explain venturimeter.
- 9.6 Explain flow nozzle.
- 9.7 Explain Rotameters.
- 9.8 Explain magnetic flow meter.
- 9.9 Explain Pitot tube.
- 9.10 Differentiate between:
 - 9.10.1 Orifice meter & Venturimeter.
 - 9.10.2 Rotameters & Pitot Tube.
- 9.11 Enlist Characteristics of each flow meter.
- 9.12 State two methods that are commonly used in the plants to measure flow rate.
- 9.13 State how a positive displacement meter is used to measure flow rate.
- 9.14 Explain the difference between displacement and inferential flow measurement.
- 9.15 State the function of flow rate by using the differential pressure measurement.
- 9.16 State the function of an orifice plate.
- 9.17 State the names of two common types of chart recorders used to record flow measurement.

10. Understand Liquid Level Measuring Instruments.

- 10.1 Explain the terms 'direct measurement' and 'indirect measurement' related to level measurement.
- 10.2 State common methods used in the plants to measure liquid level.
- 10.3 Explain how a point gauge is used to measurement liquid level.
- 10.4 State how a dip gauge is used to indicate liquid level in small volume vessels.

- 10.5 State how sight glasses are used to indicate liquid level.
- 10.6 State how a storage tank gauge functions.
- 10.7 Explain how pressure is used to indicate liquid level.

11. Understand Control Systems.

- 11.1 Define control system.
- 11.2 Explain control loop with its working principle.
- 11.3 Name various types of controller.
- 11.4 Explain proportional controller.
- 11.5 Describe proportional derivative controller.
- 11.6 Describe proportional integral derivative controller.
- 11.7 Explain pneumatic control valve.
- 11.8 Explain on-off control system.
- 11.9 List uses of each controller.

BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

CODE	Mgm-221	T	P	C
		1	0	1

TOTAL CONTACT HOURS

Theory	32
Practical	0

AIMS:

The course has been designed to enable the student:

To develop management skills, to get acquainted with the principles of management and economic relation, and to develop commercial/economic approach to solve the problems in the industrial set-up.

COURSE CONTENTS

1. Economic		2 Hours
1.1	Definition Adam smith, Alfred Marshall, Prof, Robins	
1.2	Natural and Scope.	
1.3	Importance for technicians.	
2. Basic Concept of Economics		1 Hour
2.1	Utility.	
2.2	Income.	
2.3	Wealth.	
2.4	Saving.	
2.5	Investment.	
2.6	Value.	
3. Demand and Supply		2 Hours
3.1	Definition.	
3.2	Law of Demand.	
3.3	Definition of Supply.	
3.4	Law of Supply.	
4. Factors of Production		2 hours
4.1	Land.	
4.2	Labor.	
4.3	Capital.	
4.4	Organization.	
5. Business Organization		3 Hours
5.1	Sole Proprietorship.	
5.2	Partnership.	
5.3	Joint Stock company	
6. Entrepreneurial Skills		4 Hours
6.1	Preparing, planning, establishing, managing, operating, and evaluating relevant resources in small business.	
6.2	Business opportunities, goal setting.	
6.3	Organizing, evaluating, and analyzing opportunity and risk tasks.	
7. Scale of Production		2 Hours
7.1	Meaning and its determination.	
7.2	Large scale production.	
7.3	Small scale production.	
8. Economic Systems		3 Hours
8.1	Free economic system.	
8.2	Centrally planned economy.	

	8.3 Mixed economic system.	
9. Money		1 Hours
	9.1 Barter system and its inconveniences.	
	9.2 Definition of money and its functions.	
10. Bank		1 Hours
	10.1 Definition.	
	10.2 Functions of a commercial bank.	
	10.3 Central bank and its functions.	
11. Cheque		1 Hours
	11.1 Definition.	
	11.2 Characteristics and kinds of cheques.	
	11.3 Dishonor of cheque.	
12. Financial Institutions		2 Hours
	12.1 IMF.	
	12.2 IDBP.	
	12.3 PIDC.	
13. Trade Union		2 Hours
	13.1 Introduction and brief history.	
	13.2 Objectives, merits, and demerits.	
	13.3 Problems of industrial labour.	
14. International Trade		2 Hours
	14.1 Introduction.	
	14.2 Advantages and disadvantages.	
15. Management		1 Hours
	15.1 Meaning.	
	15.2 Functions of management.	
16. Advertisement		2
	Hours	
	16.1 The concept, benefits, and drawbacks.	
	16.2 Principal media used in business world.	
17. Economy of Pakistan		
	17.1 Introduction.	
	17.2 Economic problems and remedies.	

BOOKS RECOMMENDED

1. Nisar-ud-Din, "Business Organization", Aziz Publishers Lahore.
2. M.Saeed Nasir, "Introduction to Business", Ilmi Kutub Khana, Lahore.
3. S.M.Akhtar "An Introduction to Modern Economic", United Books Limited, Lahore.

INSTRUCTIONAL OBJECTIVES

- 1. Understand the Importance of Economic**
 - 1.1 State definition of economics given by AdamSmith, Alfred Marshal, and Professor Robins.
 - 1.2 Explain nature and scope of economics.
 - 1.3 Describe importance of the study of economics for technicians.

- 2. Understand the Basic Terms Used in Economic**
 - 2.1 Define basic terms; utility, income, wealth, saving , Investment, and value.
 - 2.2 Explain the basic terms with example.

- 3. Understand the Law of Demand and Law of Supply**
 - 3.1 Define demand.
 - 3.2 Explain Law of demand with the help of schedule and diagram.
 - 3.3 State assumptions and limitations of the law of demand.
 - 3.4 Define supply.
 - 3.5 Explain law of supply with the help of schedule and diagram.
 - 3.6 State assumptions and limitations of the law of supply.

- 4. Understand the Factor of Production**
 - 4.1 Define the four factors of production.
 - 4.2 Explain labour and its features.
 - 4.3 Describe capital and its peculiarities.

- 5. Understand Forms of Business Organization**
 - 5.1 Describe sole proprietorship, its merits and demerits.
 - 5.2 Explain partnerships, its advantages and disadvantages.
 - 5.3 Describe joint stock company, its merits and demerits.
 - 5.4 Distinguish between public limited company and private limited company.

- 6. Understand Entrepreneurial Skills**
 - 6.1 Explain preparing, planning, establishing, and managing small business setup.
 - 6.2 Explain evaluating all relevant resources.
 - 6.3 Describe organizing, analyzing,

- 7. Understand Scale of Production**
 - 7.1 Explain scale of production and its determination.
 - 7.2 Describe large scale production and its merits.
 - 7.3 Explain small scale production and its advantages and disadvantages.
 - 7.4

- 8. Understand Different Economic Systems**
 - 8.1 Describe free economic system and its characteristics.
 - 8.2 Explain centrally planned economic system, its merits and demerits.
 - 8.3 State mixed economy system and its features.

- 9. Understand what Money is**
 - 9.1 Define money.
 - 9.2 Explain barter system and its inconveniences.
 - 9.3 Explain functions of money.

- 10. Understand Bank and its Functions**
 - 10.1 Define Bank
 - 10.2 Describe commercial bank and its function.
 - 10.3 State central bank and its function.

- 11. Understand Cheque and Dishonor of Cheque**
 - 11.1 Define cheque.

- 11.2 Enlist the characteristic of cheque.
- 11.3 Identify the kinds of cheque.
- 11.4 Describe the causes of dishonor of a cheque.

12. Understand Financial Institutions

- 12.1 Explain IMF and its objectives.
- 12.2 Explain organizational set up and objective of IDBP.
- 12.3 Explain organizational set up and objective of PIDC.

13. Understand Trade Union, its Background, and Functions.

- 13.1 Describe brief history of trade union.
- 13.2 State functions of trade union.
- 13.3 Explain objectives, merits and demerits of trade union.
- 13.4 Enlist problems of industrial labor.

14. Understand International Trade

- 14.1 Explain international trade.
- 14.2 Enlist its merits and demerits

15. Understand Management

- 15.1 Explain international trade.
- 15.2 Describe functions management.
- 15.3 Identify the problems of management.

16. Understand Advertisement

- 16.1 Explain the concept of advertisement.
- 16.2 Enlist benefit and drawback of advertising
- 16.3 Describe principal media of advertising used in business

17 Understand the economics problem of Pakistan

- 17.1 Describe economy of Pakistan
- 17.2 Explain economics problem of Pakistan