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**CURRICULUM**  
For  
**THREE YEARS' DIPLOMA OF ASSOCIATE ENGINEER**  
IN  
**CIVIL TECHNOLOGY**

Entry Level: -	Matriculation (Science)
Duration of Course: -	Three Years
Credit Hours:	SEVENTY (Annual System)
Methodology:	Theory 40%  Practical 60 %
Examination & Certification Body:	Punjab Board of Technical Education
Examination System:	Annual System (same as for all the DAEs programs)

Technical Education and Vocational Training Authority

**TEVTA**

**SCHEME OF STUDIES**  
**DAE in CIVIL TECHNOLOGY (3-Years' Course)**

<b>FIRST YEAR</b>				
<b>Code</b>	<b>Subject Name</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Gen 111</b>	<b>Islamiat &amp; Pakistan Studies</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Eng 112</b>	<b>English</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>Math 113</b>	<b>Applied Mathematics-I</b>	<b>3</b>	<b>0</b>	<b>3</b>
<b>Ch 112</b>	<b>Applied Chemistry</b>	<b>1</b>	<b>3</b>	<b>2</b>
<b>Phy 122</b>	<b>Applied Physics</b>	<b>1</b>	<b>3</b>	<b>2</b>
<b>Civil 104</b>	<b>Basic Civil Engineering Surveying</b>	<b>2</b>	<b>6</b>	<b>4</b>
<b>Civil 113</b>	<b>Engineering Materials &amp; Construction Techniques</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Civil 143</b>	<b>Basic Civil Engineering Drawing</b>	<b>1</b>	<b>6</b>	<b>3</b>
<b>Shop 102</b>	<b>Workshop Practice</b>	<b>1</b>	<b>3</b>	<b>2</b>
<b>Comp 111</b>	<b>Computer Applications</b>	<b>0</b>	<b>3</b>	<b>1</b>
	<b>T o t a l</b>	<b>14</b>	<b>27</b>	<b>23</b>
<b>SECOND YEAR</b>				
<b>Code</b>	<b>Subject Name</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Gen 211</b>	<b>Islamiat /Pakistan Studies</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Math 212</b>	<b>Applied Mathematics-II</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>Gen 221</b>	<b>Communication Skills &amp; Report Writing</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Civil 203</b>	<b>Public Health Technology</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Civil 214</b>	<b>Advanced Civil Engineering Surveying</b>	<b>2</b>	<b>6</b>	<b>4</b>
<b>Civil 223</b>	<b>Advanced Construction Techniques</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Civil 232</b>	<b>Quantity Surveying</b>	<b>1</b>	<b>3</b>	<b>2</b>
<b>Civil 243</b>	<b>Civil Engineering Drawing &amp; Auto CAD</b>	<b>1</b>	<b>6</b>	<b>3</b>
<b>Civil 263</b>	<b>Engineering Mechanics</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Civil 271</b>	<b>Entrepreneurship</b>	<b>1</b>	<b>0</b>	<b>1</b>
	<b>T o t a l</b>	<b>15</b>	<b>24</b>	<b>23</b>

<b>THIRD YEAR</b>				
<b>Code</b>	<b>Subject Name</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Gen 311</b>	<b>Islamiat &amp; Pakistan Studies</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>Civil 303</b>	<b>Advanced Quantity Surveying</b>	<b>1</b>	<b>6</b>	<b>3</b>
<b>Civil 314</b>	<b>Construction Project Planning &amp; Management</b>	<b>2</b>	<b>6</b>	<b>4</b>
<b>Civil 322</b>	<b>Environment Health and Safety</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>Civil 334</b>	<b>Hydraulics &amp; Irrigation Engineering</b>	<b>3</b>	<b>3</b>	<b>4</b>
<b>Civil 343</b>	<b>Transportation Engineering</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Civil 354</b>	<b>Concrete Technology and RCC Design</b>	<b>3</b>	<b>3</b>	<b>4</b>
<b>Civil 373</b>	<b>Soil Mechanics &amp; Bridge Engineering</b>	<b>2</b>	<b>3</b>	<b>3</b>
	<b>T o t a l</b>	<b>16</b>	<b>24</b>	<b>24</b>

DAE CIVIL TECHNOLOGY  
YEAR 1

اسلامیات / مطالعہ پاکستان	GEN III	حصہ اول اسلامیات حصہ دوم مطالعہ پاکستان موضوعات حصہ اول اسلامیات کتاب و سنت
ٹی پی سی 1 0 1 کل وقت: 20 گھنٹے	سہل اول	
		(1) <b>قرآن مجید</b>
		1- تعارف قرآن مجید-2- نزول قرآن 3- مکی و مدنی سورتوں کی خصوصیات 4- وحی کی اقسام 5- پندرہ منتخب آیات مع ترجمہ
		1.1 تنالوا البر حتی تنفقوا مما تحبون
		1.2 واعتصموا بحبل اللہ جمیعاً ولا تفرقوا
		1.3 ولا یجر متکم شان 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 الصلوٰۃ تنہی عن الفحشاء والمنکر
		1- اعمال اعمال بالنیات
		2- اہمیت لا تم مکارم الاخلاق
		3- لا یومن احدکم حق یحب الا خیرہ ما یحب لنفسه
		4- المسلم من سلم المسلمون من لسانہ ویدہ
		5- من امن باللہ مسلم استقم
		6- خیرکم خیرکم لاله
		7- سبب المسلم فسوق وقتالہ کفر
		8- الحو من احو المؤمن
		9- کل المسلم عسی المسلم حیر لہ بجمعه و حالہ و فرقہ
		10- ایتہ المنلق ثلاث اذا حدیث کذب و قاتل من حان و اتا و فنا خلف
		دین اسلام
		2.1 ہمام کے بنیادی مفہم 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

حصہ اول  
حصہ اسلامیات

### تدریسی مقاصد

#### 1- قرآن مجید

- عمومی مقصد: طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمت کا اصل سرچشمہ قرآن مجید ہے  
 خصوصی مقصد: طالب علم اس قابل ہو جائے گا کہ
- ۱۰ قرآن مجید کی تعریف کر سکے گا
  - ۱۱ قرآن مجید کے نزول کی صورت بیان کر سکے
  - ۱۲ قرآن مجید کی آئی و مدنی سورتوں کی پہچان کر سکے
  - ۱۳ منتخب آیات کا ترجمہ و تشریح کر سکے
- عمومی مقصد: یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی تعلیمت کا مفہوم کیا ہے  
 قرآنی آیات کا ترجمہ تشریح کر سکے  
 قرآنی تعلیمت کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

#### 2- عسفت

- عمومی مقصد: طالب علم سنت نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا  
 خصوصی مقصد:
- ۱۴ سنت کی تعریف بیان کر سکے
  - ۱۵ سنت کی اہمیت و ضرورت کی وضاحت کر سکے
  - ۱۶ سنت کی روشنی میں امور حسنہ پر عمل کر سکے
- ۳- منتخب احادیث پر عمل  
 عموی مقصد: احادیث کی روشنی میں اخلاقی اقدار سے سمجھنے حاصل کر سکے  
 خصوصی مقصد: احادیث کا ترجمہ و تشریح کر سکے  
 رسول اللہ ﷺ کے امو حسنہ کا، امو حسنہ سے اجتناب کر سکے

#### دین اسلام

- عمومی مقصد: دین اسلامی کے بنیادی مقاصد اور عبادت کے بارے میں جان سکے اور بیان کر سکے  
 خصوصی مقاصد
- ۱۷ لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے
  - ۱۸ اسلام کے بنیادی مقاصد کی اہمیت بیان کر سکے
  - ۱۹ اسلام کے بنیادی مقاصد سے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے
  - ۲۰ عبادت کے نقلی و اصطلاحی معنی بیان کر سکے
  - ۲۱ عقیدے اور عبادت کا فرق بیان کر سکے
  - ۲۲ عبادت (نماز، روزہ، حج، زکوٰۃ) کے فوری احکامات اور انسانی زندگی پر ان کی اثرات بیان کر سکے
  - ۲۳ اسلامی مقاصد و عبادت کے مطابق اپنی زندگی ڈھل کر ایک اچھا مسلمان بن سکے

ن ن ن 1 0 1 کل وقت - 20 گھنٹے	(غیر مسلم طلباء کے لئے)	GEN III	نصاب اختلاقیات سائنسوں حصہ دوم ملاحظہ پاکستان
	<b>موضوعات</b>		اختلاقیات کی تعریف اور اہمیت اختلاقیات کا معیار (لائون: عقل، العین، سب) مندرجہ ذیل اخلاقیات کی وضاحت <ul style="list-style-type: none"> <li>☆ دولت داری</li> <li>☆ وقت داری</li> <li>☆ نظم و ضبط</li> <li>☆ راست گوئی</li> <li>☆ صبر و استقامت</li> <li>☆ حوصلہ مند بننا</li> <li>☆ وقت کی پابندی</li> <li>☆ سفاکی</li> <li>☆ اعتدال</li> <li>☆ باہمی احترام</li> <li>☆ مصلحت</li> </ul>

### نصاب اخلاقیات (اسٹری لوز)

#### تدریسی مقاصد

- عمومی مقاصد: اعلیٰ تعلقات کی وجہ سے کل ترقی میں تھل قدر حاصل کر سکے
- خصوصی مقاصد: طالب اس علم سے اپنا تھل ہو گا کہ
- ۶۱. موضوعات کا مطلب بیان کر سکے
  - ۶۲. عملی زندگی سے مثالوں کی نشاندہی کر سکے
  - ۶۳. اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
  - ۶۴. وراثت داری کی اہمیت بیان کر سکے
  - ۶۵. وفا داری کی اہمیت بیان کر سکے
  - ۶۶. نظم و ضبط کی فلاحیت بیان کر سکے
  - ۶۷. صدق بیان کی ضرورت بیان کر سکے
  - ۶۸. حوصلہ مندی کے فوائد بیان کر سکے
  - ۶۹. وقت کی پابندی کے فوائد بیان کر سکے
  - ۷۰. صفائی اور باہمی اختیار سے حسن نگارگی کو بیان کر سکے
  - ۷۱. مصلحت کے فوائد بیان کر سکے

### نصاب: اسٹری لوز (Gen III)

کل وقت 12 گھنٹے

مذاہ پاکستان

حصہ دوم

#### موضوعات

- ۶۱. صورت نظر: مسلمان قوم میں آزادی نگرانی تاریخ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت - ذاتی و جمالی غلامی کے تعلقات
- ۶۲. نظریہ پاکستان
- ۶۳. قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض اہمیت نظریہ پاکستان کی وضاحت - نظریہ پاکستان اور حصہ اول اور قائد اعظم کے ارشادات کی روشنی میں
- ۶۴. نظریہ پاکستان کا تاریخی پسو
- ۶۵. مہرینہ قاسم کی سہ - مجید تلف مانی اور شہدہ امی اللہ کی تباہی خدمت سید احمد شہید کی تحریک مجاہدین قاسمی تحریکیوں
- ۶۶. علی گڑھ - تحریک اصلاحیہ (نور محمد - مدرسہ لاطام - سندھ) اسلامی کانگریس (پٹنور) انجمن حمایت اسلام (الہ آباد)

مطالعہ پاکستان (حصہ دوم)  
تدریس کا مقصد  
حریت فکر:

- عمومی مقصد  
طالب علم یہ جان لے کہ اسلام میں اور مسلمان قوم میں آزادی فکر کی کیا اہمیت ہے  
خصوصی مقاصد
- ☆ حریت فکر کا معنی و مفہوم بیان کر سکے  
☆ آزادی فکر کی اہمیت بیان کر سکے  
☆ خصوصاً "اسلام میں آزادی" اعداد و اہمیت بیان کر سکے  
☆ ذہنی غلامی کے قومی سطح پر نقصانات کے بیان کر سکے  
☆ بدسلوکی غلامی قومی سطح پر نقصانات بیان کر سکے  
☆ نظریہ پاکستان  
☆ عمومی مقصد:  
☆ نظریہ پاکستان (دوین 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 پسو  
☆ عمومی مقصد  
☆ نظریہ پاکستان کے تاریخی پسو سے واقفیت حاصل کر سکے  
☆ خصوصی مقاصد:  
☆ محمدین قاسم کے بارے میں بیان کر سکے



- ۶۱۔ محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکتے
- ۶۲۔ محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکتے
- ۶۳۔ بیان کر سکتے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکتہ آغاز کیا ہے
- ۶۴۔ مہدالقب خانی کی ملی خدمات بیان کر سکتے
- ۶۵۔ شہد ولی اللہ کی علمی خدمات بیان کر سکتے
- ۶۶۔ مہدالقب خانی اور شہد ولی اللہ نے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکتے

### علمی تحریکیں

- ۶۷۔ علمی مقصد
- ۶۸۔ برصغیر کی علمی تحریکوں سے آگاہی حاصل کر سکتے
- ۶۹۔ قصود میں مقصد:
- ۷۰۔ ملی مرکز - دیوبند - تحریک العلماء مدرسہ السلام، اسلامیہ کالج - انجمن حمایت اسلام کے ذریعہ سیاسی شعور مسلمانوں میں پیدا کیا اسے بیان کر سکتے
- ۷۱۔ آزادی ہند کے سلسلہ میں تحریک محمدین کی خدمات بیان کر سکتے

**Eng-112 ENGLISH****Total contact hours**

Theory	64	T	P	C
Practical	0	2	0	2

**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****ENGLISH PAPER "A"**

- 1. PROSE/TEXT** **16 hrs**
- 1.1 First eight essays of Intermediate. English Book-II
- 2. CLOZE TEST** **4 hrs**
- 1.2 A passage comprising 50-100 words will be selected from the text. Every 11<sup>th</sup> word or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

**ENGLISH PAPER "B"**

- 3. GRAMMAR** **26 hrs**
- 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** **8 hrs**
- 4.1 Letters/Messages
- 4.2 Job application letter
- 4.3 For character certificate/for grant of scholarship
- 4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles
- 4.5 Essay writing
- 4.6 Technical Education, Science and Our life, Computers, Environmental Pollution, Duties of a Student. **4 hrs**
- 5. TRANSLATION** **6 hrs**
- 5.1 Translation from Urdu into English.  
For Foreign Students: A paragraph or a dialogue.

**RECOMMENDED BOOKS**

1. Technical English developed by Mr. Zia Sarwar, Mr. Habib-ur –Rehman, Evaluated by Mr.Zafar Iqbal Khokhar, Mr. ZahidZahoor, Vol - I, National Book Foundation

**Eng-112 ENGLISH****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 RULES 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 and use verb tense correctly in different forms to denote relevant time.
- 3.3 Identify function words and content words.
- 3.4 Use marks 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 CONCEPTS OF COMPOSITION WRITING TO PRACTICAL SITUATIONS**

- 4.1 Use concept to construct applications for employment, for character certificate for grant of scholarship.
- 4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
- 4.3 Describe steps of a 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. APPLIES 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.

**Math-113 APPLIED MATHEMATICS**

<b>Total contact hours</b>	96	<b>T</b>	<b>P</b>	<b>C</b>
Theory		3	0	3

Pre-requisite: 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. Menstruation, Matrices and Determinants.
2. Develop skill, mathematical attitudes and logical perception in the use of mathematical instruments as required in the technological fields.
3. Acquire mathematical clarity and insight in the solution of technical problems.

**COURSE CONTENTS**

<b>1</b>	<b>QUADRATIC EQUATIONS</b>	<b>6 Hrs</b>
1.1	Standard Form	
1.2	Solution	
1.3	Nature of roots	
1.4	Sum & Product of roots	
1.5	Formation	
1.6	Problems	
<b>2</b>	<b>ARITHMETIC PROGRESSION AND SERIES</b>	<b>3Hrs</b>
2.1	Sequence	
2.2	Series	
2.3	nth term	
2.4	Sum of the first n terms	
2.5	Means	
2.6	Problems	
<b>3</b>	<b>GEOMETRIC PROGRESSION AND SERIES</b>	<b>3Hrs</b>
3.1	nth term	
3.2	sum of the first n terms	
3.3	Means	
3.4	Infinite Geometric progression	
3.5	Problems	
<b>4</b>	<b>BINOMIAL THEOREM</b>	<b>6 Hrs</b>
4.1	Factorials	

4.2	Binomial Expression	
4.3	Binomial Co-efficient	
4.4	Statement	
4.5	The General Term	
4.6	The Binomial Series.	
4.7	Problems	
<b>5</b>	<b>PARTIAL FRACTIONS</b>	<b>6 Hrs</b>
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	
5.6	Problems	
<b>6</b>	<b>FUNDAMENTALS OF TRIGONOMETRY</b>	<b>6 Hrs</b>
6.1	Angles	
6.2	Quadrants	
6.3	Measurements of Angles	
6.4	Relation between Sexagesimal & circular system	
6.5	Relation between Length of a Circular Arc & the Radian Measure of its central Angle	
6.6	Problems	
<b>7</b>	<b>TRIGONOMETRIC FUNCTIONS AND RATIOS</b>	<b>6 Hrs</b>
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	
<b>8</b>	<b>GENERAL IDENTITIES</b>	<b>6 Hrs</b>
8.1	The Fundamental Law	
8.2	Deductions	
8.3	Sum & Difference Formulae	
8.4	Double Angle Identities	
8.5	Half Angle Identities	
8.6	Conversion of sum or difference to products	
8.7	Problems	
<b>9</b>	<b>SOLUTION OF TRIANGLES</b>	<b>6 Hrs</b>
9.1	The law of Sine's	
9.2	The law of Cosines	

9.3 Measurement of Heights & Distances

9.4 Problems

## **10 MENSURATION OF SOLIDS**

**30 Hrs**

10.1 Review of regular plane figures and Simpson's Rule

10.2 Prisms

10.3 Cylinders

10.4 Pyramids

10.5 Cones

10.6 Frusta

10.7 Spheres

## **11 VECTORS**

**9 Hrs**

11.1 Scalars & Vectors

11.2 Addition & 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 Deductions

11.9 Analytic Expression for  $a \times b$ .

11.10 Problems.

## **12 MATRICES AND DETERMINANTS**

**9 Hrs**

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

## **REFERENCE BOOKS**

Applied Mathematics Math-113, by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

**Math-113 APPLIED MATHEMATICS-I****INSTRUCTIONAL OBJECTIVES****1 USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATIONS**

- 1.1 Define a standard quadratic equation.
- 1.2 Use methods 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 a quadratic equation.
- 1.6 Calculate 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 given numbers
- 2.4 Insert n Arithmetic means between two numbers
- 2.5 Derive formulas for summation of an Arithmetic series
- 2.6 Solve problems on Arithmetic Progression and Series

**3 UNDERSTAND GEOMETRIC PROGRESSION AND SERIES**

- 3.1 Define a geometric sequence and a series.
- 3.2 Derive formula for nth term of a G.P.
- 3.3 Explain geometric mean between two numbers.
- 3.4 Insert n geometric means between two numbers.
- 3.5 Derive a formula for the summation of geometric Series.
- 3.6 Deduce a formula for the summation of an infinite G.P.
- 3.7 Solve problems 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 a given decimal place.
- 4.8 Solve problems involving binomials.

## **5 RESOLVE A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT METHODS.**

- 5.1 Define a partial fraction, a proper and an improper fraction.
- 5.2 Explain all the four types of partial fractions.
- 5.3 Set up 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 SYSTEMS OF MEASUREMENT OF ANGLES.**

- 6.1 Define angles and the related terms.
- 6.2 Illustrate the generation of angle.
- 6.3 Explain sexagesimal and circular systems for the measurement of angles
- 6.4 Derive 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 FUNCTIONS**

- 7.1 Define the basic trigonometric functions/ratios 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 problems 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 & triple angle formulas
- 8.6 Convert sum or difference into product & 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 sines and the law of cosines.
- 9.3 Explain elements of a triangle.
- 9.4 Solve triangles and the problems involving heights and distances.
- 10 USE PRINCIPLES OF MENSTRUATION IN FINDING SURFACES, VOLUME AND WEIGHTS OF SOLIDS.**
- 10.1 Define mensuration of plane and solid figures
- 10.2 List formulas for perimeters & areas of plane figure.
- 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 vector
- 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 vector.
- 11.7 Deduce conditions of perpendicularity and parallelism of two vectors.
- 11.8 Solve problems
- 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 equation by matrices.
- 12.8 Explain the solution of a determinant.
- 12.9 Use Crammer's Rule for solving linear equations

**Ch-112 APPLIED CHEMISTRY**

<b>T</b>	<b>P</b>	<b>C</b>
1	3	2

**Total Contact Hours**

Theory	<b>32</b>
Practical	<b>96</b>

Pre-requisite: The student must have studied the subject of elective chemistry at Secondary, school level.

**AIMS:** After studying this course a student will be able to;

1. Understand the significance and role of chemistry in the development of modern technology.
2. Become acquainted with the basic principles of chemistry as applied in the study of relevant Technology.
3. Know the scientific methods for production, properties and use of materials of industrial & technological significance.
4. Gains skill for the efficient conduct of practical's in a Chemistry lab.

**COURSE CONTENTS**

<b>1</b>	<b>INTRODUCTION AND FUNDAMENTAL CONCEPTS</b>	<b>2 Hrs</b>
1.1	Orientation with reference to this technology	
1.2	Terms used & units of measurements in the study of chemistry	
1.3	Chemical Reactions & their types	
<b>2</b>	<b>ATOMIC STRUCTURE</b>	<b>2 Hrs</b>
2.1	Sub-atomic particles	
2.2	Architecture of atoms of elements, Atomic No. & Atomic Weight	
2.3	The periodic classification of elements periodic law	
2.4	General characteristics of a period and group	
<b>3</b>	<b>CHEMICAL BOND</b>	<b>2 Hrs</b>
3.1	Nature of chemical Bond	
3.2	Electrovalent bond with examples	
3.3	Covalent Bond (Polar and Non-polar, sigma & Pi Bonds with examples	
3.4	Co-ordinate Bond with examples	
<b>4</b>	<b>WATER</b>	<b>2 Hrs</b>
4.1	Chemical nature and properties.	
4.2	Impurities	
4.3	Hardness of water (types, causes & removal)	
4.4	Scales of measuring hardness (Degrees Clark	
4.5	Boiler feed water, scales & treatment	

4.6	Sea-water desalination, sewage treatment	
<b>5</b>	<b>ACIDS, BASES AND SALTS</b>	<b>2 Hrs</b>
5.1	Definitions with examples	
5.2	Properties, their strength, basicity & Acidity	
5.3	Salts and their classification with examples	
5.4	pH-value and scale	
<b>6</b>	<b>OXIDATION &amp; REDUCTION</b>	<b>2 Hrs</b>
6.1	The process, definition& examples	
6.2	Oxidizing and reducing agents	
6.3	Oxides and their classifications	
<b>7</b>	<b>NUCLEAR CHEMISTRY</b>	<b>2 Hrs</b>
7.1	Introduction	
7.2	Radioactivity (alpha, beta and gamma rays)	
7.3	Half life process	
7.4	Nuclear reaction & transformation of elements	
<b>8</b>	<b>CEMENT</b>	<b>2 Hrs</b>
8.1	Introduction	
8.2	Composition and manufacture	
8.3	Chemistry of setting and hardening	
8.4	Special purpose cements	
<b>9</b>	<b>GLASS</b>	<b>2 Hrs</b>
9.1	Composition and raw material	
9.2	Manufacture	
9.3	Varieties and uses	
<b>10</b>	<b>PLASTICS AND POLYMERS</b>	<b>2 Hrs</b>
10.1	Introduction and importance	
10.2	Classification	
10.3	Manufacture	
10.4	Properties and uses	
<b>11</b>	<b>PAINTS, VARNISHES AND DISTEMPER</b>	<b>2 Hrs</b>
11.1	Introduction	
11.2	Constituents	
11.3	Preparation and uses	
<b>12</b>	<b>CORROSION</b>	<b>2 Hrs</b>
12.1	Introduction with causes	

12.2	Types of corrosion	
12.3	Rusting of iron	
12.4	Protective measures against-corrosion	
<b>13</b>	<b>REFRACTORY MATERIALS AND ABRASIVE</b>	<b>2 Hrs</b>
13.1	Introduction to Refractories	
13.2	Classification of Refractories	
13.3	Properties and Uses	
13.4	Introduction to Abrasives	
13.5	Artificial and Natural Abrasives and their uses	
<b>14</b>	<b>ALLOYS</b>	<b>2 Hrs</b>
14.1	Introduction with need	
14.2	Preparation and Properties	
14.3	Some Important alloys and their composition	
14.4	Uses	
<b>15</b>	<b>FUELS AND COMBUSTION</b>	<b>2 Hrs</b>
15.1	Introduction of fuels	
15.2	Classification of fuels	
15.3	Combustion	
15.4	Numerical Problems of Combustion	
<b>16</b>	<b>LUBRICANTS</b>	<b>1 Hr</b>
16.1	Introduction.	
16.2	Classification.	
16.3	Properties of lubricants.	
16.4	Selection of lubricants:	
<b>17</b>	<b>POLLUTION</b>	<b>1 Hr</b>
17.1	The problem and its dangers.	
17.2	Causes of pollution.	
17.3	Remedies to combat the hazards of pollution.	

### BOOKS RECOMMENDED

1. Text Book of Intermediate Chemistry (I & II)
2. Ilmi Applied Science by Sh. Atta Muhammad
3. Polytechnic Chemistry by J. N. Reedy Tata McGraw Hill (New Delhi)
4. Chemistry for Engineers by P.C. Jain (New Delhi, India)

**Ch-112 APPLIED CHEMISTRY****INSTRUCTIONAL OBJECTIVES****1 UNDERSTAND THE SCOPE, SIGNIFICANCE AND FUNDAMENTAL ROLE OF THE SUBJECT**

- 1.1 Define chemistry and its important terms
- 1.2 State the units of measurements in the study of chemistry
- 1.3 Write chemical formula of common compounds
- 1.4 Describe types of chemical reactions with examples

**2 UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS**

- 2.1 Define atom.
- 2.2 State the periodic law of elements.
- 2.3 Describe the fundamental sub atomic particles
- 2.4 Distinguish between atomic no. and mass no.; isotopes and isobars
- 2.5 Explain the arrangements of electrons in different shells and sub energy levels
- 2.6 Explain the grouping and placing of 'elements' in the periodic table

**3 UNDERSTAND THE NATURE OF CHEMICAL BOND**

- 3.1 Define chemical bond
- 3.2 Describe the nature of chemical bond
- 3.3 Differentiate between electrovalent and covalent bonding
- 3.4 Explain the formation of polar and non polar, sigma and pi-bond with examples
- 3.5 Describe the nature of coordinate bond with examples

**4 UNDERSTAND THE CHEMICAL NATURE OF WATER**

- 4.1 Describe the chemical nature of water with its formula
- 4.2 Describe the general impurities present in water
- 4.3 Explain the causes and methods to removing hardness of water
- 4.4 Express hardness in different units like mg/liter, p.p.m, degrees Clark and degrees French
- 4.5 Describe the formation and nature of scales in boiler feed water
- 4.6 Explain the method for the treatment of scales
- 4.7 Explain the sewage treatment and desalination of sea water

**5 UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS**

- 5.1 Define acids, bases and salts with examples
- 5.2 State general properties of acids and bases
- 5.3 Differentiate between acidity and basicity and use the related terms
- 5.4 Define salts, state their classification with examples

5.5 Explain p-H value of solution and pH scale

## **6 UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION**

6.1 Define oxidation

6.2 Explain the oxidation process with examples

6.3 Define reduction

6.4 Explain reduction process with examples

6.5 Define oxidizing and reducing-agents and give it least six examples of each

6.6 Define oxides

6.7 Classify the oxides and give example

## **7 UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY**

7.1 Define nuclear chemistry and radio activity

7.2 Differentiate between alphas, Beta and Gamma particles

7.3 Explain half-life process

7.4 Explain at least six nuclei reactions resulting in the transformation of some elements

7.5 State important uses of isotopes

## **8 UNDERSTAND THE MANUFACTURE, SETTING AND HARDENING CEMENT**

8.1 Define port land cement and give its composition

8.2 Describe the method of manufacture

8.3 Describe the chemistry of setting and hardening of cement

8.4 Distinguish between ordinary and special purpose cement

## **9 UNDERSTAND THE PROCESS OF MANUFACTURE OF GLASS.**

9.1 Define glass

9.2 Describe its composition and raw materials

9.3 Describe the manufacture of glass

9.4 explain its varieties and uses

## **10 UNDERSTAND THE NATURE AND IMPORTANCE OF PLASTICS POLYMERS**

10.1. Define plastics and polymers

10.2 Explain the mechanism of polymerization

10.3 Describe the preparation and uses of some plastics/polymers

## **11 KNOW THE CHEMISTRY OF PAINTS, VARNISHES AND DISTEMPERS**

11.1 Define paints, varnishes and distemper

11.2 State composition of each

11.3 State methods of preparation of each and their uses

## **12 UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES**

12.1 Define corrosion

12.2 Describe different types of corrosion

12.3 State the causes of corrosion

12.4 Explain the process of rusting of iron

12.5 Describe methods to prevent/control corrosion

## **13 UNDERSTAND THE NATURE OF REFRACTORY MATERIALS AND ABRASIVE**

13.1 Define refractory materials

13.2 Classify refractory materials

13.3 Describe properties and uses of refractories

13.4 Define abrasive.

13.5 Classify natural and artificial abrasives

13.6 Describe uses of abrasives

## **14 UNDERSTAND THE NATURE AND IMPORTANCE OF ALLOYS**

14.1 Define alloy

14.2 Describe different methods for the preparation of alloys

14.3 Describe important properties of alloys

14.4 Enlist some important alloys with their composition, properties and uses

## **15 UNDERSTAND THE NATURE OF FUELS AND THEIR COMBUSTION**

15.1 Define fuels

15.2 Classify fuels and make distinction of solid, liquid & gaseous fuels

15.3 Describe important Fuels

15.4 Explain combustion

15.5 Calculate air quantities in combustion, gases

## **16 UNDERSTAND THE NATURE OF LUBRICANTS.**

16.1 Define a lubricant

16.2 Explain the uses of lubricants

16.3 Classify lubricants and cite examples

16.4 State important properties of oils, greases and solid lubricants

16.5 State the criteria for the selection of lubricant for, particular purpose/job

**17 UNDERSTAND THE NATURE OF POLLUTION**

- 17.1 Define Pollution (air, water, food)
- 17.2 Describe the causes of environmental pollution.
- 17.3 Enlist some common pollutants.
- 17.4 Explain methods to prevent pollution



**CH-112 APPLIED CHEMISTRY****96 Hours**

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the co-efficient of viscosity of benzene with the help of Ostwald viscometer.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of Cu SO.
11. To get introduction with the scheme of analysis of salts for basic radicals.
12. To analyse 1st group radicals ( $\text{Ag}^+$  -  $\text{Pb}^{++}$  -  $\text{Hg}^+$ ).
13. To make practice for detection 1st group radicals.
14. To get introduction with the scheme of II group radicals.
15. To detect and confirm II-A radicals ( $\text{Hg}^{++}$ ,  $\text{Pb}^{++++}$ ,  $\text{Cu}^+$ ,  $\text{Cd}^{++}$ ,  $\text{Bi}^{+++}$ ).
16. To detect and confirm II-B radicals  $\text{Sn}^{+++}$ ,  $\text{Sb}^{+++}$ ,  $\text{As}^{+++}$ ).
17. To get introduction with the scheme of III group radicals ( $\text{Fe}^{+++}$  -  $\text{Al}^{+++}$ ,  $\text{Cr}^{+++}$ ).
18. To detect and confirm  $\text{Fe}^{+++}$ ,  $\text{Al}^{+++}$  and  $\text{Cr}^{+++}$ .
19. To get introduction with the scheme of IV group radicals.
20. To detect and confirm  $\text{An}^{++}$  and  $\text{Mn}^{++}$  radicals of IV group.
21. To detect and confirm  $\text{Co}^{++}$  and  $\text{Ni}^{++}$  radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm  $\text{CO}_3$  and  $\text{HCO}_3$  radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.

27. To find the strength of a given alkali solution.
28. To estimate  $\text{HCO}_3^-$  contents in water.
29. To find out the %age composition of a mixture solution of  $\text{KNO}_3$  and  $\text{KOH}$  volumetrically.
30. To find the amount of chloride ions ( $\text{Cl}^-$ ) in water volumetrically.

**Phy 122 APPLIED PHYSICS**

<b>Total Hours</b>	<b>128</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Theory</b>	<b>32</b>	<b>1</b>	<b>3</b>	<b>2</b>
<b>Practical</b>	<b>96</b>			

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

**Course Contents**

<b>1</b>	<b>Measurements.</b>	<b>2 Hours</b>
	1.1 Fundamental units and derived units	
	1.2 Systems of measurement and S.I. units	
	1.3 Concept of dimensions, dimensional formula	
	1.4 Conversion from one system to another	
	1.5 Significant figures	
<b>2</b>	<b>Scalars and Vectors.</b>	<b>4 Hours</b>
	2.1 Revision of head to tail rule	
	2.2 Laws of parallelogram, triangle and polygon of forces	
	2.3 Resolution of a vector	
	2.4 Addition of vectors by rectangular components	
	2.5 Multiplication of two vectors, dot product and cross product	
<b>3</b>	<b>Motion</b>	<b>4 Hours</b>
	3.1 Review of laws and equations of motion	
	3.2 Law of conservation of momentum	
	3.3 Angular motion	
	3.4 Relation between linear and angular motion	
	3.5 Centripetal acceleration and force	
	3.6 Equations of angular motion	
<b>4</b>	<b>Torque, Equilibrium and Rotational Inertia.</b>	<b>6 Hours</b>
	4.1 Torque	
	4.2 Centre of gravity and centre of mass	
	4.3 Equilibrium and its conditions	
	4.4 Torque and angular acceleration	

4.5	Rotational inertia	
5	<b>Wave Motion.</b>	<b>5 Hours</b>
5.1	Review Hooke's law of elasticity	
5.2	Motion under an elastic restoring force	
5.3	Characteristics of simple harmonic motion	
5.4	S.H.M. and circular motion	
5.5	Simple pendulum	
5.6	Wave form of S.H.M.	
5.7	Resonance	
5.8	Transverse vibration of a stretched string	
6	<b>Sound.</b>	<b>5 Hours</b>
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	<b>Light.</b>	<b>5 Hours</b>
7.1	Review laws of reflection and refraction	
7.2	Image formation by mirrors and lenses	
7.3	Optical instruments	
7.4	Wave theory of light	
7.5	Interference, diffraction, polarization of light waves	
7.6	Applications of polarization in sunglasses, optical activity and stress analysis	
8	<b>Optical Fiber.</b>	<b>2 Hours</b>
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	<b>Lasers.</b>	<b>3 Hours</b>
9.1	Corpuscular theory of light	
9.2	Emission and absorption of light	
9.3	Stimulated absorption and emission 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 marking
- 9.13 Printing
- 9.14 Lasers in medicine

### **RECOMMENDED BOOKS**

- 1 Tahir Hussain, Fundamentals of Physics Vol-I and II
- 2 Farid Khawaja, Fundamentals of Physics Vol-I and II
- 3 Wells and Slusher, Schaum's Series Physics .
- 4 Nelkon 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 Note Book

## Phy-122

## APPLIED PHYSICS

**Instructional 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 a 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
  - 2.5 Use the concepts 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 Situation/Problems.**
  - 4.1 Explain Torque
  - 4.2 Distinguish between Centre of gravity and centre 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 Hooke's Law of Elasticity
  - 5.2 Derive formula for Motion under an elastic restoring force
  - 5.3 Derive formulae for simple harmonic motion and simple pendulum
  - 5.4 Explain wave form with reference to S.H.M. and circular motion
  - 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 Concepts 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 zones, 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.**
- 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.
- 8 **Understand Wave Theory of Light**
- 8.1 Explain wave theory of light
- 8.2 Explain phenomena of interference, diffraction, polarization of light waves
- 8.3 Describe uses of polarization given in the course contents.
- 9 **Understand the Structure, Working and Uses of Optical Fiber.**
- 9.1 Explain the structure of the Optical Fiber
- 9.2 Explain its principle of working
- 9.3 Describe use of optical fiber in industry and medicine.

**Phy-122 APPLIED PHYSICS****List of Practicals.**

- 1 Draw graphs 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 callipers.
- 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-sands 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 forces
  - b. Law of triangle of forces
  - c. Lami's theorem
- 8 Verify law of polygon of forces using Grave-sands 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 centre of gravity of regular and irregular shaped bodies.
- 13 Find Young's Modules of Elasticity of a metallic wire.
- 14 Verify Hooke's Law using helical spring.
- 15 Study of frequency of stretched string with length.
- 16 Study of variation of frequency of stretched string 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 centre of curvature.
- 24 Find focal length of concave mirror by object and image method
- 25 Find focal length of concave mirror with converging lens.
- 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 lense 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 expansion of a metallic rod.
- 40 Find the heat of fusion of ice.
- 41 Find the heat of vaporization.
- 42 Determine relative humidity using hygrometer

**DAE CIVIL TECHNOLOGY**  
**YEAR 1**  
**CIVIL-104**                      **BASIC CIVIL ENGINEERING SURVEYING**

<b>TOTAL CONTACT HOURS:</b>	<b>256</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	2	6	4
Practical:	192			

**AIM:** To determine the relative positions of distinctive features on the surface and near the surface of the earth by means of measurements of distances, directions and elevations

**COURSE CONTENTS**

- |           |  |                 |
|-----------|--|-----------------|
| <b>1.</b> | <b>Introduction</b>  | <b>4 Hours</b>  |
| 1.1       | Definition of surveying  |                 |
| 1.2       | Primary divisions of surveying (Geodetic, Plane).  |                 |
| 1.3       | Types of Surveying ( According to: field of survey, Purpose of survey, Method of survey and Instrument used) |                 |
| 1.4       | Define Geographical Information Systems(GIS)   |                 |
| 1.5       | Linear and angular measurement tools and instruments   |                 |
| 1.6       | Fundamental principles of surveying. including reliability of a survey                                       |                 |
| 1.7       | Trilateration- reconnaissance, ranging up, chaining up, off-setting its types and methods.                   |                 |
| 1.8       | Accuracy standards and reliability of chain survey.  |                 |
| <b>2.</b> | <b>Compass Traversing</b>  | <b>8 Hours</b>  |
| 2.1       | Introduction to compass survey.  |                 |
| 2.2       | Introduction to compass, its types, parts and taking observations.   |                 |
| 2.3       | Concept of meridian and its types.   |                 |
| 2.4       | Introduction of whole circle bearing and reduced bearing   |                 |
| 2.5       | Determination of whole circle bearing from reduced bearing and vice versa                                    |                 |
| 2.6       | Define the traverse, its types and methods of traversing.  |                 |
| 2.7       | Concept of Dip, Declination and Local attraction   |                 |
| 2.8       | Plotting of compass survey and errors in compass traversing and their adjustment                             |                 |
| <b>3</b>  | <b>Plane Table Surveying</b>   | <b>6 Hours</b>  |
| 3.1       | Introduction to plane table survey and equipment used.   |                 |
| 3.2       | Setting of plane table - centring, levelling & orientation   |                 |
| 3.3       | Methods of plane tabling -radiation, intersection, traversing and resection.                                 |                 |
| 3.4       | Merits and demerits of plane table survey  |                 |
| <b>4</b>  | <b>Levelling</b>   | <b>24 Hours</b> |
| 4.1       | Introduction.  |                 |
| 4.2       | Definitions of terms-level line, level surface, datum line, reduced level, line of                           |                 |

	collimation, horizontal plane, vertical plane, station point, axis of telescope, axis of bubble tube etc.	
4.3	Bench mark and its types.	
4.4	Types of levelling instruments, component parts	
4.5	Types of levelling staves	
4.6	Types of levelling	
4.7	Temporary adjustment of level	
4.8	Finding reduced levels.	
4.9	Booking - height of instrument and rise & fall method, finding missing data in a level book page.	
4.10	Classification of levelling and detailed description.	
4.11	Errors in levelling	
4.12	Introduction and use of Laser Level.	
<b>5</b>	<b>Contouring.</b>	<b>6 Hours</b>
5.1	Definition, contour lines (contours) contour interval, horizontal equivalent	
5.2	Purpose and use of contour map	
5.3	Characteristics of contour lines	
5.4	Methods of contouring	
5.5	Marking of alignment & grade of road, railway and canal on contour map. Computing earthwork, capacity of reservoir using trapezoidal and prismoidal rule	
<b>6</b>	<b>Tacheometry.</b>	<b>4 Hours</b>
6.1	Definition, types and principles.	
6.2	Finding horizontal distances & elevations of different objects by tacheometry.	
<b>7</b>	<b>Hydrographic / <u>Bathymetric</u> Survey.</b>	<b>4 Hours</b>
7.1	Introduction and purpose.	
7.2	Soundings - sounding boat, sounding rod, still water recess, current meter, fathometer, velocity rod.	
7.3	Long section & cross section of a small distributory, determination of velocity and area.	
7.4	Discharge of different sections	
<b>8.</b>	<b>Computations of Areas and Volumes</b>	<b>8 Hours</b>
8.1	Regular and irregular geometrical figures	
8.2	Area enclosed between surveying lines (railway line, highways, etc) and irregular boundary lines by:	
8.2.1	Mid Ordinate Rule	
8.2.2	Average Ordinate Rule	

**RECOMMENDED / REFERENCE BOOKS:**

1. Surveying & Leveling: **T.P.Kanetar and S.V. Kulkarni**, [2000], A.V.G Publications
2. Text Book of Surveying : **S.K. Hassan**
3. Surveying : **Hakim Ali**
4. Professional Practice in surveying and viva voce: **P.B. Shahani**
5. Rasul Manual (volume I & II) on surveying
6. Plane and Geodetic Surveying : **David Clark**
7. Surveying (theory & practice): **E. Davis**
8. Practical field surveying and computation: **A.L. Allan**
9. Guide to site surveying: **Ralph Hewitt**
10. Surveying: **A. Bannister, S. Raymond and R. Baker**, [2009], Pearson Education
11. Surveying and Levelling: **R.Agor**, [2007], Khanna Publishers
12. Surveying with Construction Applications: **Barry F. Kavanagh**, [2004], Pearson Prentice-Hall
13. Surveying, Principles and Applications: **Barry F. Kavanagh**, [2006], Pearson Prentice-Hall
14. Surveying and Levelling: **N.N. Basak**, [1994], Tata McGraw-Hill, NewDelhi
15. Fundamentals of Surveying: **S.K. Roy**, [2007], Prentice-Hall of India, New Delhi

**INSTRUCTIONAL OBJECTIVES****1. Know Basic Facts About Surveying**

- 1.1 Define Surveying.
- 1.2 State the purpose of surveying
- 1.3 State the divisions (plane, geodetic) and classification of surveying based on function of survey and type of instrument used including Chain & Compass Surveying, Control surveying, Land surveying, Topographic Surveying, Engineering Surveys, Cadastral Surveys.
- 1.4 Describe Geographical Information Systems(GIS)
- 1.5 State the fundamental principles of surveying
- 1.6 Define chain surveying/ trilateration, reconnaissance, ranging up
- 1.7 Describe types of chain, offsets and its types

**2. Compass Traversing**

- 2.1 State the purpose and principles of compass traversing
- 2.2 State compass, its types, its parts and explain reading from it.
- 2.3 Define meridian and state its types
- 2.4 Define the traverse, bearing and types of bearing.
- 2.5 Solve problems relating to bearings
- 2.6 Define dip, declination & local attraction and solution of relevant problems.
- 2.7 State the types of traverse and explain methods of traversing.
- 2.8 State the methods of plotting compass traverse and adjustment of closing error.

**3. Understand the Principle of Plane Table Surveying and Perform Field Work**

- 3.1 State the purpose and principles of plane table surveying and identify the functions of accessories used in plane table surveying
- 3.2 Explain the operations involved in setting-up plane table and the methods of Orientation by back sighting and by Trough compass.
- 3.3 Explain the methods of plane tabling.
- 3.4 List steps involved in carrying out plane table surveying by radiation, intersection, traversing and resection.
- 3.5 State the merits and demerits of plane table surveying and list the errors in plane table surveying and precaution to be taken.

**4. Understand the Principles of Levelling for Different Engineering Purposes**

- 4.1 Define levelling and describe the purpose of levelling.
- 4.2 Define technical terms, level line, level surface, datum, datum line, horizontal plane, vertical plane, Horizontal line, vertical line, level line, line of collimation, Axis of telescope, bubble tube axes, back sight, foresight, Intermediate sight, change point, station point.
- 4.3 Describe bench mark and its types.

- 4.4 Identify the parts and function of various types of tilting levels and Auto set level
- 4.5 Explain with sketches levelling staves and their uses.
- 4.6 List the steps involved in performing temporary adjustment of a level.
- 4.7 Compute the reduced levels by rise & fall method and height of instrument method and recording the same on level book.
- 4.8 Determine the missing data of a level book page.
- 4.9 Define fly levelling, Longitudinal sectioning, cross-sectioning, reciprocal levelling, precise levelling, Barometric levelling .
- 4.10 State precautions in levelling operation.
- 4.11 Describe the procedures for taking readings to plot L-section x-section, and for reciprocal levelling precise levelling etc.
- 4.12 Plot X-section and L-section
- 4.13 Solve numerical problem on reciprocal levelling
- 4.14 Describe errors in levelling
- 4.15 Compute correction due to curvature and refraction
- 4.16 Describe parts and functions of Laser Level
- 4.17 Explain the procedure of levelling by use of Laser Level.

## **5. Understand Methods of Contouring and Computation of Volumes**

- 5.1 Define the terms relating to contouring and explain characteristics and the purpose of contouring
- 5.2 Explain the uses of contour map.
- 5.3 Explain the methods of performing contour survey.
- 5.4 Interpolate contours on a plan.
- 5.5 Explain the procedure to lay down alignment of road, railway and channel on contour map and describe procedure for measuring gradient.
- 5.6 Compute the capacity of reservoirs and volume of earth from the contour map.

## **6. Understand the Principles of Tachometry to find the Elevations and Distances of Stations**

- 6.1 Explain the principles of tacheometry and enlist the method of tacheometry
- 6.2 Describe the instruments used in stadia survey and state tacheometric constants
- 6.3 Lists the steps involved in taking stadia observations in field to find elevations and distances of stations and compute the elevation and horizontal distances.
- 6.4 Solve examples for finding horizontal and vertical distances by tacheometry

## **7. Understand the Principles of Hydrographic Survey**

- 7.1 Define Hydrographic / Bathymetric survey and state its purposes.
- 7.2 Describe sounding, sounding rod/pole, sounding boat, still water recess, fathometer, velocity rod and current meter
- 7.3 Explain the methods of taking soundings
- 7.4 Explain procedure of determining velocity with velocity rod and current meter for determination of discharge of channel.

## **8. Understand the Computation of Areas and Volume**

- 8.1 Describe Regular and irregular geometrical figures
- 8.2 Calculate Area enclosed between surveying lines (railway line, highways, etc) and irregular boundary lines (contours) by:-
- i. Mid Ordinate Rule
  - ii. Average Ordinate Rule
- 8.3 Calculate Area of contours by graphical method and mechanical method (by planimeter).
- 8.4 Calculate Volume of earthwork in plane and hilly area for cutting and filling.

**LIST OF PRACTICALS****HOURS**

1. Ranging and chaining of various survey lines,	3
2. Taking different off-sets from chain line.	3
3. Setting up the compass and observation of bearings.	6
4. Compass survey of an area.	9
5. Plotting of data from compass survey	6
6. Plane table survey of an area (Temporary adjustment and radiation method).	3
7. Plane table survey of an area (intersection method and orientation).	3
8. Plane table survey of an area (Traversing method with triangular check).	6
9. Reading different types of staves.	6
10. Temporary adjustment of level and taking readings.	3
11. Simple Levelling of line	3
12. Taking reduced levels of various points and recording in the field book.	6
13. Fly levelling and finding R.Ls by height of collimation and rise fall method.	9
14. Route levelling (by auto set level).	12
15. Reciprocal levelling and its booking.	9
16. Finding and setting gradient using a level and staff.	12
17. Taking longitudinal section and cross section of a 1/2 mile long route and their plotting, marking alignment and gradient calculation of earth work.	18
18. Levelling by Laser Level (Fly Levelling, Route Levelling).	15
19. Contouring of small area by radial and square method and preparing of a contour map	18
20. Determination of horizontal distance and elevation by stadia tacheometry.	9
21. Measuring distance by Hydrographic survey of a small channel	12
22. Determination of area: enclosed between surveying line (Railway lines/Highways and irregular boundary lines in the field)	9
23. Shifting of Bench Mark by precise levelling	12

**DAE CIVIL TECHNOLOGY  
YEAR 1**

**CIVIL-113                      ENGINEERING MATERIALS & CONSTRUCTION TECHNIQUES**

<b>TOTAL CONTACT HOURS:</b>	<b>160</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	2	3	3
Practical:	96			

The student will be able to:

**AIM:**

1. Understand about the manufacture, properties and uses of building materials in order to produce the required finished facility and to use it to the best advantage
2. Understand the fundamentals of building construction and gain skills through practical work.

**COURSE CONTENTS**

<b>1. Bricks and Tiles</b>	<b>2 Hours</b>
1.1 Merits as a building material	
1.2 Classification of bricks	
1.3 Testing of bricks.	
1.4 Tiles and their classification.	
<b>2 Stones</b>	<b>2 Hours</b>
2.1 Quarrying	
2.2 Characteristics	
2.3 Types	
2.4 Uses	
2.5 Dressing of stones	
<b>3 Lime</b>	<b>3 Hours</b>
3.1 Sources of lime	
3.2 Calcination, slaking and hydraulicity	
3.3 Classifications, quick lime and hydraulic lime	
3.4 Uses and storage	
<b>4 Cement</b>	<b>4 Hours</b>
4.1 Composition & manufacture	
4.2 Types of cement and their uses.	
4.3 Storage	
4.4 Hydration, heat of hydration, rate of hydration and water requirements for hydration.	



<b>5</b>	<b>Sand</b>	2 Hours
5.1	Sources and classification	
5.2	Grading	
5.3	Bulking	
5.4	Uses	
<b>6</b>	<b>Mortars</b>	2 Hours
6.1	Introduction and Classification of mortars.	
6.2	Batching Mixing.	
6.3	Functions and Application	
<b>7</b>	<b>Concrete and Concreting Operations</b>	6 Hours
7.1	Composition and proportioning.	
7.2	Batching of materials by volume and weight	
7.3	Mixing of concrete	
7.4	Transportation of concrete	
7.5	Compaction of concrete	
7.6	Finishing of concrete surface, types	
7.7	Curing of concrete	
<b>8</b>	<b>Ferrous Metals and Non Ferrous Metals</b>	4 Hours
8.1	Types of ferrous metals	
8.2	Structural steel sections and their use in building construction.	
8.3	Steel used in Reinforced cement concrete-Plain, deformed & cold twisted steel bars.	
8.4	Special steels-High carbon steel, high tensile steel, properties and uses.	
8.5	Types of non ferrous metals and their uses in construction.	
8.6	Lead and Zinc properties and uses.	
<b>9</b>	<b>Paints and Varnishes</b>	2 Hours
9.1	Types and uses of paints-oil paints, Enamel, colour wash	
9.2	Characteristics of a good paint.	
9.3	Varnishes-French Polish types and uses.	
<b>10</b>	<b>Advanced Construction Materials.</b>	6 Hours
10.1	Introduction to modern materials	
10.2	Glass types and uses, glass tiles and glass doors.	
10.3	Bitumen, Asphalt and tar grades and uses.	
10.4	Tiles and their types including Tuff tiles-uses and construction	
10.5	Fibre reinforced concrete	
10.6	Fibre reinforced polymers(FRP), FRP Technology, its advantages and	

	disadvantages.	
10.7	Self compacting concrete and geo-polymer concrete.	
10.8	Construction bonding materials.	
<b>11</b>	<b>Composite materials</b>	<b>3 Hours</b>
11.1	Fundamentals of composite materials.	
11.2	Types of composite materials.	
11.3	Benefits of composite materials.	
11.4	Application of composite materials.	
<b>12</b>	<b>Miscellaneous Materials</b>	<b>3 Hours</b>
12.1	Asbestos, characteristics and uses	
12.2	Asbestos cement sheets	
12.3	Linoleum, characteristics and uses	
12.4	Thermocol characteristics and uses	
12.5	Resin and uses	
12.6	wood wool, characteristics and uses	
12.7	Rubber, types and uses	
12.8	Plaster of Paris, characteristics and uses	
12.9	Definition of adhesives, characteristics, uses and types	
12.10	Glass wool, characteristics and uses	
12.11	Ebonite, characteristics and uses	
<b>13</b>	<b>Introduction to Building Construction.</b>	<b>2 Hours</b>
13.1	Definition of building and Building classification.	
13.2	Classification based on materials and occupancy.	
13.3	Different parts of building and their functions.	
<b>14</b>	<b>Foundations</b>	<b>4 Hours</b>
14.1	Introduction	
14.2	Concepts of foundation, types of soils and bearing capacity.	
14.3	Sub soil investigation-trial pit, trench, drilling holes.	
14.4	Shallow foundation definition, types and suitability.	
14.5	Design of thickness, width and depth of foundation for concrete block wall.	
14.6	Deep foundation - necessity uses and types.	
14.7	Construction of foundation-layout, for excavation.	
14.8	<del>De-watering.</del>	
<b>15</b>	<b>Masonry</b>	<b>4 Hours</b>
15.1	Brick bonds and their types.	
15.2	Methods of bedding bricks.	
15.3	Construction of brick walls.	
15.4	Classification of Stone Masonry.	

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15.5	Specifications of Stone Masonry.	
<b>16</b>	<b>Damp Proof Course.</b>	2 Hours
16.1	Causes and effects of dampness	
16.2	Necessity, Types and materials used.	
16.3	Method of laying damp proof course	
16.4	Damp proofing of floors.	
16.5	Basic principles of water proofing of basements.	
<b>17</b>	<b>Walls</b>	2 Hours
17.1	Purpose of walls.	
17.2	Classification of walls according to functions and material used.	
<b>18</b>	<b>Arches and Lintels.</b>	2 Hours
18.1	Arches-definition, terminologies, parts, and functions	
18.2	Classification-according to material used, function and shapes.	
18.3	Methods of arch construction including stone arches.	
18.4	Lintels-types and construction.	
18.5	Plinth beams and grade beams	
<b>19</b>	<b>Doors, windows and ventilators</b>	3 Hours
19.1	Introduction	
19.2	Doors, windows and ventilators	
19.3	Standard sizes of doors, windows and ventilators	
19.4	Types of doors	
19.5	Windows and its types	
<b>20</b>	<b>Roofs</b>	2 Hours
20.1	Definition, functions	
20.2	Classification of roofs	
20.3	Pitched roofs-types and roof covering materials	
20.4	Types of trusses for pitched roofs	
20.5	Introduction, <b>materials used</b> and <b>construction</b> of False Ceiling	

**21 Surface Finishing**

4 Hours

- 21.1 Plastering objectives, types and procedures.
- 21.2 White washing, distempering and their specifications.
- 21.3 Painting old and new surfaces - wooden, metal and wall surfaces.
- 21.4 Defects in painting.
- 21.5 Pointing objectives and types.
- 21.6 Graffito & Rockwall finishing
- 21.7 Tiles Finishing
- 21.8 Panel Finishing
- 21.9 Terms used to classify internal and external finishes (Wet finish, dry finish, self finish)
- 21.10 Functions of internal floor finishes and ceiling finishes.
- 21.11 Functions of external finishes (exclusion, solar reflection, insulation, aesthetics, impact resistance)

**RECOMMENDED / REFERENCE BOOKS:**

1. Engineering Material: **Surrender Singh**.
2. Building Materials: Choudhry.
3. Building Construction : **Kulkarne**
4. Building Construction : **Arora & Gupta**
5. Building Construction: **Mitchell**.
6. Building Construction: **Mckay**.
7. Engineering Materials: **Handoo**.
8. Building Construction: **P. C. Varghese** [2009], PHI Learning, New Delhi
9. Building Construction: **N.L.Arora and B.R.Gupta**, [2001], Prakashar, New Delhi
10. Construction Technology: **Eric Fleming**, [2004], Blackwell Publishing
11. Steel Designer's Manual: **Buick Davison and Graham Owens**, [2005], Blackwells Publishing
12. Fundamentals of Building Construction : **Edward Allen**, [1985], Wiley & Sons
13. Rehabilitation and Re-use of Old Buildings: **D. High field**, [1987], E & F. N Spon
14. Building Materials and Construction: **Theodore Marotta**, [2005], Pearson  
Apprentice-Hall

**INSTRUCTIONAL OBJECTIVES****1. Understand the Selection of Suitable Bricks for Construction Work**

- 1.1 State the classification of bricks according to specifications
- 1.2 Describe the characteristics of a good brick
- 1.3 Explain standard tests for bricks
- 1.4 Describe the common types of tiles and their uses
- 1.5 Describe merits and classification of fair faced bricks, i.e. burnt clay tiles, glazed tiles, marble tiles, tuff tiles, other ceramics tiles.

**2. Understand Selection of Stones and their Acceptability for Construction Work.**

- 2.1 Define the quarrying
- 2.2 Explain the methods of quarrying
- 2.3 State the classification of stone and their uses in different items of construction
- 2.4 Explain the methods of dressing stone.

**3. Understand the Types and Uses of Lime for Construction Work**

- 3.1 State the sources of lime
- 3.2 Explain terms, calcination, slaking and hydraulicity
- 3.3 State classification and uses of lime
- 3.4 Describe the method of storage of lime

**4. Understand the Manufacturing Process and Uses of Cement for Construction Work**

- 4.1 State the composition of cement.
- 4.2 Explain the types of cement and their uses.
- 4.3 Explain the methods of storage of cement under various situations
- 4.4 Describe the hydration and rate of hydration.
- 4.5 State water requirements for hydration.

**5. Understand the Characteristics of Sand**

- 5.1 State the classification of sand and uses
- 5.2 Describe the grading of sand
- 5.3 Explain the bulking of sand

**6. Understand the Principles of Preparation of Mortars for Building Work**

- 6.1 State the classification of mortars
- 6.2 State the different proportions of mortars for various works
- 6.3 State the function of mortar
- 6.4 Explain the methods of preparation of mortars

## 7. Understand the Principles of Preparation of Concrete

- 7.1 Define the concrete, types of concrete
- 7.2 State the ingredients of plain and reinforced concrete
- 7.3 State the proportions of plain and reinforced concrete for different types of work
- 7.4 Describe methods of batching by weight and by volume
- 7.5 Explain the procedure of hand and machine mixing
- 7.6 State the types of concrete mixers
- 7.7 Explain the various methods of transportation of fresh concrete
- 7.8 Explain various methods of compacting concrete t hand, vibrators
- 7.9 Explain methods of concrete finishing
- 7.10 Describe objects of curing and methods of curing
- 7.11 Explain the needs of joints in curing.

## 8. Know the Properties and Uses of Ferrous Metals in Construction Work

- 8.1 State the properties of cast iron, mild steel and wrought iron with their uses
- 8.2 List the common structural steel sections used in construction work
- 8.3 Distinguish between plain steel, deformed steel and cold twisted steel bars
- 8.4 State the properties and uses of special steels i.e. High carbon steel, high tensile steel
- 8.5 State the properties of Aluminium, lead and zinc
- 8.6 State the uses of Aluminium lead and zinc in construction work

## 9. Know the Selection of Suitable Paints and Varnishes for Construction Work

- 9.1 Describe the characteristics, *constituents and preparation* of a good paint.
- 9.2 State the types of paints and their uses in construction works
- 9.3 State the types and uses of varnishes

## 10. Understand the Properties and Uses of Advance Materials i.e. Glass, Asphalt, Tuff Tiles and Fiber Reinforced Concrete

- 10.1 State the uses of different types of glass in construction work
- 10.2 State use of glass tiles and glass doors.
- 10.3 Describe the differences between asphalt, tar and bituminous materials
- 10.4 Describe the grades and uses of bituminous materials
- 10.5 Explain the uses and construction of tuff tile
- 10.6 Describe composition and uses of fiber reinforced concrete
- 10.7 Describe FRP Technology, its advantages and disadvantages.
- 10.8 Explain self compacting concrete and geo-polymer concrete.
- 10.9 Describe different construction bonding materials.

## 11. Understand different types of Composite materials, their Benefits and Applications

- 11.1 Describe the fundamentals of composite materials, matrices, reinforcement( glass fibres, natural fibres, carbon fibres), particulate (sand, talc, coloured chips, recycled glass).
- 11.2 Describe the types of composite materials (Traditional- Wood, Engineered wood, brick, steel, concrete, disc brake pads) Polymers.
- 11.3 State benefits of composite materials.

11.4 Describe the applications of composite materials.

## **12. Understand the Characteristics and Uses of Miscellaneous Materials**

- 12.1 Define asbestos, state its characteristics and uses
- 12.2 State asbestos cement sheets
- 12.3 Define linoleum, state its characteristics and uses
- 12.4 Define thermocole, state its characteristics and uses
- 12.5 Define resin and state its uses
- 12.6 Define wood wool, state its characteristics and uses
- 12.7 Define rubber, state its types and uses
- 12.8 Define plaster of paris ,state its characteristics and uses
- 12.9 Define adhesives, state its characteristics, uses and types
- 12.10 Define glass wool, state its characteristics and uses
- 12.11 Define ebonite, state its characteristics and uses

## **13. Know the Classification of Building as Per Building Code**

- 13.9 Define Building.
- 13.10 Define classification of Building.
- 13.11 State the classification of buildings (agricultural, commercial, residential, Educational, Government, industrial, religious, Military, Transport etc.)with examples
- 13.12 State the components of a building and their functions

## **14. Understand the Suitability and Design of Common Types of Foundations**

- 14.9 Define foundation
- 14.10 Explain the properties of various soil deposits
- 14.11 Explain the terms bearing capacity, safe and ultimate bearing capacity
- 14.12 Explain the types of investigations required for foundation
- 14.13 Describe with sketches various types of shallow and deep foundations and their suitability
- 14.14 Explain rules for minimum depth, width of foundation and thickness of concrete block
- 14.15 Explain the layout of a building
- 14.16 Explain the procedure of constructing spread footings
- 14.17 Describe the methods of timbering foundation

## **15. Understand Masonry Work**

- 15.9 Define the technical terms related to masonry work.
- 15.10 Explain with sketches bond and their types i.e. English bond, Flemish bond, herring bone bond, zigzag bond, and garden wall bond.
- 15.11 State the general principles to be observed in brick masonry construction.
- 15.12 Explain the different types of stone masonry i.e. ashlar masonry, random rubble.
- 15.13 Explain specification for carrying out stone masonry work.

## **16. Understand the Function of Damp Proof Course in Building**

- 16.9 State the causes and effects of dampness in building
- 16.10 Describe the necessity, types and materials used for DPC.
- 16.11 Explain the functions and method of laying damp proof courses

- 16.12 Describe damp proofing of floors.
- 16.13 State basic principles of water proofing of basements.

### **17. Understand the Types and Suitability of Various Types of Wall**

- 17.1 Describe the purpose of wall
- 17.2 Explain the classification of walls according to functions and materials
- 17.3 Select suitable type of wall for given situation

### **18. Understand the Constructions and Suitability of Various Types of Arches and Lintels in Construction Work**

- 18.1 Explain the functions of arch and lintels and their suitability in construction work.
- 18.2 Label the parts of common arch.
- 18.3 Explain with sketches common types of arches and lintels and their respective suitability in construction work.
- 18.4 Explain the general procedure of construction of arches and lintels.

### **19. Understand the Construction and Methods of Fixation of Common Types of Doors and Windows and ventilators.**

- 19.1 Explain with sketches common and special types of doors and windows.
- 19.2 Describe the method of fixing door frame and window in a wall.
- 19.3 Enlist the fittings and fastenings used for door and windows.

### **20. Understand the Methods of Construction of Roofs**

- 20.1 State the functions of roofs.
- 20.2 State the classifications of roofs.
- 20.3 Explain with sketches the different types of pitched roof.
- 20.4 Explain with sketches the different types of wooden and steel trusses.
- 20.5 Explain with sketches common types of flat roofs.
- 20.6 Explain the construction of common types of flat roofs
- 20.7 Describe construction of False Ceiling.

### **21. Understand the Finishes Provided Over Masonry Wood Work and Metal Work**

- 21.1 Describe purpose and types of plastering.
- 21.2 Explain the methods of cement plastering.
- 21.3 Explain the specifications and procedures of white washing/ colour washing and distempering on old and new surfaces.
- 21.4 State the purpose of pointing.
- 21.5 Explain the types and methods of pointing with sketches.
- 21.6 Explain the purpose and method of painting new and old wall surfaces.
- 21.7 Explain the method of painting wood work and steel work.
- 21.8 State the defects in painting.
- 21.9 Explain use of Graffito and Rockwall finishing, Tile finishing & Panel finishing.
- 21.10 Describe the terms used to classify internal and external finishes.
- 21.11 Explain functions of internal floor finishes and ceiling finishes.
- 21.12 State the functions of external finishes.



LIST OF PRACTICALS		HOURS
1.	Visit of brick kiln near by and write report regarding constituent materials, mixing of ingredients, moulding of bricks, burning, cooling, stacking, transport.	6
2.	Preparation of models in construction yard of dry & wet brick walls and pillar 9” and 13 - 1/2” thick by English and Flemish bond	6
3.	Preparation of dry mix, wet mortar and use on some construction work	3
4.	Visit of cement factory. Sketch a flow diagram, showing manufacturing process of cement.	3
5.	Visit to precast unit factory, demonstration of casting and submission of visit report.	6
6.	Preparation of hand/machine mix concrete placing, finishing, etc. of concrete at site for suitable useful work.	3
7.	Practice of plastering of small wall with cement mortar.	6
8.	Practice white washing and distempering on plastered surface.	6
9.	Painting of plastered surface/steel surface, wooden surface.	6
10.	Preparation of layout plan for a building and layout on the ground.	6
11.	Sketching of various types of foundations.	9
12.	Sketches of various bonds and practice making dry brick bond.	9
13.	Construction of small masonry wall.	3
14.	Demonstration of dressing of natural stone.	6
15.	Visit to nearby quarry/crusher and submission of visit report.	3
16.	Demonstration and practice of fixing of door/windows.	3
17.	Demonstration and practice on setting out of an arch.	3
18.	Demonstration and practice in laying DPC horizontal & Vertical for a portion of wall.	3
19.	Demonstration of preparation of putty and fixation of glass panes in door/windows.	3
20.	Practical Demonstration of false ceilings.	3

**DAE CIVIL TECHNOLOGY**  
**YEAR 1**  
**CIVIL 143 BASIC CIVIL ENGINEERING DRAWING**

<b>TOTAL CONTACT HOURS:</b>	<b>224</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	<b>32</b>	<b>1</b>	<b>6</b>	<b>3</b>
Practical:	192			

**AIM:** The student will be able to:

1. Understand proper use of drawing instruments for preparation of geometric and multi-view pictorial drawings.
2. Understand the construction of various geometric figures as applicable in civil technology.
3. Apply the techniques of free hand sketching for preparation of finished sketches of given objects.

**COURSE CONTENTS**

<b>1. Introduction.</b>	<b>2 Hours</b>
1.1 Meanings of drafting and its scope.	
1.2 Free hand sketching of plane figures and solid figures.	
<b>2. Engineering Drawing Instruments.</b>	<b>3 Hours</b>
2.1 Classification; basic and advance drawing tools and their uses.	
2.2 Scales.	
2.3 Line; type and selection of line thickness.	
2.4 Selection of pencil.	
2.5 Title strip/block-types and sizes.	
<b>3. Lettering/Printing.</b>	<b>2 Hours</b>
3.1 Importance and types.	
3.2 Size and style.	
3.3 Lettering stencils.	
<b>4. Geometrical Constructions.</b>	<b>3 Hours</b>
4.1 Construction of angles.	
4.2 Construction of Triangles, quadrilaterals, and polygons.	
4.3 Meaning of inscribed and circumscribed figures.	
4.4 Terms used in a circle.	
4.5 Conical curves, ellipse, parabola, hyperbola and their applications in civil engineering.	

<b>5. Orthographic Projections.</b>	2 Hours
5.1 Planes including principal plane.	
5.2 Projections and projection lines.	
5.3 Dihedral and trihedral angles.	
5.4 Types of orthographic projections.	
5.5 Principal views in 1 <sup>st</sup> & 3 <sup>rd</sup> angle	
<b>6. Sectioning</b>	2 Hours
6.1 Definition & purpose of sectional views.	
6.2 Location of cutting plane- purpose of cutting plane line.	
6.3 Direction of arrowheads of CPL in 1st & 3rd angle projections.	
6.4 Position of cutting plane lines in case of full & half section.	
<b>7. Dimensioning.</b>	2 Hours
7.1 Definition	
7.2 Elements in dimensioning.	
7.3 System of dimensioning.	
<b>8. Pictorial Drawing</b>	3 Hours
8.1 Definition & uses.	
8.2 Brief description of different types of pictorial drawing.	
8.3 Isometric axis, angles and scales.	
8.4 Isometric arc, angles, scales.	
8.5 Oblique drawing & their uses.	
8.6 Angle of receding axis.	
8.7 Similarity between front and oblique view.	
8.8 Lettering in oblique cavalier and cabinet views.	
8.9 Perspective drawings; definition and purpose, vanishing point, parallel & Angular (diametric and trimetric) perspective, principles of making perspective views.	
<b>9. Auxiliary Views</b>	1 Hours
9.1 Necessity, auxiliary plane	
9.2 Cases of auxiliary views.	
<b>10. Development of Surfaces</b>	1 Hours
10.1 Definition, Uses, methods of development of surfaces	
10.2 Calculation of true length, Finding Line of intersection.	

- 11. Building Drawing** 9 Hours
- 11.1 Conventions and terms used for buildings.
  - 11.2 Symbols used for public health & electrical installations.
  - 11.3 Plan; site plan, line plan, detailed plan and layout plan.
  - 11.4 Instructions for drawing plan, elevation and cross-section of single and double storey building.
  - 11.5 Instruction on baths and kitchen arrangement.
  - 11.6 **Local** Building bye-laws
  - 11.7 Categories of Government servant's residences(Total area & covered area)
- 12. House Planning** 2 Hours
- 12.1 Significance of house planning.
  - 12.2 Selection of site and its governing factors.
  - 12.3 Introduction to factors affecting the planning of a house, orientation, selection of material, ventilation and position of openings.

**RECOMMENDED / REFERENCE BOOKS:**

1. A text book on Basic Civil Engineering Drawing by TEVTA.
2. Engineering Drawing: **Parkinson**.
3. Engineering Drawing: **N.D. Bhat**.
4. Building Drawing: **Gurcharn Singh**.
5. First Year Drawing : **Gupta**
6. Civil Engineering Practice (Urdu) : **Niaz Ahmed Mirza**
7. Engineering Drawing: **N.D. Bhatt and V. M. Panchal**, [2006], Prabhat Publishers. Delhi

## INSTRUCTIONAL OBJECTIVES

### 1. Understand the Need of Drafting, Civil Drafting and use of Free Hand Sketching.

- 1.1 State the importance of civil drafting as an engineering communication medium.
- 1.2 Understand necessity of civil drafting in different engineering fields.
- 1.3 Indicate the link between drafting and other subjects of study in diploma course.
- 1.4 State plane and solid figures.
- 1.5 State the difference between plane and solid figure.
- 1.6 Draw free hand sketches of different plane and solid figures.

### 2. Understand Different Engineering Drawing Instruments and Accessories.

- 2.1 State the different engineering drawing instruments and drawing papers.
- 2.2 State the types of scales and meaning of R.F.
- 2.3 State the uses of hard and soft grades of pencils.
- 2.4 State the types of lines.

### 3. Know the Need and Types of Lettering & Printing.

- 3.1 State importance of lettering.
- 3.2 State different types of lettering.
- 3.3 Select and use lettering stencils for a given applications.
- 3.4 State the principles of lettering.

### 4. Understand the Construction of Geometrical Figures.

- 4.1 State the construction of angles.
- 4.2 State different triangles quadrilaterals and polygons.
- 4.3 State difference between inscribed and circumscribed figures.
- 4.4 State the terms used in a circle.
- 4.5 Sketch and label different lines and arcs in a circle.
- 4.6 State cone, conical sections, (circle, parabola, ellipse and hyperbola).
- 4.7 Relate the conical sections in civil engineering drawings.
- 4.8 Define ellipse and parabola

### 5. Understand Types & Techniques of Orthographic Projections.

- 5.1 Define plane, principal plane.
- 5.2 Explain the principle of orthographic projection with simple sketches.
- 5.3 State the definition of projector and projection lines and their use.
- 5.4 State and differentiate between dihedral and trihedral angles.
- 5.5 State the types of orthographic projection.
- 5.6 Sketch the orthographic views of a simple engineering part of given pictorial drawing.
- 5.7 Identify the object from a number of orthographic views of the object.
- 5.8 Select the minimum number of views needed to fully represent a given object

## 6. Understand the Basics of Sectioning.

- 6.1 State the definition of section and sectioning.
- 6.2 Explain purpose of sectional views.
- 6.3 State cutting plane and cutting plane line.
- 6.4 State the purpose of cutting plane line.
- 6.5 State conventional representation of engineering materials.
- 6.6 Know rule of putting arrowhead on cutting plane line.
- 6.7 State types of sectional views.
- 6.8 Select the position of cutting plane line to give maximum details of object.
- 6.9 Explain the principles of hatching.

## 7. Understand Techniques of Dimensioning.

- 7.1 Define dimensioning.
- 7.2 State the need of dimensioning drawings according to accepted standards
- 7.3 State the dimension and extension line.
- 7.4 State the length of arrowhead.
- 7.5 Identify the system of placement of dimensions of a given dimensioned drawing.
- 7.6 Dimension a given drawing using standard notations and desired system of dimensioning.

## 8. Understand the Techniques of Pictorial Drawings.

- 8.1 Define pictorial drawing.
- 8.2 State the types of pictorial drawings and their general uses.
- 8.3 Sketch isometric axis, angles, scales, arcs and circles.
- 8.4 Differentiate between the isometric and non-isometric lines.
- 8.5 Sketch isometric drawing and isometric projection.
- 8.6 Sketch the isometric projection from the given orthographic drawings.
- 8.7 Explain the angle of receding axis.
- 8.8 State the oblique drawing and its uses.
- 8.9 Sketch and letter the oblique cavalier and cabinet views.
- 8.10 Define perspective drawing.
- 8.11 Explain the purpose of perspective drawing.
- 8.12 State the vanishing point.
- 8.13 State the principles of making perspective views.
- 8.14 State the parallel and angular (diametric and trimetric) perspective.

## 9. Know the Types and Uses of Auxiliary Views.

- 9.1 State auxiliary views and auxiliary planes.
- 9.2 State necessity of auxiliary views.
- 9.3 State the types of auxiliary views i.e. primary and secondary auxiliary views.
- 9.4 State the types of auxiliary views due to their location with reference line i.e. symmetrical, unilateral and bilateral auxiliary views.
- 9.5 State the classes of primary views i.e. front top and profile auxiliary planes and oblique surfaces.
- 9.6 State the cases of secondary auxiliary views.

**10. Understand the Techniques of Development of Surfaces.**

- 10.1 Definition of development pattern drawing.
- 10.2 State the necessity of development of surfaces.
- 10.3 State ruled, single curved, plane and double curved surfaces.
- 10.4 State the uses of development drawings.
- 10.5 Explain the method of development i.e. right-angled triangle and revolution method.
- 10.6 State the rules for calculation of true length.
- 10.7 Sketch the development of surfaces of prism, pyramid, cylinder and cone.
- 10.8 Explain the intersection and line of intersection.
- 10.9 Explain the procedures for finding line of intersection.

**11. Understand the Types and Procedures of Building Drawing.**

- 11.1 Define conventional symbols and give its importance.
- 11.2 Sketch the x-section of wall with flooring and roofing
- 11.3 Label the parts of given plan.
- 11.4 State the sizes of rooms for different classes of houses.
- 11.5 Follow measurements from a given plan.
- 11.6 Define site plan, detailed plan, layout plan, index plan, elevations & sections.
- 11.7 Sketch plans elevations and sections of buildings from given line diagrams.
- 11.8 Explain the procedure for preparing plans, elevations and sections for single storey and double storey buildings.
- 11.9 State the different fixtures required for bath, kitchen, dining and courtyards.
- 11.10 Sketch the different fixtures in kitchen and bathrooms at their proper places.

**12. Know the Importance and Factors of House Planning.**

- 12.1 Define House planning
- 12.2 State the necessity of house planning
- 12.3 State the factors, which govern the selection of site for building
- 12.4 Define orientation
- 12.5 State the factors affecting the planning of a house
- 12.6 State the minimum area of the building services
- 12.7 State principles of providing building services
- 12.8 State the inter-relationship of different rooms
- 12.9 Select materials for building structures
- 12.10 State the portion of different openings in building at their appropriate places
- 12.11 Draw sketches of different sizes of plots along with location of commercial area
- 12.12 State building by laws of different agencies i.e., CDA, LDA
- 12.13 State the classes of residential buildings

**LIST OF PRACTICALS****HOURS**

1.	Printing/Lettering on graph paper	9
	i. Block printing in ratio 4:5 & 4:7	
	ii. Single stroke printing in ratio 4:5 & 4:7	
	iii. Italic printing; free hand, gothic letters, figures in capital and lower case letters.	
2.	Space distribution of drawing sheet and drawing of title strips and drawing different types of lines.	3
3.	Freehand proportionate sketching & sketching to scale of lines, triangle, quadrilaterals, polygon and circle.	9
4.	Construction of scales useful for civil engineering.	3
5.	Drawing triangles with inscribed and circumscribed circles, hexagons inside and outside circle, cones, and conic sections (ellipse, parabola, and hyperbola).	9
6.	Sketching three views of V-block and different wooden blocks.	6
7.	Completion of missing views when two views are given.	3
8.	Drawing of full sectional front view and outside top view of the hollow concrete block.	3
9.	Drawing of full sectional front view, side view and top view of the prisms, pyramids of different types.	9
10.	Drawing isometric views of a cube having circular hole in its focus and R.C.C. stairs (First three steps).	3
11.	Create an oblique drawing of different prisms and pyramids from its given principal views.	6
12.	Perspective drawing of slotted block and different wooden blocks from there given principal views.	6
13.	Draw partial, symmetrical and auxiliary view when top and front views are given, front and side views are given.	6
14.	Draw development of a right and oblique truncated hexagonal prism, cylinder and pyramid.	6
15.	Pattern drawing of a funnel from given data.	3
16.	Draw the following features; Symbols used in building work including public health and electrical installation.	9
17.	X-section of wall with foundation, floor and roof details. (9",13-1/2",20cm,30cm	6
18.	Line plan of a single room, two roomed quarter and C-Type (1500 sft plinth area ) residence.	6
19.	Detailed plan, elevation and section of;	1 8
	a) Single room with verandah.	
	b) C-class residence	
	c) Double storey building.	



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20. Foundation/layout plan of ;	15
a) C-type residence.	
b) A-class residence.(3500 sft)	
21. Detailed plan of;	18
a) A & C class bathroom showing internal arrangement.	
b) Kitchen with internal fittings.	
22. Drawing plan of C type residence showing public health and water supply connections.	12
23. Draw layout plan for electrification and circuit diagram for C type residence	12
24. Prepare a Submission Drawing of a residential building.	12

**DAE CIVIL TECHNOLOGY  
YEAR 1  
WORKSHOP PRACTICE**

**SHOP-102**

<b>TOTAL CONTACT HOURS:</b>	<b>128</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	<b>32</b>	<b>1</b>	<b>3</b>	<b>2</b>
Practical:	<b>96</b>			

**AIM:** The student will develop skills to prepare basic woodworking and wiring tasks in building construction and be able to select proper tools and ensure their maintenance.

**COURSE CONTENTS****A- WOOD WORK****1. Work Shop Polish Safety Precautions and Importance of Wood**

- 1.1 Wood Work shop orientation
- 1.2 Safety precaution
- 1.3 Importance of wood for industry

**2. Wood for Construction, Types and Uses**

3 Hours

- 2.1 Define wood
- 2.2 Explain Constructional wood (timber) with sketch
- 2.3 Explain structure and growth of timber.
- 2.4 wood types and Uses of various wooden products
- 2.5 Felling and conversion of timber.
- 2.6 Defects and decay of timber.
- 2.7 Qualities-characteristics, section of timber

**3. Wood Seasoning**

1 Hours

- 3.1 Wood seasoning and importance of seasoning.
- 3.2 Methods of seasoning
- 3.3 Safety precaution during seasoning

**4. Wood working tools**

2 Hours

- 4.1 Wood tool
- 4.2 Measuring tool
- 4.3 Marking tools
- 4.4 Holding tool
- 4.5 Cutting tool
- 4.6 Planning tool

<b>5. Wood Working Machines</b>	3 Hours
5.1 Introduction and safety	
5.2 Circular SAW	
5.3 W.W, Planer	
5.4 Wood Turning lathe, Spindle, Boring, Sander	
<b>6. Wood Sawing</b>	1 Hours
6.1 Sawing of log and timber	
6.2 Method of sawing	
<b>7. Wood Joints and Their Uses</b>	1 Hours
7.1 Types of wood joints	
7.2 Uses of wood joints	
<b>8. Wood Finishing and Polishing</b>	2 Hours
8.1 Glue	
8.2 Fastener	
8.3 Sprit polish	
8.4 Lacquering and paints	
<b>9. Measurement of Wood</b>	2 Hours
9.1 Measuring of wood square and board	
9.2 Measuring of Log	
<b><u>B- ELECTRICAL WIRING</u></b>	
<b>10. Basic Terms/Units &amp; Laws of Electricity</b>	4 Hours
10.1 Introduction to the subject.	
10.2 Conductor, Insulator, Semi Conductor current, Ampere voltage, Resistance and ohm	
10.3 Define ohms law, specific resistance laws up Resistance make calculation using laws of resistance in series and parallels	
<b>11. Cable And Protection Device</b>	4 Hours
11.1 Wire and cable, parts of cable, types of insulating materials.	
11.2 Types of cable w.r.t insulation and core	
11.3 fuse and types (Rewire able, HRC and Cartridge fuse)	
11.4 Earthing, necessity of earthing and parts of earthing	
11.5 Cable Jointing (Skinning, Scraping Soldering and tapping)	
11.6 Wiring types & Test	
<b>12. Domestic Wiring</b>	4 Hours
12.1 Wiring testing equipment (Millimeter, Mager)	
12.2 Testing of wiring (Polarity test, short circuit test)	
12.3 Service line, main cable sub main cable, Branch circuit and final sub circuit	

- 12.4 Distribution fuse boards and types (Single phase D.F.B and three phase D.F.B)  
12.5 Define Magnetic Contactor thermal relay

### 13. Electricity Rules & Safety

4 Hours

- 13.1 Pakistan electricity rules 1973, (25,28,29,32,40,46,49,51,57,58)  
13.2 Fire, causes of fire, types of fire (Class A,B,C, D, E) fire fighting equipment precautions during fire fighting, principle of fire fighting  
13.3 General safety precaution  
13.4 Electric shock, Causes and treatment

#### RECOMMENDED / REFERENCE BOOKS:

1. Workshop Technology: **John Chapman**
2. A TEXT BOOK OF WORKSHOP TECHNOLOGY: **R.S. KHURMI & J. K. GUPTA** [2008], S. CHAND & Co., NEW DELHI

**INSTRUCTIONAL OBJECTIVES****1. Understand Work Shop Policy, Safety Precautions, Importance Of Wood In Industries**

- 1.1 Define work shop orientation
- 1.2 Enlist safety precautions
- 1.3 Explain Importance of wood in industry

**2. Understand Wood, Construction Of Wood, Types Of Wood Uses Of Wood And Wood Defects**

- 2.1 Define wood
- 2.2 Explain construction of wood (timber) with sketch
- 2.3 Explain structure and growth of timber.
- 2.4 Explain wood types and
- 2.5 Explain felling and conversion of timber.
- 2.6 Explain uses of various wooden products in industry
- 2.7 Enlist and explain Defects and decay of timber.
- 2.8 Explain Qualities-characteristics, section of timber

**3. Understand Seasoning, Method Of Seasoning, Safety Precautions**

- 3.1 Define wood seasoning
- 3.2 Enlist methods of seasoning
- 3.3 Explain each method of seasoning and importance of seasoning.
- 3.4 Enlist safety precaution in seasoning

**4. Understand Impact Tools, Measuring Tools, Marking Bolding, Cutting And Planning Tools**

- 4.1 Enlist wood working tool
- 4.2 Describe measuring tools
- 4.3 Describe marking tools
- 4.4 Holding tools
- 4.5 Cutting tools (Saw, chisel, file)
- 4.6 Describe planning tools (Jack plane and other planes)

**5. Understand Wood Working Machines, Band Saw, Circular Saw Planer, And Wood Turning Lathe.**

- 5.1 Enlist wood working machines
- 5.2 Explain band saw
- 5.3 Explain circular saw
- 5.4 explain planer
- 5.5 Explain wood turning lathe, Spindle, Boring, Sander

## 6. Understand wood sawing, method of sawing,

- 6.1 Define sawing of log and timber
- 6.2 Enlist method of sawing explain seasoning
- 6.3 Explain seasoning method

## 7. Wood Joints and Their Uses

- 7.1 Classify wood working joints
- 7.2 Explain each joint
- 7.3 Uses of joint in industry

## 8. Wood Finishing And Polishing

- 8.1 Define glue
- 8.2 Describe fanners
- 8.3 Explain sprit polish
- 8.4 Explain lacquering and paint

## 9. Calculation Of Wood, Squire, Board And Log

- 9.1 Define measuring of wood
- 9.2 Explain measuring of log
- 9.3 Explain measuring of board
- 9.4 Explain measuring square.

## 10. Understand Basic Terms/Units & Laws

- 10.1 describe Conductor, Insulator, Semi Conductor current, Ampere voltage, Resistance and ohm
- 10.2 Define ohms law specific resistance laws up Resistance make calculation using
- 10.3 Define these laws resistance in series and parallels solve series and parallel circuits

## 11. Cable And Protection Device

- 11.1 Define wire and cable, parts of cable, types of insulating materials.
- 11.2 Define Types of cable w.r.t insulation and core
- 11.3 Define fuse and types (Rewire able, HRC and Cartridge fuse)
- 11.4 Define Earthling, necessity of earthling and parts of earthling
- 11.5 Define different steps up cable Jointing (Skinning, Scraping Soldering and tapping)
- 11.6 Describe Wiring types & Test.

## 12. Under Stand Domestic wiring components and Techniques.

- 12.1 Define types of domestic wiring (cleat wiring) latten wiring, casing and capping wire and conduit
- 12.2 Define wiring testing equipment (Millimeter, Mager)
- 12.3 Define Testing of wiring (Polarity test, short circuit test)
- 12.4 State the service line, main cable sub main cable, Branch circuit and final sub circuit
- 12.5 Describe distribution fuse boards and types (Single phase D.F.B and three phase D.F.B)

12.6 Define Magnetic Contactor thermal relay

### 13. Electricity Rules & Safety

13.1 State Pakistan electricity rules 1973, (25,28,29,32,40,46,49,51,57,58)

13.2 Define fire, causes of fire, types of fire (Class A,B,C, D, E) fire fighting equipment precautions during fire fighting, principle of fire fighting

13.3 State General safety precaution

13.4 Define Electric shock, Causes and treatment

### List Of Practicals

1.	Study the wiring accessories and tools used in different types of wirings including latest/modern accessories with specifications.	3
2.	Treatment against electric shock	3
3.	Control of one lamp with a single way switch control of Two lamps in series with a single way switch	3
4.	Control of one lamp with Two, Two way switches	3
5.	Construct a test board	3
6.	Construct a bell indicator circuit	3
7.	Construct of one ball with two push but tow with their indicators	3
8.	Construct up two lamps with two one way switch in batten wiring	3
9.	Construct one lamp with single way witch with conduit wiring	3
10.	Construct one lamp with two, two way switches with conduit wiring	3
11.	Construct three lamps in parallel with Individual single way switches with conduit wiring	3
12.	Construct tunnel light circuit	3
13.	Study and connect fluorescent lamp circuit	3
14.	Perform the wiring lay out up of a three phase pump	3
15.	Demonstrate earthling for residential building and machinery along with circuit diagrams	3
16.	Measuring of voltage current and resistance using modern electronic measuring equipment.	3
17.	Introduction to work shop, safety precaution	3
18.	Introduction different wood working tools such as lag out, measuring, Holding, cutting and planning	3
19.	Sawing Practice (Tobs1)	
20.	Planning and squaring to dimensions (Tob2)	3
21.	Sharpening plane iron and wood chisel	
22.	Making dado Joint (Job3)	3
23.	Making cross Lap Joint (Job4 )	3
24.	Making Mortise and Tennon Joint (Job5)	3
25.	Nailing and wood screwing process (Job6)	3
26.	Boring Process, making holes (Job 7)	3
27.	Polishing (Prepare wood surface for polishing staining and lacquering)	3
28.	Project wood working	3
29.	Project Electrical Wiring (one room wiring)	3

**DAE CIVIL TECHNOLOGY  
YEAR 1**

**COMP-111****COMPUTER APPLICATIONS**

<b>TOTAL CONTACT HOURS:</b>	<b>96</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	0	<b>0</b>	<b>3</b>	<b>1</b>
Practical:	96			

**AIM:** This subject will enable the student to be familiar with the operation of a computer and its applications. Basic skills on Windows, Word processing, MS Excel, will be practiced for its applications in civil engineering

**RECOMMENDED / REFERENCE BOOKS:**

1. Computer Applications for Beginners.
2. Word Processor Latest Release
3. MS Excel for Learners
4. AutoCAD 2012 for Engineers and Designers by Prof. Shan Tickoo & Gaurav Verma

**LIST OF PRACTICALS****HOURS****1. Introduction to Computer**

6 Hours

- 1.1 Demonstrate & practice identification/application of Input/ Output devices
- 1.2 Demonstrate & practice identification/application of Hardwares/ Softwares & their types
- 1.3 Demonstrate & practice identification/application of Computer Resources

**2. Windows Operating System & Internet**

12 Hours

- 2.1 Practice start, restart, shut down, log on/off
- 2.2 Demonstration & Practice Windows interface
- 2.3 Demonstration & Practice Windows Help
- 2.4 Practice File / folder Manipulation
- 2.5 Demonstration & Practice window search
- 2.6 Practice Windows Advance setting options.
- 2.7 Demonstration & Practice Partitioning & installation of windows
- 2.8 Demonstration Introduction to internet
- 2.9 Demonstration & Practice setting up internet connection using internet browser



- 2.10 Practice Make/Maintain E-Mail address
- 2.11 Practice send/Receive E-Mail
- 2.12 Practice Downloading data
- 2.13 Practice search teaching & learning Resources (TLRs)

### 3. Word Processing

24 Hours

- 3.1 Demonstration & Practice installation of MS-office package
- 3.2 Demonstration Introduction to word processor
- 3.3 Introduction to MS-Word
- 3.4 Demonstration Main Interface window
- 3.5 Practice open/Close MS-Word
- 3.6 Practice Create/save/Rename/Close files
- 3.7 Practice Editing data in MS-Word
- 3.8 Demonstration and Practice use of clip board
- 3.9 Practice Insert Symbols
- 3.10 Demonstration & Practice find/replace data
- 3.11 Practice Formatting character
- 3.12 Practice Formatting Paragraph
- 3.13 Practice paragraph indentation
- 3.14 Practice Bullets & Numbering
- 3.15 Demonstration & Practice Inserting columns
- 3.16 Practice page setup
- 3.17 Practice spelling & grammar
- 3.18 Practice Synonyms & Thesaurus
- 3.19 Demonstration & Practice Drawing toll bar
- 3.20 Practice word Art
- 3.21 Practice Manipulating Tables
- 3.22 Demonstration & Practice Printing Documents
- 3.23 Demonstration & Practice Mail Merge
- 3.24 Practice using formulas in MS-Word

### 4. MS-Excel

27 Hours

- 4.1 Introduction to spread sheet program
- 4.2 Introduction to MS-Excel
- 4.3 Practice open/close MS-Excel
- 4.4 Introduction to data types, work sheets/work books
- 4.5 Introduction Row, Column, Cell
- 4.6 Practice Editing Data
- 4.7 Practice data manipulation
- 4.8 Practice Formatting cells
- 4.9 Practice printing documents
- 4.10 Practice using Formula
- 4.11 Practice insert function/wizard
- 4.12 Formula application for surveying data calculation

- 4.13 Formula application for geometry calculation
- 4.14 Formula application for trigonometry calculation
- 4.15 Practice prepare charts
- 4.16 Practice protection of files
- 4.17 Practice data sorting
- 4.18 Practice filtering data
- 4.19 Practice table Manipulation
- 4.20 Practice creating macro
- 4.21 Practice find/replace data
- 4.22 Practice merge/split cells

## 5. AutoCAD

27 Hours

- 5.1 Installation of Auto CAD Software
- 5.2 Introduction to AutoCAD and demonstration of its use
- 5.3 Demonstration & Practice of AutoCAD Menus
- 5.4 Demonstration & Practice of AutoCAD Graphic window
- 5.5 Demonstration & Practice of coordinate system (Types of coordinates).
- 5.6 Practice setting of model and its layout.
- 5.7 Practice of Draw commands
- 5.8 Practice of File commands
- 5.9 Practice of Edit commands
- 5.10 Practice of dimensions.
- 5.11 Practice of display command.
- 5.12 Modify Commands
- 5.13 Insert object
- 5.14 Formatting Commands
- 5.15 Practice to use existing templates and also create relevant templates.
- 5.16 Practice of drawing of plane and solid geometrical figures
- 5.17 Practice for incorporation of data from WORD and Excel.
- 5.18 Practice of drawing of two roomed house (detailed plan, elevation and sections) and steel reinforcement for slabs and setting layouts for plotting.
- 5.19 Plotting of two roomed house.
- 5.20 Practice Integration of AutoCAD & MS Excel.

DAE CIVIL TECHNOLOGY  
YEAR 2

اسلامیات / مطالعہ پاکستان	GEN 211	مضامین (اسٹیل دو نم)
1	1	تعارف کول اسلامیات
0	0	تعداد و سلاخہ پاکستان
1	1	موضوعات
کل وقت: 20 گھنٹے		
		1- سورة المؤمنین آیت تا آیہ آیات کا مع ترجمہ
		2- دنِ نخبیہ بھلائی مع زمرہ تفریح
		3- خیالِ کم من تعسیم القرآن و علمہ
		4- لا ايمان لمن لا امانة له ولا دين لمن لا عهد له
		5- وياكم و لظنن ان اظنن اكر رب الحديث
		6- من احدث في امرنا بناها ليس منه فمورد
		7- من حمل عليه السلاح فليس منا
		8- لاو كافل البيتيم في الجنة
		9- لا ضرر ولا ضرار في السلام
		10- كلكم راع وكللكم راع وكلكم مسؤول عن رعيته
		3- سیرۃ طیبہ
		11- مکی زندگی و ارتقاء بحشت و اجرت
		12- خلی زلزلہ - مہاقت - میلن ہرغ - کد (اسباب و نتائج)
		4- حضور ﷺ بحیثیت
		13- خطبہ تجزیہ لہذا
		14- معبر کھل، سرپرہ، خاندان
		5- اسلامی معاشرہ
		15- نظام تعلیم اور ان کے مقاصد، عدس و انصاف، امر بالمعروف۔ فی من افکر
		16- جہاد۔ کسب طریق۔ سچو اہمیت (فضیلت)
		17- انسانی ریاست کی تعریف۔ انسانی ریاست کی خصوصیات۔ انسانی 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
  - ☆ اپنی 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 انحصار کے ساتھ بیان کر سکے
  - ☆ حضور ﷺ کی ہجرت کا واقعہ بیان کر سکے
  - ☆ حضور ﷺ کی مدنی زندگی انحصار 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
☆	جملہ کے لفظی و اصطلاحی معنی بیان کر سکے
☆	جملہ کی اہمیت بیان کر سکے
☆	جملہ اور فتل میں فرق بیان کر سکے
☆	جملہ کی مختلف اقسام بیان کر سکے
☆	اقل مسجد کی تعریف کر سکے
	مسجد کی سابقہ حیثیت کو بحال کرنے کے بارہ میں اقدامات کو بیان کر سکے
	<b>اسلامی ریاست</b>
	عمومی مقصد: اسلامی ریاست کی خصوصیات بیان کر سکے
	خصوصی مقاصد:
☆	ریاست کی تعریف بیان کر سکے
☆	اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے
☆	اسلامی ریاست کی خصوصیات بیان کر سکے
☆	اسلامی ریاست کے اغراض و مقاصد بیان کر سکے
☆	اسلامی ریاست کے قیام کیلئے جدوجہد کر سکے

## نصاب مطالعہ پاکستان

آئی بی سی  
1 0 1  
کل وقت: 12 گھنٹے

سہ روزہ	
حصہ دوم	
<b>موضوعات</b>	
۱۰ قرن نظریات	☆
تحریک پاکستان	☆
انڈین کانگریس	☆
مسلم لیگ	☆
تقسیم بنگلہ	☆
میشن کیمسٹری	☆
تحریک خلافت	☆
سندھ تحریک	☆
تیلو پڑوسی	☆
سورپورٹ	☆
قائمہ اعظم کے چورہ نکلت	☆
خلیفہ آلہ آپر	☆
انقلاب 1938 اور انقلاب برصغیر	☆
قرارداد پاکستان	☆

حصہ دوم

سزاخار پاکستان

تدریس مقاصد

تحریک پاکستان

عمومی مقصد: قیام پاکستان کے اسباب و محرکات کو بیان کرتے

خصوصی مقاصد:

- ☆ قومیت کے مفہوم کو بیان کر سکے
- ☆ دو قومی نظریہ کی تعریف و توضیح کر سکے
- ☆ دو قومی نظریہ اہمیت بیان کر سکے
- ☆ ہندوستان مسلمانوں کی محرومیوں کو بیان کر سکے
- ☆ قومی تشخص کو عمل رکھنے سے لئے مسلمان 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)

بی ٹی سی  
101  
کل وقت: 20 گھنٹے

نصاب اختلاقیات  
سال دوم

## موضوعات

معاشرتی قدرات، ایمانیہ، قوم، قومی سطح، شہری سطح، صنعتی اور لوہائی سطح، ضروریات، ورثہ

- ☆ حقوق و فرائض
- ☆ قوت پرورش
- ☆ قوت ارادی
- ☆ نکلن و جذبہ
- ☆ وسیع النظری
- ☆ بے غرضی
- ☆ منسلک دوستی
- ☆ سخاوتی شعور
- ☆ پاس آڑائی
- ☆ کمال اچھی
- ☆ تعزیرات کو قبول کرنا
- ☆ خود شناسی



## نصاب اخلاقیات

سہ ماہی

### تدریس مقاصد

عمومی مقاصد:

- طالب علم: اخلاقیات کی اہمیت و ضرورت سے سمجھ ہو سکے اور بیان کر سکے
- خصوصی مقاصد: طالب علم اس قدر متعلم ہو کہ
- ۶۱ موضوعات کا مطلب بیان کر سکے
  - ۶۲ عملی زندگی سے مثالوں کی نشاندہی کر سکے
  - ۶۳ اپنی شخصیت اور معاشرے پر موضوعات کے متعلق مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
  - ۶۴ اعلیٰ اخلاقی تقواریں سے
  - ۶۵ لیت برداشت۔ قوت ارادی۔ نکتہ چینی۔ وسیع انگری۔ بے غرض۔ انسانی دوستی خالص۔ شعور۔ پس آزادی۔
  - ۶۶ کمال اعلیٰ اور ذرا شناسی کی اہمیت بیان کر سکے
  - ۶۷ اخلاقیات سے متعلقہ اور قومی خدمت بہتر طور پر انجام دے سکے

**DAE CIVIL TECHNOLOGY**  
**YEAR 2**  
**MATH 212 APPLIED MATHEMATICS**

<b>Total Contact Hours</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory 64 Hours	2	0	2

**Pre-requisite:** Must have completed Mathematics I.

**AIMS** The students will be able to:

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

**COURSE CONTENTS**

- 1. FUNCTIONS & LIMITS. 4 Hours**
  - 1.1 Constant & Variable Quantities
  - 1.2 Functions & 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 4 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 4 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  $\text{Cosec } x$ ,  $\text{Sec } x$ ,  $\text{Cot } x$   
4.3 Differentiation of inverse Trigonometric functions.  
4.4 Problems.
- 5. DIFFERENTIATIONS OF LOGARITHMIC & EXPONENTIAL FUNCTIONS**  
**4 Hours**
- 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. 4 Hours**
- 6.1 Increasing and decreasing functions  
6.2 Maxima and Minima values  
6.3 Criteria for maximum & minimum values  
6.4 Methods of finding maxima & minima  
6.5 Problems
- 7. INTEGRATION 8 Hours**
- 7.1 Concept  
7.2 Fundamental Formulas  
7.3 Important Rules  
7.4 Problems
- 8. METHODS OF INTEGRATION 6 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. PLANE ANALYTIC GEOMETRY & STRAIGHT LINE 6 Hours**
- 10.1 Coordinate System  
10.2 Distance Formula  
10.3 The Ratio Formula  
10.4 Inclination and slope of a line  
10.5 The slope Formula  
10.6 Problems
- 11. EQUATIONS OF STRAIGHT LINE 6 Hours**
- 11.1 Some important Forms  
11.2 General Form  
11.3 Angle Formula

- 11.4 Parallelism & Perpendicularity
- 11.5 Problems

**12. THE EQUATIONS OF CIRCLE                      6 Hours**

- 12.1 Standard form of Equation
- 12.2 Central form of Equation
- 12.3 General form of Equation
- 12.4 Radius & Coordinates of the centre
- 12.5 Problems

**REFERENCE BOOKS**

Applied Mathematics Math-212, by Sana-ullah Khan, Syed Tanvir Haider, Zaif-ullah Khan  
Vol - I, National Book Foundation

**Math-212 APPLIED MATHEMATICS****INSTRUCTIONAL OBJECTIVES****1. USE THE CONCEPT OF FUNCTIONS AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS.**

- 1.1 Define a function.
- 1.2 List all type 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 functions.
- 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 formula Derivatives of  $\sec x, \csc x, \cot x$ .
- 4.3 Find differential coefficients of inverse trigonometric functions

**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 formula for velocity, acceleration and slope of a line.

- 6.2 Define an increasing and a decreasing function, maxima and minima values, point of inflexion.
  - 6.3 Explain criteria for maxima and minima values of a function.
  - 6.4 Solve problems involving rate of change of variables.
- 7. APPLY CONCEPT 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 rules 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. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY.**
- 10.1 Explain the rectangular coordinate system.
  - 10.2 Locate points in different quadrants.
  - 10.3 Derive distance formula.
  - 10.4 Prove section formulas.
  - 10.5 Derive Slope Formula
  - 10.6 Solve problem using these formulas.
- 11. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.**
- 11.1 Define a straight line.
  - 11.2 Write general form of equation of a straight line.
  - 11.3 Derive slope intercept and intercept forms of equations of a straight line.
  - 11.4 Derive expression for angle between two straight lines.
  - 11.5 Derive conditions of perpendicularity and parallelism of two straight lines.
  - 11.6 Solve problems involving these equations/formulas.
- 12. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATIONS OF CIRCLE.**
- 12.1 Define a circle.
  - 12.2 Describe standard, central and general forms of the equation of a circle.
  - 12.3 Convert general form to the central form of equation of a circle.
  - 12.4 Derive formula for the radius and the coordinates of the center of a circle from the general form.
  - 12.5 Derive equation of the circle passing through three given points.
  - 12.6 Solve problems involving these equations.

## DAE CIVIL TECHNOLOGY YEAR 2

### GEN 221 COMMUNICATION SKILLS AND REPORT WRITING

<b>TOTAL CONTACT HOURS:</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	32	1	0	1
Practical:	0			

**AIM:** The student will be able to express their understanding of communication skills in the form of speaking, listening, reading and writing and use it to supplement their technical skills

### COURSE CONTENTS

- |   |         |
|---|---------|
| <b>1. Listening Skills</b>                          | 4 Hours |
| 1.1 Listening comprehension                         |         |
| 1.2 Principles for teaching listening comprehension |         |
| 1.3 How to listening skill be developed             |         |
| <b>2. Speaking Skills</b>                           | 6 Hours |
| 2.8 Starting and Ending conversations               |         |
| 2.9 Introducing oneself and others                  |         |
| 2.10 Greeting, praises and compliments              |         |
| 2.11 Interviewing skills                            |         |
| <b>3. Reading Skills</b>                            | 6 Hours |
| 3.1 Skimming  |         |
| 3.2 Scanning  |         |
| 3.3 Guessing  |         |
| 3.4 Intensive reading                               |         |
| 3.5 Extensive reading                               |         |
| 3.6 How to improve reading skill                    |         |
| <b>4. Writing Skills</b>                            | 6 Hours |
| 4.1 What is writing                                 |         |
| 4.2 Guided writing                                  |         |
| 4.3 Free writing                                    |         |
| 4.4 Creative writing                                |         |
| 4.5 Kinds of writing                                |         |
| 4.6 What is effective writing                       |         |

4.7 The process of writing

**5. Report Writing.**

10 Hours

5.1 Introduction importance, Types of report.

5.2 General principles of report writing.

5.3 Functional design of report, opening statement outline, main body, specific recommendations.

5.4 Rough draft, submission of report, letter of transmittal.

**RECOMMENDED / REFERENCE BOOKS:**

1. Communications Skills : **Mathew McKay**[2009], New Harbinger Publications
2. A course in English Communication: **M. Apte**, [2009], PHI Learning, New Delhi.
3. Communication Skills Handbook: **Jane Summers and Brett Smith** [2005], Wiley & Sons
4. Effective Business Communication and Report Writing: **Ata ur Rehman**,[2009], Farrukh & Brothers, Lahore



## INSTRUCTIONAL OBJECTIVES

### Developing Communication Skills by understanding and applying Listening, Speaking, Reading and Writing Skills for its practical use at the work place

#### 1. Explain and Develop Listening Skills

- 1.1 Define listening skill
- 1.2 Demonstrate listening skill

#### 2. Explain and Develop Speaking Skills

- 2.1 Express 'how to introduce yourself', 'talk about your skills' and 'exhibit interviewing skills' and demonstrate their applications
- 2.2 Express and demonstrate how to agree, disagree, likes, dislikes, etc)
- 2.3 Explain how to speak in condensation and demonstrate its use
- 2.4 Explaining and demonstrate how to report

#### 3. Explain and Develop Reading skills

- 3.1 Understand about skimming, scanning, guessing, identification and inference and demonstrate their use
- 3.2 Understand and demonstrate about 'identification of contrasting ideas', 'main and support ideas' and attitude of author/ writer
- 3.3 Explain and demonstrate use of synonyms and antonyms

#### 4. Explain and Develop Writing Skills

- 12.1 Understand and demonstrate different types of writing and describing a process
- 12.2 Explain and demonstrate about writing simple sentences and writing complex sentences
- 12.3 Developing and demonstration about coherence and cohesion
- 12.4 Explain about 'beginning of topic' and 'its middle and end' and demonstrate its application
- 12.5 Explain about 'linking different paragraphs' and demonstrate its use
- 12.6 Understand how to write business letters and demonstrate its application

#### 5. Report writing

- 5.1 Understand how to write reports
- 5.2 Qualities of good reports
- 5.3 Model reports

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**Civil-203****PUBLIC HEALTH TECHNOLOGY**

<b>TOTAL CONTACT HOURS</b>	<b>160</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	2	3	3
Practical:	96			

**AIM:** To have a comprehensive understanding of the technology of municipal water processing, water distribution, waste water collection & treatment and sludge & effluent disposal

**INTRODUCTION OF PUBLIC HEALTH TECHNOLOGY**

- 1. Pipes Used In Plumbing Water And Gas Supply:** 2 Hours
  - 1.1 Types.
  - 1.2 Description of pipes with reference to material e.g. G.I, PVC, PPR CI & A/C PIPES
  - 1.3 Specification of pipes.
- 2. Plumbing Tools** 1 Hour
  - 2.1 Introduction
  - 2.2 Type of Tools
  - 2.3 Hand Tools and Machines
- 3. Plumbing Fixtures** 3 Hours
  - 3.1 Flushing cistern, water closets, urinals.
  - 3.2 Type of Traps and their functions.
  - 3.3 Wash hand basin and bath tub
- 4. Plumbing Fittings:** 3 Hours
  - 4.1 Introduction
  - 4.2 Different type of Fittings, G.I, PPRC & PVC
  - 4.3 Joints methods for different plumbing fittings.
- 5. Faucets, Valves & Specials:** 3 Hours
  - 5.1 Taps and their types.
  - 5.2 Valves and their types.
  - 5.3 Mixer of different types.
  - 5.4 Cocks and their types.
  - 5.5 G.I. Specials

<b>6. Introduction to Water Supply</b>	2 Hours
6.1 General importance of water supply.	
6.2 Need for protected water supply.	
6.3 Development of water supply.	
<b>7. Sources Of Water:</b>	3 Hours
7.1 Surface source, lakes, streams, rivers, rainfall, intensity of rainfall, run off, catchments area, and yield from surface sources.	
7.2 Underground/ subsurface sources, springs, wells-its kinds (i.e. tube well), infiltration galleries	
7.3 Yield from wells-Quantity of underground water, water table, aquifers, cone of depression.	
<b>8. Intakes:</b>	3 Hours
8.1 Introduction	
8.2 Type of Intakes(according to objective, location, material & shape)	
8.3 Factor governing the selection of site for an intake.	
<b>9. Quantity Of Water:</b>	3Hours
9.1 Total quantity of water for a town, per capita demand, factors affecting demand	
9.2 Water requirement for domestic, industrial, fire fighting & commercial purposes.	
9.3 Variation in demand	
<b>10. Quality of Water.</b>	4 Hours
10.1 Pure water (Potable water), Contaminated water..	
10.2 Impurities in water	
10.3 Turbidity	
10.4 Colour	
10.5 Temperature	
10.6 Taste and Odour	
10.7 Suspended Solids	
10.8 Total Dissolved Solids (TDS)	
10.9 Alkalinity	
10.10 Hardness	
10.11 Fluorides	
10.12 Biological Water Quality Parameters (Pathogens)	
10.13 Tests of water (physical chemical tests and biological tests) and PH Value of water / use of "WHO" Standards and guidelines for drinking water	
<b>11. Treatment of Water.</b>	10 Hours

- 11.1 Sedimentation-purpose of sedimentation, plain sedimentation, Types of settling tanks based on functions and shapes.
- 11.2 Coagulation-purpose, use of coagulants and kinds. Method of feeding and mixing.
- 11.3 Filtration
- Theory of filtration,
  - Construction and operation of slow sand, rapid sand, & pressurized filters.
  - comparison between slow sand and rapid sand filters
- 11.4 Disinfection of Water.
- Necessity and methods of disinfection,
  - Chlorination
  - Forms of chlorination and
  - Test for chlorine.
- 11.5 Water softening.
- Purposes
  - Types of hardness
  - Methods of softening.
- 11.6 Miscellaneous methods of water treatment, aeration, fluoridation, colour, odour and taste removal.
- 12. Distribution System of Water. 6 Hours**
- 12.1 Methods of distribution, gravity, combined and direct pumping.
- 12.2 Methods of supply of water intermittent and continuous.
- 12.3 Methods of layout of pipes, dead end, grid, ring and radial system.
- 12.4 Storage-underground and overhead service reservoirs, necessity and accessories.
- 12.5 Appurtenance in distribution system. Use of sluice valves, air valves, drains valves, fire hydrants, water meter, reflux valve, scour valves.
- 13. Pumps & pumping. 3 Hours**
- 13.1 Introduction to pumps and their necessity.
- 13.2 Kinds of pumps, fundamental principle of pumping.
- 13.3 Selection of site for pump /tube-well and pumping station requirements..
- 14. Introduction to Sanitary Engineering 3 Hours**
- 14.1 Introduction.
- 14.2 Terminology of sanitary Engineering. e.g. refuse, garbage, sludge, sullage, refuse etc.
- 14.3 Types of Sanitation systems-conservancy system, water carriage system & cesspool system and their comparison.
- 14.4 Types of sewerage systems and their suitability

- 15. Quantity of Sewage & design of sewer** 5 Hours
- 15.1 Quantity of discharge in sewer, dry weather flow, Self cleansing velocity.
  - 15.2 Variation in quantity of dry weather flow and wet weather flow.
  - 15.3 Quantity of storm water flow-run off, its co-efficient, time of concentration.
  - 15.4 Impervious factor, hydraulic formula for velocity of flow.
  - 15.5 Numerical problems
- 16. House Drainage** 3 Hours
- 16.1 Introduction.
  - 16.2 Requirements of house drainage.
  - 16.3 Shapes & construction of different type of drains & ducts.
  - 16.4 House drains slopes & connection with main sewer.
  - 16.5 One & two pipe system of drainage and their comparison.
- 17. Alignment & Layout of sewer Line** 3 Hours
- 17.1 Introduction.
  - 17.2 Layout of sewer.
  - 17.3 Location of sewer line - longitudinal & X-Section showing sewer lines.
  - 17.4 Layout of sewer line gradient fixing, bedding, handling, laying, jointing, testing & back filling.
  - 17.5 Testing of sewer line.
- 18. Sewer Appurtenances** 4 Hours
- 18.1 Introduction of sewer appurtenances.
  - 18.2 Brief description for different type of sewer appurtenances.
  - 18.3 Sewer appurtenances location and their functions.
  - 18.4 Construction of:- Man holes, shallow MH ,Deep MH, drop-man hole, inlets, clean out, lamp hole, grease, & oil traps, inverted syphon, trestles & piers.

**RECOMMENDED / REFERENCE BOOKS:**

1. Plumbing by: **Babbitt.**
2. Fundamental of water supply and sanitary engineering by: **Rangwala S.C.**
3. Water supply and sanitary engineering. By: **Kulkarni.**
4. A text book of sanitary engineering by: **Deshpande R.S.**
5. Public health engineering by: **Sharma.**

**INSTRUCTIONAL OBJECTIVES****1. Understand the Types and Specifications of Pipes.**

- 1.1 State the types of pipes.
- 1.2 Compare pipes with reference to materials.
- 1.3 Describe specifications of pipes.

**2. Understanding Plumbing Tools**

- 2.1 State different type of tools, their uses and precautions.
- 2.2 Hand tools and machine tools
- 2.3 Different plumber tools & machines and their working procedures
- 2.4 Precautions for using of tools

**3. Understanding Plumbing Fixtures:**

- 3.1 State different fixtures i-e Flushing cistern, water closets, urinals.
- 3.2 Type of Traps and their functions.
- 3.3 Explain different type of wash hand basin and bath tub fittings
- 3.4 Installation methods and precautions

**4. Understanding Plumbing Fittings:**

- 4.1 State objective of fittings.
- 4.2 Explain different type of Fittings, G.I, PPRC & PVC
- 4.3 Joints methods for different plumbing fittings.
- 4.4 Precautions for jointing the fittings.

**5. Understand about Faucets and their use.**

- 5.1 Explain taps and their types.
- 5.2 Explain valves and their types.
- 5.3 Explain Mixer and their types
- 5.4 Explain G.I specials and their uses and specifications.
- 5.5 Explain cocks their types and uses.

**6. Understand the Importance and Necessity of o Water Supply**

- 6.1 Explain the importance of water supply.
- 6.2 Explain the development of water supply.
- 6.3 Describe the need of protected water supply

**7. Understand the Surface and Underground Sources of Water and their Yields.**

- 7.1 Explain surface and sub-surface water sources.
- 7.2 Explain underground/ sub-surface water sources.
- 7.3 Enlist different sources of water & compare their merits and demerits.

- 7.4 Define rain fall intensity, run off, catchments area, and hydraulic gradient yield from surface sources.
- 7.5 Calculate yield from surface source
- 7.6 Describe springs, wells, kinds of well, tube well and infiltration galleries
- 7.7 Explain the construction and function of well, tube well
- 7.8 Define aquifer, static water level, Piezometric head, pumping water, Draw Down, area of influence, well yield and cone of depression
- 7.9 Describe quality of underground water acceptable for human life.
- 7.10 Calculate yield from wells (confined & unconfined)
- 7.11 Explain the need for better quality of water for human life.

## **8. Understand Intakes and Pipe Laying and Testing**

- 8.1 Explain intakes and its types i.e. reservoir intakes, river intakes, lake intakes and canal intakes.
- 8.2 State the factors governing the selection of site for an intake.
- 8.3 Explain the pipe laying and testing procedure

## **9. Understand calculation of Total Quantity of Water for a Town**

- 9.1 Explain per capita water consumption & factors affecting demand.
- 9.2 Describe the water requirement for domestic, industrial fire-fighting and commercial purposes.
- 9.3 Describe variation in demand of water.
- 9.4 Calculation of quantity and demand of water.

## **10. Understand the Quality & Tests for Quality of Water**

- 10.1 Define pure water (potable water) and contaminated water.
- 10.2 Explain impurities in water
- 10.3 Explain the procedure for physical chemical and biological tests of water, PH of water
- 10.4 Explain WHO standards and guidelines for drinking water.

## **11. Understand the Methods and Process for Treatment of Water**

- 11.1 Sketch the over all layout of water treatment plant indicating different stages
- 11.2 Explain sedimentation & plain sedimentation
- 11.3 State the objects of plain sedimentation
- 11.4 Describe types of settling tanks based on function & shapes
- 11.5 Define coagulation
- 11.6 Describe types, purpose and use of coagulants
- 11.7 State the method of feeding and mixing of coagulations
- 11.8 Explain the process of sedimentation by coagulations
- 11.9 State flocculation and types of Flocculator
- 11.10 Explain the working of baffled and mechanical Flocculator
- 11.11 Explain filtration and types of filters

- 11.12 Describe the construction and operation of slow sand and rapid sand and pressure filters
- 11.13 Compare slow sand and rapid sand filters
- 11.14 Describe the process of filter washing
- 11.15 Explain disinfections & its necessity
- 11.16 State methods of disinfections
- 11.17 Explain chlorination, its forms and points of chlorination & chlorine demand
- 11.18 Describe the test for chlorine
- 11.19 State hardness & its types
- 11.20 Explain methods of softening
- 11.21 Explain aeration, fluoridation, colour, odour, and taste

## **12. Understand The Systems of Distribution, its Components and Layouts**

- 12.1 Explain gravity and combined & direct pumping system of distribution
- 12.2 Explain intermittent and continuous methods of supply of water
- 12.3 Explain with sketches the different pipe layout methods including dead end system, grid iron system, radial & ring system
- 12.4 State the necessity of underground, overhead and service reservoirs
- 12.5 Draw sketches of rectangular overhead service reservoir showing all accessories
- 12.6 Explain with sketches the functions of various appurtenances in a distribution system

## **13. Understand Principle of pumping**

- 13.1 Recognize different types of pumps
- 13.2 Explain kinds of pumps and principle of working
- 13.3 Explain Pumping station requirements.
- 13.4 Explain Selection of Pumps.

## **14. Understand basic facts about Sanitary Engineering**

- 14.1 Define terms; sewage, sanitary sewage, domestic sewage, industrial sewage, storm or rain sewage, sewerage works, sewage treatment and sewage disposal
- 14.2 State types of sewer (sanitary sewer, storm sewer, combined sewer, lateral sewer, house sewer, sub-main sewer, main or trunk sewer, out fall sewer and relief sewer)
- 14.3 Compare systems of sewage disposal (Sanitation systems), conservancy system, water carriage system and cesspool drainage system
- 14.4 State types of sewerage system and their suitability
- 14.5 Compare the sewerage systems with each other

## **15. Understand the Discharge calculation of sewage for sewer design.**

- 15.1 State quantity of discharge in sewer for dry weathering flow.
- 15.2 State the factors on which dry weather flow depends.



- 15.3 Explain the variation in quantity of dry weather flow.
- 15.4 Define terms: run off co-efficient, time of concentration, rain fall intensity and impervious factor.
- 15.5 State the hydraulic formula for velocity of flow.
- 15.6 Estimate the quantity of storm water flow using empirical formula and rational formula.

#### **16. Understand the Fundamentals and its Requirements of House Drainage**

- 16.1 State the aims of buildings drainage and its requirement
- 16.2 Describe with sketches the shapes and construction of different types of drains
- 16.3 State House drains slopes & connection with main sewer
- 16.4 Compare one and two pipe system of drainage

#### **17. Understand the Procedure for Laying Out and Alignment of Sewer**

- 17.1 Define Alignment & Lay out of sewer
- 17.2 State the shapes and material used for sewers
- 17.3 State suitability factors governing alignment of sewer
- 17.4 Describe the procedure of setting out alignment
- 17.5 Explain the steps, gradient fixing, bedding, handling, lowering, laying, jointing testing & back filling of sewer
- 17.6 Explain testing of sewer.

#### **18. Understand the Various Types of Sewer Appurtenances.**

- 23.1 Enlist Sewer Appurtenances.
- 23.2 Describe the location of Sewer Appurtenances.
- 23.3 Construction and function of man hole, drop man hole, catch basins, inlets, clean out, lamp hole, flushing tanks, regulators, grease and oil traps, inverted syphon, trestle & pier.

LIST OF PRACTICALS	HOURS
1. Layout drawing of training institution's plumbing lab.	3
2. Demonstration and sketching of various tools and pipe appurtenances.	3
3. Cutting and threading of G.I. Pipes and connections of PPR pipes.	6
4. Taking out water connection from main pipe line.	6
5. Fitting/replacement of water taps.	3
6. Installation of water closet, flushing cistern and pipe.	6
7. Installation of urinal with flushing cistern and waste pipe.	6
8. Installation of wash hand basin (complete).	3
9. Jointing of pipes (cast iron SPPRC, PVC and concrete).	6
10. Making model of dead system grid, system, ring system and, radial System with G.I. Pipe.	6
11. Repair of single acting reciprocating pumps and replacement of non-return valve.	6
12. Demonstration on boring of tube-well/hand pump.	3
13. Drawing of intakes for water supply.	3
14. Turbidity and hardness test of water, PH (testing)	3
15. Drawings of settling tank, slow sand filter rapid sand filter	3
16. Flow diagram of water treatment.	3
17. General layout of water supply and sanitary fitting in a house and calculation of all fixtures.	3
18. Visit of water treatment plant, and water works.	6
19. Drawing sketches of various sewer appurtenances (lamp hole, manhole ,shallow and deep man hole drop man hole inlets, regulator, grease and oil trap, inverted syphon, trestles and piers	6
20. Demonstration for excavation of trenches of a small sewer line with proper grade.	3
21. Visit of Sewage Treatment Plant	3
22. Preparation of hydraulic statement of water supply scheme	3
23. Preparation of hydraulic statement of sewerage scheme	3

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**CIVIL-214****ADVANCED CIVIL ENGINEERING SURVEYING**

<b>TOTAL CONTACT HOURS:</b>	<b>256</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	2	6	4
Practical:	192			

**AIM:** On completion, the student will be able to:

- 1 Understand the fundamental principles of triangulation, traversing and curves.
- 2 Develop skills in carrying out traverse survey, setting out curves, and layout of structures.
- 3 Understand the use of Total Station and GPS and its mapping through related computer software.

**COURSE CONTENTS****Hours****1. Theodolites Traversing**

16

- 1.1 Introduction theodolite, parts and types
- 1.2 Definition of technical terms associated with theodolites
- 1.3 Temporary adjustment of theodolites
- 1.4 Functions of theodolites: measuring angles, prolonging a line, lining in, measuring heights & distances by stadia formula
- 1.5 Introduction of traverse & its types, methods of traversing
- 1.6 Objects and standard of accuracy of traversing
- 1.7 Check of open & closed traverse
- 1.8 Plotting & graphical adjustment of closing error
- 1.9 Calculation of angles from given bearings and vice versa
- 1.10 Introduction to coordinates, types and technical terms.
- 1.11 Computation of co-ordinates and computation of missing data associated with theodolites traversing
- 1.12 Balancing the traverse by different methods

**2. Triangulation**

4

- 2.1 Introduction & types of triangulation.
- 2.2 Methods to solve Triangles
- 2.3 Introduction & types of Triangulation
- 2.4 Sine rule and its application in triangulation
- 2.5 Well condition and ill condition in Triangulation
- 2.6 Selection of station points
- 2.7 Measurement of base line

2.8	Correction of base line measurement	
<b>3.</b>	<b>Curves</b>	16
3.1	Definition, types and necessity of curves	
3.2	Designation of curves	
3.3	Elements and notation of simple circular curves & their relationship	
3.4	Calculation of data & methods of setting out simple circular curves	
3.5	Setting out simple curve beyond obstacles	
3.6	Description, types and necessity of transition curves. Characteristics, elements & notation of transition curve and their inter relationship	
3.7	Introduction to super elevation and methods of calculation length of transition curve with numerical problems	
3.8	Calculation of data and methods of setting out of transition curve	
3.9	Introduction to vertical curves, types of vertical curves, elements, <u>terms</u> and their inter relationship.	
3.10	Calculation of data and Setting out vertical curves	
3.11	Various steps in setting out of combined curves.	
<b>4.</b>	<b>Setting /Lay out</b>	2
4.1	Methods of setting out	
4.2	Instrument for horizontal and vertical control	
4.3	Checks application to setting out	
4.4	Calculations of coordinate data for setting out	
4.5	Procedure of setting out a sewer line	
4.6	Verticality of structure	
<b>5.</b>	<b>Total Station</b>	20
5.1	Introduction, types, main parts and accessories of Total Stations.	
5.2	Functions and modes of a Total Station.	
5.3	Setting of parameters, tilt correction and preparation for observations/ operations.	
5.4	Use for measurement of distances, angles, bearings and co-ordinates.	
5.5	Use for setting out of horizontal & vertical angles and co-ordinates	
5.6	Setting grade, stack out and offset measurement.	
5.7	Set and calculate coordinate value of occupied station, setting height of instrument, height of reflector and execution of coordinate measurement.	
5.8	Remote elevation measurement and missing line measurement.	
5.9	Measurement of area, point to point measurement with total station.	
5.10	Calculation of coordinate data for rectangular building & Simple circular curve and execution of layout.	
5.11	Data searching in memory manager mode and data collection.	
5.12	Downloading data from the Total Station: knowledge of downloading software.	
5.13	Putting data in the respective software and its mapping.	

**6. Global Positioning System (GPS)**

6

- 6.1 Introduction to GPS & its types.
- 6.2 Functions and modes of GPS.
- 6.3 Setting parameters.
- 6.4 Preparation for observations.
- 6.5 Introduction to the GIS.

**RECOMMENDED / REFERENCE BOOKS:**

1. Surveying & Levelling : **T.P. Kanatkar and Rangwala**
2. Surveying Levelling : **S.K. Hussain**
3. Rasul Manual (I&II) on surveying
4. Surveying : **David Clark**
5. Manuals for Total Station and GPS
6. Surveying : **S. Ahmed**
7. Advanced Surveying : **P. S. Ghosh**
8. Surveying theory and practice : **Raymond E. Davis**
9. A text book of Advanced Surveying: **R. Agor.**
10. Surveying and leveling : **R. Agor**
11. Surveying: **A. Bannister, S. Raymond and R. Baker**, [2009], Pearson Education
12. Surveying and Levelling: **R.Agor**, [2007], Khanna Publishers
13. Surveying with Construction Applications: **Barry F. Kavanagh**, [2004], Pearson Prentice-Hall
14. Surveying, Principles and Applications: **Barry F. Kavanagh**, [2006], Pearson Prentice-Hall
15. Surveying and Levelling: **N.N. Basak**, [1994], Tata McGraw-Hill, NewDelhi
16. Fundamentals of Surveying: **S.K. Roy**, [2007], Prentice-Hall of India,

**INSTRUCTIONAL OBJECTIVES****1. Understand the Construction of Theodolites and its Basic Function**

- 1.1 Define theodolite, sketch & label theodolite and list the types of theodolites
- 1.2 Define the terms; centring, transiting, face left, Face right, swinging the telescope, axis of level tube, horizontal & vertical axis
- 1.3 Explain the procedure of temporary adjustment of a theodolites
- 1.4 Explain the procedure of measuring horizontal & vertical angles.
- 1.5 Explain the procedure of setting out an angle and prolonging a line
- 1.6 Explain the procedure of fixing inter-mediate points between two given points
- 1.7 Explain various methods of traversing and enlist steps involved in traversing
- 1.8 State the standards of accuracy in linear and angular measurement.
- 1.9 Checks on open and closed traverse
- 1.10 Explain the method of plotting traverse and adjustment of closing error.
- 1.11 Compute the bearings from angles & vice versa of traverse.
- 1.12 Explain coordinate and its types.
- 1.13 Compute Latitude and departures of line and Calculate coordinates from given field notes.
- 1.14 Explain errors and mistakes in theodolite traversing and their rectification.
- 1.15 Explain balancing of traverse by different methods

**2. Understand Techniques of Triangulation**

- 2.1 Define Geodetic and Trigonometrical survey
- 2.2 Describes the terms used in triangulation and types of triangulation.
- 2.3 Solution in triangulation by use of sine, cosine rules etc.
- 2.4 Explain the factors governing the selection of stations & base line
- 2.5 Enlist the steps in measurement of base line
- 2.6 Compute correction of base line measurement

**3. Understand the Principles of Curves and Type of Curve used**

- 3.1 Define curve and its type with sketch and necessity of curves in surveying
- 3.2 Explain the designation of curve
- 3.3 Explain the definition & notation of circular curve and Compute the inter-relationship
- 3.4 Calculate the data for setting out simple circular curves by various methods.
- 3.5 List the steps for setting out of simple circular curves by various methods and describe the procedure for ranging a curve beyond obstacles
- 3.6 Describe the transition curve, its type, the necessity of transition curves, characteristics, elements, notation of transition curve and their inter relationship
- 3.7 Explain super elevation and derive formula for super elevation
- 3.8 Calculate the length of transition curve by various methods and calculate data for setting out a combined curve
- 3.9 State the types of vertical curve, its necessity of vertical curves

- 3.10 Explain the elements, notation of vertical curves and their inter-relationship
- 3.11 Enlist the steps for setting out vertical curves
- 3.12 Compute the data for setting out vertical curves
- 3.13 Explain the elements & notations of transition curve
- 3.14 Enlist the steps for the setting out combined curves

#### **4. Understand the procedure of Setting out of Engineering structures**

- 4.1 Describe Methods of setting out
- 4.2 Explain Instrument for horizontal and vertical control for set out
- 4.3 Describe the checks applied to setting out
- 4.4 Calculations of coordinate data for setting out
- 4.5 Explain Procedure of setting out a sewer line, building and bridge.
- 4.6 Describe Verticality of structure for setting out

#### **5. Understand the Total Station and its use**

- 5.1 Identify the total station, its parts functions and modes.
- 5.2 Identify and describe the accessories of total station and their operation.
- 5.3 Describe the parameters, setting of total station and its operation.
- 5.4 Explain the methods of measurement of distances, angles, bearings and co-ordinates by total station.
- 5.5 Explain the measurement of vertical angle and tilt correction
- 5.6 Preparation and setting of horizontal and vertical angle Repetition angle measurement.
- 5.7 Setting out percentage grade and stack-out.
- 5.8 Explain offset measurement
- 5.9 Setting and calculation co-ordinate value of occupied station, setting height of instrument & height of reflector
- 5.10 Define remote elevation measurement, and missing line measurement
- 5.11 Explain measurement of area, point to point measurement
- 5.12 Describe how data collected
- 5.13 Define layout and explain its procedure
- 5.14 Explain data searching in memory manager mode
- 5.15 Explain down loading data from total station.
- 5.16 Putting data in the respective software and mapping thereof.

#### **6. Global Positioning System (GPS).**

- 6.1 Identify the parts of GPS and describe its types
- 6.2 Describe the functions and modes of GPS.
- 6.3 Describe the parameters of GPS.
- 6.4 Explain the methods of observations for Static, Real Time Kinematic (RTK) and Stop & Go Method and operations of a GPS.
- 6.5 Describe the GIS

<b>LIST OF PRACTICALS</b>		<b>HOURS</b>
1	Practice to perform temporary adjustment of theodolite on a station. Vernier/ Microptic theodolites and its parts and use	6
2	Measurement of horizontal & vertical angles.	3
3	Setting out angles in the field	3
4	Practice to prolong a survey line and lining in	6
5	Practice to measure the horizontal angle by repetition method the horizontal angles by reiteration method	6
6	Practice to measure the magnetic bearing of line	3
7	Practice to measure the vertical angle	3
8	Practice to measure the height of building or tower with theodolite. <b>(trigonometric levelling)</b>	3
9	Exercise to Compute the bearing from angles & computation of <b>coordinates</b>	3
10	Theodolites traversing Exercise to Balance the traverse compute the area of traverse	12
11	Prepare Gale's traverse table taking data of already done field, compute the coordinates and adjust closing error and plotting of traverse.	6
12	Setting out horizontal curves in the field by theodolites	12
13	Setting out vertical curves in the field	3
14	Setting out transition curve in the field	3
15	Finding out height of <b>an</b> accessible point, with a theodolite.	6
16	Practice to set total station on a point & prepare for measurement atmosphere correction prism correction and selection of units)	3
17	Measurement of slope distance, horizontal distance and vertical distance by total station.	3
18	Practice to enter the coordinate of occupied point, height of instrument & height of prism.	3
19	Practice to measure the coordinate of <b>different</b> points by using coordinate mode	3
20	Practice to measure horizontal angle by repetition method with total station	3



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21	Practice to measure the vertical angle & percentage	3
22	Practice to stack out different point at various distances on a line.	6
23	Practice to measure the height of an object with total station by using REM program with and without prism height input	6
24	Practice to measure the <b>distance</b> between <b>different</b> station points with the help of occupied point (MLM) by using measure data <b>or</b> by using coordinate data	6
25	Practice to measure the area of a traverse by direct field observations.	6
26	Practice to calculate the area from coordinate data file etc.	6
27	Practice to measure the coordinates of survey points by point to line measurement program	12
28	Practice to set the Z coordinates of occupied point; entering the instrument height, known point <b>coordinates, data file</b> <b>inputting the R.L. of any known visible point</b>	3
29	Demonstration and practice of advance functions of a total station for mapping.	6
30	Setting out horizontal curves in the field by total station	6
31	Area calculation with the help of total station	9
32	Determination of storage capacity of a reservoir	6
33	Temporary adjustment of single frequency GPS	3
34.	Temporary adjustment of double frequency GPS	3
35.	Initializing the single and double frequency GPS	3
36.	Practice for Static, Real Time Kinematic (RTK) and Stop & Go Method	15

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**CIVIL-223****ADVANCED CONSTRUCTION TECHNIQUES**

<b>TOTAL CONTACT HOURS:</b>	<b>160</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	<b>2</b>	<b>3</b>	<b>3</b>
Practical:	96			

**AIM:** To understand the fundamentals of building construction and machinery used for the purpose and also be able to identify the modern methods used in construction

**COURSE CONTENTS**

- 1. Components of a building and building specifications** 4 Hours
  - 1.1 Introduction
  - 1.2 Construction of a building: Civil Works
  - 1.3 Various steps in construction of a residential building
  
- 2. Site preparation and setting out of works** 4 Hours
  - 2.1 Introduction
  - 2.2 Site layout of Civil Project
  - 2.3 Water Supply ground water control: permanent exclusion of water
  - 2.4 Electrical Supply
  - 2.5 Initial checks on drawings
  - 2.6 Layout / Setting out of buildings
  - 2.7 Construction procedure of a Multi-storey building
  
- 3. Construction of Foundation** 4 Hours
  - 3.1 Simple foundation design
  - 3.2 Setting out for brickwork foundation of Two room
  - 3.3 Foundations of framed buildings
  - 3.4 Foundations for staircases
  - 3.5 Eccentrically-loaded foundations
  - 3.6 Bridge Foundations
  
- 4. Block masonry and Marble Work** 4 Hours

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- 4.1 Considerations for use of hollow concrete blocks
- 4.2 Laying of blocks
- 4.3 Hollow concrete blocks with concrete infilling
- 4.4 Special features of concrete block masonry
- 4.5 Compound walls in block work
- 4.6 Tools for stone and marble work
- 5. Water Proofing / Termite Proofing of Structures** 4 Hours
- 5.1 Water proofing materials and products.
- 5.2 Water proofing of struck (horizontal/ vertical)
- 5.3 Termite proofing
- 5.4 Materials used in termite proofing
- 6. Flooring** 4 Hours
- 6.1 Ground floors
- 6.2 Suspended floors
- 6.3 Laying of toppings
- 6.4 Choice of floor finishes
- 6.5 Use of abrasives in floors
- 6.6 Types of floors
- 7 False Works** 7 Hours
- 7.1 Types of False works.
- 7.2 Types of scaffolding.
- 7.3 Types of shoring.
- 7.4 Methods of underpinning.
- 7.5 Purpose of formwork
- 7.6 Components of formwork wares
- 7.7 Characteristics of a good form work quality, safety, and economy
- 7.8 Types of formwork collapsible, progressive, slip formwork and non-removable
- 7.9 Preparation of formwork for placing concrete-
- 7.10 Loads on formwork
- 7.11 Form work for different components of structure
- 8. Stairs, Stair Case and lifts / Elevators and Escalators** 5 Hours
- 8.1 Important technical terms.
- 8.2 Types of different stairs and staircases with brief specifications and parts
- 8.3 Planning and design of a stair-relation between going and rise, width of stair,
-

- length of flight, landing and location of stair etc.
- 8.4 Types of stains according to material used.
- 8.5 Lifts, elevators, ramps and escalators.
- 9. Multi-storey framed Structure Buildings** 2 Hours
- 9.1 The selection of the material.
- 9.2 Types of multi-story frames.
- 9.3 Forms of multi-story construction.
- 9.4 Description of Components of framed structure building.
- 10. Basement construction** 3 Hours
- 10.1 Purpose of basements.
- 10.2 Box basements.
- 10.3 Water proofing methods.
- 10.4 Construction procedures.
- 11. Fire Protection of Buildings** 3 Hours
- 11.1 Causes and effects of fire
- 11.2 Fire resisting materials-characteristics, fire-resisting properties of construction materials
- 11.3 Arrangements for fire-protection of building-alarm system, protection of openings, stairs and floors, smoke detectors, fire extinguishing arrangement
- 11.4 Fire-resisting construction-classification of building for fire resistance, fire protection of concrete, wooden and steel structures
- 11.5 Means of escape in case of fire basic principles of means of escape means of escape required for flat, office building, and public building.
- 12. Air conditioning and ventilation of building** 4 Hours
- 12.1 Introduction, definition, conditioned air, purity, humidity cooling, heating, ventilation.
- 12.2 Thermal insulation, transmission of heat, insulating material
- 12.3 Factors affecting ventilation of building, functional requirements of ventilation, methods of ventilation
- 12.4 Heating of building, methods of heating, warm air furnace steam heating, hot water heating system, panel heater, and unit heater.
- 12.5 Cooling of building, methods of cooling, chilling water cooling, ice cooling, spray cooling, mechanical refrigeration (air conditions)
- 12.6 Air conditioning plants, system of air conditioning, air circulation filters.

- 13. Acoustics of Buildings** 4 Hours
- 13.1 Technical terms: sound, pitch, loudness, intensity of sound, reflection, transmission and absorption of sound, optimum time of reverberation
  - 13.2 Factors to be considered in an acoustics of buildings.
  - 13.3 Sound absorbing materials-characteristics
  - 13.4 Acoustic design of an auditorium
  - 13.5 Sound insulation-methods of sound insulation.
  - 13.6 Physical measurement of sound
  - 13.7 Reverberation of echos
  - 13.8 Sound insulation
  - 13.9 Common acoustical defects and remedies of conference halls
  - 13.10 Use of ray diagram and echo
  - 13.11 Design of auditoriums
  - 13.12 Requirements of an auditorium
  - 13.13 Acoustical materials
  - 13.14 Recommendations for different types of buildings for good acoustics
- 14. Maintenance of Structures** 6 Hours
- 14.1 Introduction
  - 14.2 Classification of building maintenance-routine/annual repair, special repairs and maintenance etc.
  - 14.3 Repair to damage surface finishing such as plaster, pointing, white wash, distemper and painting.
  - 14.4 Repair to damage parts of floors such as concrete floor, terrazzo floor, mosaic floor, and timber floors.
  - 14.5 Exposure of reinforcement spalling causes and repairs.
  - 14.6 Protection against leakage through roofs-causes and repairs
  - 14.7 Replacement of glass panes, decayed timber, easing of door and windows.
  - 14.8 Repair to cracks in masonry wall.
  - 14.9 Repair to concrete structures.
  - 14.10 Maintenance of sanitary appliances
  - 14.11 Maintenance of electrical system
  - 14.12 Maintenance of water supply system including taps and fixtures
  - 14.13 Maintenance of septic tank
  - 14.14 Maintenance of drainage system
  - 14.15 Renovation / rehabilitation of old structures and their procedures.
- 15. Introduction to Seismic Proof Construction.** 4 Hours
- 15.1 Important seismic related Definition & Terms,
  - 15.2 Different seismic zones

- 15.3 Seismic Design Parameters
- 15.4 Seismo-resistant building architecture
- 15.5 Ductility considerations in earthquake resistant design of buildings
- 15.6 Construction in different seismic zones
- 15.7 Methods and materials of construction

## 16. Municipal Requirements in planning of buildings

2 hours

- 16.1 Introduction
- 16.2 Classification of buildings
- 16.3 Example of building regulations

### RECOMMENDED / REFERENCE BOOKS:

- 1 Building Construction: Arora and Gupta.
- 2 Building Construction : M.Rangwala
- 3 Construction Technology Chudly Volume I, II, III, IV
- 4 Building Construction Mackay Volume I, II, III, IV
- 5 Building Construction : S.K. Sharma
- 6 Building Construction and Foundation Engineering : Jah
- 7 Construction Planning, Equipment and Materials : R. L. Puri
- 8 Dampness in Buildings: Oliver.
- 9 Building Construction : P.C. Varghese (Eastern Economy Edition)
- 10 Geotechnical Earthquake Engineering S. L. Kramer, [2008], Pearson Education
- 11 Earthquake Resistant Design of Structures, P. Agarwal & M. Shrikhande [2009], PHI, New Delhi.
- 12 Design of Steel Structures: P. Dayaratnam, [2008], S. Chand & Co New Dehli
- 13 Building Construction: P. C. Varghese [2009], PHI Learning New Dehli
- 14 Building Construction: N.L.Arora and B.R.Gupta, [2001], Prakashar,New Delhi
- 15 Construction Technology: Eric Fleming, [2004], Blackwell Publishing
- 16 Steel Designer's Manual: Buick Davison and Graham Owens, [2005], Blackwells Publishing
- 17 Fundamentals of Building Construction : Edward Allen, [1985], Wiley & Sons
- 18 Rehabilitation and Reuse of Old Buildings: D. High field,[1987], E & F. N Spon
- 19 Building Materials and Construction: Theodore Marotta, [2005], Pearson Apprentice-Hall
- 20 Structural steel works: A.B. Clark & S. H. Coverman,[1987], Chapman & Hall

**INSTRUCTIONAL OBJECTIVES****1. Understand components of building & building**

- 1.1 State different components of building
- 1.2 Explain : - Works of a building
- 1.3 Explain various step involved in construed of a residential building

**2. Understand site preparation for Civil projects and setting out works.**

- 2.1 Introduce site preparation for project.
- 2.2 Draw site lay out including site activities space allocation for material storage, plant position, working area, accommodation for staff.
- 2.3 Explain water supply for construction including ground water control, permanent exclusion of ground water, temporary exclusion (well point system, deep bored well).
- 2.4 Basic nature of electric supplies for equipments & matures used in construction.
- 2.5 Stale different checks drawings of project.
- 2.6 Explain setting out of buildings.
- 2.7 Describe construction procedure of multistory building.

**3. Understand Construction precedence of foundations.**

- 3.1 State simple foundation design.
- 3.2 Describe setting out for brick work of a load bearing wall.
- 3.3 State foundations of framed buildings.
- 3.4 Describe foundation of staircase.
- 3.5 Explain exceptionally loaded foundations.
- 3.6 Explain deep foundation the necessity
  - Pile foundation
  - Cofferdam
  - Caisson foundation

**4. Understand Principles of Constructing Formwork for Reinforced Concrete Structural Components.**

- 4.1 State use of hollow concrete blocks.
- 4.2 Explain laying of blocks
- 4.3 Explain hollow concrete blocks with concrete infilling.
- 4.4 Explain compound walls in block work.
- 4.5 Describe different tools for stone and marble work.
- 4.6 State the stripping of formwork.

**5. Understand water proofing/Termite proofing of structure.**

- 5.1 State water proofing materials and products
- 5.2 Explain water proofing of basement (Vertical & Horizontal).
- 5.3 Describe the procedure of termite proofing of foundation.
- 5.4 State the material use in termite proofing.

**6. Understand the Principles and Technique of Air Conditioning and Ventilation of a Building.**

- 6.1 State different ground floors with their base & bare layer. .
- 6.2 Explain types of suspended floors.
- 6.3 Describe laying of toppings
- 6.4 State choice of floor finishes.
- 6.5 Explain use of abrasives in floors.
- 6.6 Describe the structure of followings
  - Concrete and basic floors
  - Stone floors
  - Ceramic tile floors
  - Mosaic floors
  - Wood block cork and parquet flooring

**7. Understand the Principles of constructing false works and form works for structural components.**

- 7.1 Define false work.
- 7.2 Explain different types of scaffoldings.
- 7.3 Explain different types of shoring.
- 7.4 Explain different Methods of underpinning.
- 7.5 Purpose of formwork
- 7.6 Describe different components of form work sheathing, supporting member braces, form hard wares.
- 7.7 Explain characteristics of a good form work quality, safety and economy.
- 7.8 Describe Collapsible, progressive, slip and non removable form work.
- 7.9 Explain principles of form work for placing of concrete, assembly, cleaning and oiling.
- 7.10 Explain form work for column, colluder base walls slab beams.

**8. Understand the Principles involved in planning & design of stairs, lifts, elevators and escalators.**

- 8.1 Define the terms used.
- 8.2 Describe different types of stairs and staircases with brief specifications and parts.
- 8.3 Explain principles to be observed while planning and design of stair.
- 8.4 State the types of stairs according to material used.



8.5 Describe lifts, elevators, ramps and escalators.

## **9 Understand the Techniques involved in the Construction of Multi-storey framed structure Buildings**

- 9.1 State the selection of the material for multi-storey framed buildings.
- 9.2 Describe different types of multi-storey frames.
- 9.3 State the different forms of multi-storey framed structure construction.
- 9.4 State the different components of multi-storey framed structure construction.

## **10 Understand the Principles of Basement construction**

- 10.1 State purpose of basements.
- 10.2 Describe box basements.
- 10.3 Describe methods of water proofing basements.
- 10.4 Describe the construction procedures of basement.

## **11. Understand the Principles for Fire Protection of Buildings**

- 11.1 Discuss the causes and effects of fire
- 11.2 Explain the fire resisting properties of construction materials.
- 11.3 Describe the arrangement for fire protection of building i.e. alarm system, fire extinguishing arrangement.
- 11.4 Explain principles to be observed for fire protections of concrete, wooden and steel structures.
- 11.5 Discuss the means of escape from a building in case of fire.

## **12. Understand the Principles and Technique of Air Conditioning and Ventilation of a Building.**

- 12.1 Define terms, conditioned air, purity of air, humidity, cooling heating and ventilation.
- 12.2 State the importance of thermal insulation of building.
- 12.3 State the standards for ventilation of building.
- 12.4 Explain the methods of ventilation i.e. natural and mechanical ventilation.
- 12.5 Explain the methods of heating a building.
- 12.6 Explain the methods of cooling building.
- 12.7 State the systems of mechanical air conditioning of building.
- 12.8 State the air distribution and cleaning method.
- 12.9 Explain the working principles of mechanical air conditioning plant/system.
- 12.10 Calculate flow of heat energy through a composite structure.
- 12.11 Calculate heat losses/gains for an enclosure and propose procedures to minimize heat loss/gain.

## **13. Understand the principles and Techniques of Acoustic Control of a Building.**

- 13.1 Define terms, sound, pitch, loudness, tone, intensity of sound, reflection of sound, reverberation, time of reverberation, transmission of sound and absorption of sound.
- 13.2 Explain the factors to be considered in acoustics of building.
- 13.3 Describe the characteristics of various types of sound absorbing materials.
- 13.4 Explain principles to be observed in the acoustic design of an auditorium.
- 13.5 Explain the methods of sound insulation of a building.
- 13.6 Describe common acoustical defects and remedies of conference halls
- 13.7 State use of ray diagram and echo

#### **14. Understand the Maintenance Required for Building**

- 14.1 Explain the annual and special repairs required for building.
- 14.2 Explain the methods of repair of damaged plastered surface, white wash, distemper and painting.
- 14.3 Explain the procedure of repair of various damaged floors such as, concrete floor, terrazzo floor, mosaic and timber floors.
- 14.4 Explain causes of spalling in R.C.C members and protections against it.
- 14.5 Explain causes, method of repair for leakage through roofs.
- 14.6 Explain causes and symptoms of cracks in masonry and their repairs.
- 14.7 Explain repair of sanitary system electrical, water supply, septic tank and drainage system.
- 14.8 Explain repair of concrete structures.
- 14.9 Explain renovation/revalidation of striation

#### **15. Understand the Principles of seismic proof construction**

- 15.1 State Reid's elastic theory, theory of plate tectonics, seismic waves, earthquake size local site effects, internal structure of earth, classification of earth quakes sunami
- 15.2 Describe different seismic zones.
- 15.3 Explain seismic design parameters.
- 15.4 Explain seism resistant building architecture.
- 15.5 State ductility consideration in earthquake resistant design of building.
- 15.6 Explain construction of project in different seismic zones
- 15.7 Describe methods and materials of construction.
- 15.8 Describe principles to be observed while planning, designing and construction of earthquake resisting buildings.
- 15.9 Describe precautions to be taken in planning, designing and construction of buildings in seismic zones.

#### **16. Understand Municipal Requirement in planning**

- 16.1 Describe general requirement municipal requirement
- 16.2 State classification of building
- 16.3 Explain building regulations of municipal administration

LIST OF PRACTICALS	HOURS
1 Draw a job layout plan for a building project showing, material, plant and accommodations on site.	3
2 Visit for demonstration of pile boring site and draw lay out plan (showing machinery location and other details)	6
3 Draw sketches of various shapes of well foundation.	3
4 Draw plan and section of coffer dam and caissons.	3
5 Sketch basement of a building and show the water proofing treatments.	3
6 Practice in laying brick floor, conglomerate floor, mosaic floor and tiles floors.	6
7 Draw sketches of various types of stairs lifts and escalators/elevators.	3
8 Demonstration of laying-out of typical stair.	6
9 Demonstration and practice in fabrication and erection of various form work.	6
10 Demonstration and practice in removal of form work, completed during previous week.	6
11 Visit to under construction building project and presentation of visit report.	3
12 Visit to air conditioning plant	3
13 Visit to a building equipped with central air conditioning system.	3
14 Draw sketches of various methods of ventilation.	3
15 Draw the cross section of a typical acoustically treated hall.	3
16 Treatment of a damaged expansion/construction joints, repair & maintenance of old building in campus.	6
17 Demonstration and practice in knotting, lashing and erection of common scaffolding	3
18 Demonstration and working of construction plants as given in course contents.	3
19 Visit to a precast concrete factory and preparation of its layout and report.	3
20 Demonstration of manufacturing of tough tiles.	6
21 Renovation & rehabilitation of academic/admin block, hostel & staff colony.	15

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**CIVIL-232****QUANTITY SURVEYING**

<b>TOTAL CONTACT HOURS:</b>	<b>128</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	32	<b>1</b>	<b>3</b>	<b>2</b>
Practical:	96			

**AIM:**

The student will be able to understand the procedures governing estimation of earth work and complete estimate of single storey building in order to:

1. Work out the rate analysis and material statement of various items of work.
2. Understand complete estimates of bituminous and concrete roads, and sewerage scheme.

**COURSE CONTENTS**

- 1. Introduction** 3Hours
  - 1.1 Review of area, perimeters and volumes of various plane and solid geometrical figures.
  - 1.2 Estimate and its types.
  - 1.3 Data for estimating.
  - 1.4 Various units of measurement and their conversion.(FPS, MKS and SI Units)
- 2. Specifications.** 2 Hours
  - 2.1 Definition and purpose of specifications
  - 2.2 Principle of writing specs
  - 2.3 General specifications.
  - 2.4 Detailed specifications of all items of work.
- 3. Building Estimates.** 6 Hours
  - 3.1 Terms used in quantity surveying (provisional sum, prime cost, input rates, MRS, CSR, Premium, rebate, contingencies, petty establishment charges, cost, value, bill, BOQs, and FIDIC).
  - 3.2 Rough cost estimate of Buildings with different methods.
  - 3.3 P.W.Ds, MES and English method of writing measurement in MB.
  - 3.4 Methods of detailed Estimate.
  - 3.5 Instructions on working out quantities of various types of wall Shapes/sections.
  - 3.6 Rules for deduction in different items of work.
  - 3.7 Instructions on working out quantities and Abstract of quantities of various items of work of a single storey building (building portion only).
  - 3.8 Study of schedule of rates and preparation of abstract of cost for all item of work of a single storey building (building portion only).
  - 3.9 Annual and special repair estimates for building maintenance.

<b>4.</b>	<b>Earth Work</b>	4 Hours
4.1	Units of measurement/payment, methods of calculation.	
4.2	Technical terms used in earth work (lead, lift, dead man, borrow pit).	
4.3	Preparation of proforma for earth works.	
4.4	Taking out quantities for embankment, roads in plain and hills and irrigation channel (including re-modelling).	
<b>5.</b>	<b>Road Estimates.</b>	3 Hours
5.1	Types of road & their structures along with <b><i>technical</i></b> terms	
5.2	Units of measurements/payments.	
5.3	Instruction regarding complete estimate of bituminous road, cement concrete road.( for original & repair works)	
<b>6.</b>	<b>Rate Analysis.</b>	5 Hours
6.1	Definition & prerequisite for analysis of rates	
6.2	Labor required for constructional work.	
6.3	Instruction on Market rates, (Materials, labour, carriage and equipment) (PWD, MES Rate Schedules)	
6.4	Schedule of labour, schedule of equipment, hiring and cost owing, of machinery work their output.	
6.5	Rate analysis for: <ul style="list-style-type: none"> <li>– Cement concrete of different ratios.</li> <li>– Brick work in cement mortar.</li> <li>– Cement conglomerate floor</li> <li>– Dry brick paving.</li> <li>– Cement plaster of given ratios.</li> <li>– Cement pointing (Struck &amp; Flush type)</li> <li>– White washing/ Distemper to wall and painting to doors/windows.</li> </ul>	
6.6	Material statement for various items of building work.	
<b>7.</b>	<b>Sewerage and Water Supply Schemes.</b>	4 Hours
7.1	Items of work for water supply and sewerage (Internal and External)	
7.2	Units of measurements & payments.	
7.3	Rough cost estimate for water supply and sewerage schemes.	
7.4	Detailed estimate for sewer line and its appurtenance (Manholes)	
7.5	Prepare hydraulic statement for a sewerage scheme comprising of 10 manholes.	
7.6	Prepare hydraulic statement for a water supply scheme for 1000 ft. length in five parts	
<b>8.</b>	<b>Valuation of Property.</b>	5 Hours
8.1	Introduction-definition and purpose of valuation.	
8.2	Methods of valuation	
8.3	Sinking fund, scrap value, salvage value, market value, book value, assessed value; potential value, year purchase, Monopoly value, annuity, gross income, net income, outgoing, price variation etc.	
8.4	Depreciation of buildings-methods of calculating depreciation.	

- 8.5 Depreciation of Machinery-methods of calculating depreciation.  
8.6 Calculation of standard rent of buildings on capital %age basis method

**RECOMMENDED / REFERENCE BOOKS:**

1. Rasul Manual No.4 on Estimating.
2. Estimating and Costing: BN Dutta.
3. Estimating and Costing: M.A. Aziz.
4. Construction Cost Estimating: Len Holm, John Schaufelberger, Dennis Griffin and Thomas Cole, [2005], Prentice-Hall, USA
5. Civil Engineering Quantities: Ivor Seeley and George P. Murray,[2001], Palgrave Publishers
6. Estimating and Costing by GS Bridge.
7. *Construction Cost Estimates by US Army Corps of Engineer (UFC)*
8. **Standard Methods of Measurement (Released by PEC Body)**

**INSTRUCTIONAL OBJECTIVES****1. Know the Importance and Types of Estimates of Works.**

- 1.1 State formulae for area, perimeters and volumes of various plane and solid geometrical figures.
- 1.2 State the units FPS, MKS and SI.
- 1.3 Convert the units.
- 1.4 Describe the importance of estimates.
- 1.5 State the data required for preparation of estimates.
- 1.6 State the type of estimate.

**2. Understand Specifications of all Items of Works of a Building & Road.**

- 2.1 Define specifications.
- 2.2 Explain the purpose and types of specification.
- 2.3 State general specifications of a building & Road.
- 2.4 Discuss the detailed specifications of important items of works.

**3. Understand Principles Involved in Preparation of Building Estimates.**

- 3.1 Terms used in quantity surveying (provisional sum, prime cost, input rates, MRS, CSR, Premium, rebate, contingencies, petty establishment charges, cost, value, bill and BOQs).
- 3.2 Prepare rough cost estimate of a building from given line plan or covered area.
- 3.3 Distinguish between P.W.D and English method of recording measurements.
- 3.4 List the all items of works for a residential building (only building position except public health and electrification installation).
- 3.5 Determine quantities of all items of works for straight; D,F,H,T,U shaped walls and circular walls.
- 3.6 Workout quantities of all items of works for a single storey building (building portion only) from given drawings.
- 3.7 Prepare bill of quantities and abstract of cost with the help of composite schedule of rates.
- 3.8 Prepare annual and special repair estimate for a given building.

**4. Understand the Principles Involved in Calculation of Earth Work for Embankments, Roads, and Irrigation Channels etc.**

- 4.1 State data required for computation of earth works.(Intermediate point-IMP)
- 4.2 Explain methods to determine quantity of earth work and their respective proforma (mid area, mean area, coordinates Prismatical & Graphical).
- 4.3 Work out (determine) quantity of earth work for embankments, roads and irrigation channels.
- 4.4 Explain remodeling of irrigations channels.
- 4.5 Work out quantity of earth work for remodeling of a channel from given x-sections of channels.

**5. Understand the Preparation of Detailed Estimate of Various Types of Roads.**

- 5.1 Describe parts of road structure and their specifications.
  - 5.2 State the units and method of measurement of all items of works for a road.
  - 5.3 Prepare detailed & repair estimate for bitumen and cement concrete road.
- 6. Understand Rate Analysis of Major Items of Works.**
- 6.1 Describe the purpose of rate analysis.
  - 6.2 Explain prerequisites for analysis of rate of items of works, i.e. market rates of materials and labour, carriage, out-turn of labour, specifications, overhead costs etc labour required for different constructional works out put of machinery.
  - 6.3 Determine quantity of materials required for various items of building works.
  - 6.4 Prepare material statement for various items of building works.
  - 6.5 Prepare analysis of rates for important items of work as given in subject contents.
- 7. Understand Detailed Estimate for Water Supply and Sewerage Schemes**
- 7.1 List all item of works for a sewer line and their measurement units.
  - 7.2 Explain the preparation methods rough cost estimate of water supply and sewerage schemes.
  - 7.3 Work out quantities of each item of work for sewer line and manhole from given drawing.
  - 7.4 Prepare bill of quantities and abstract of cost.
- 8. Understand Valuation of Building and Fixation of Rent.**
- 8.1 State the purpose of valuation.
  - 8.2 Explain terms, book value, market value, salvage value, scrap value, sinking fund, year's purchase, annuity, capitalized value, depreciation and price variation.
  - 8.3 Determine the depreciation of a building by straight line method, constant percentage method and sinking fund method.
  - 8.4 Determine the depreciation of machinery.
  - 8.5 Determine the value of a building by rental method, valuation based on profit and depreciation method.
  - 8.6 Determine rent for government and private building



<b>LIST OF PRACTICALS</b>	<b>HOURS</b>
1. Preparation of rough cost estimates of buildings.(Using different types of units) and Writing specifications/Description of various items.	9
2. Taking out measurements of a straight wall, T, L, H, U, shaped walls and circular walls.	9
3. Complete estimate of a single storey building. (Except Public Health Installations & Electric Installations)	12
4. Preparation of annual repair/special repair estimates. (Building and Roads)	6
5. Working out earth work of earthen embankment of given design and data.	6
6. Working out earth work of road in plain areas.	3
7. Working out earth work of road in hilly areas.	3
8. Working out earth work of irrigation channel.	3
9. Complete estimate of arterial roads (bituminous and concrete road).	9
10. Preparation of material statements of Brick work, foundation concrete, RCC, Cement plaster, DPC, Cement pointing, whitewashing of building works.	6
11. Rate analysis for various items of building work viz cement concrete of different ratios, Brick work in cement mortar in foundation and plinth and superstructure, dry brick paving, cement plaster of ratios, cement pointing, white washing.	12
12. Preparation of rough cost estimate of water supply scheme 1000 ft length comprising of rising main and 5 branches including analysis of rates for works and preparation of hydraulic statement.	9
13. Calculation of present market value of an existing building by standard rent method and depreciation method.	6
14. Calculation of standard rent of government buildings	3

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**CIVIL-243****CIVIL ENGINEERING DRAWING & AUTO CAD**

<b>TOTAL CONTACT HOURS:</b>	<b>224</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	32	<b>1</b>	<b>6</b>	<b>3</b>
Practical:	192			

**AIM:** On completion, the student will understand the techniques of drawing buildings, roads, irrigation structures and methods of inking and Ferro-printing.

Use of Auto CAD software and its applications in civil engineering drawing

**COURSE CONTENTS**

- 1 Structural Drawings of Building Components. 5 Hours**
  - 1.1 Instruction for detailed drawing of foundations, lintels, arches, stairs, floors, roofs (flat and sloping), doors, windows, C-windows, calculations of spread footing.
  - 1.2 Instructions on drawing plan and x-section of R.C.C. column.
  - 1.3 Instructions on drawing plan and x-section of R.C.C. slab roof with main and secondary beams.
  - 1.4 Introduction on drawing of steel truss and labelling its parts
  - 1.5 Instruction on drawing of raft foundation with steel reinforcement.
  - 1.6 Instruction for detailed drawing of frame structure showing all components.
  
- 2. Drawing of Cross Drainage Structures. 5 Hours**
  - 2.1 Instructions for drawing of x-section of roads.
  - 2.2 Instructions for drawings of R.C.C. road culvert 5 ft span
  - 2.3 Instructions for detailed drawing of high level two span R.C.C. Deck Bridge with 25' span-each.
  - 2.4 Instructions for detailed drawing of 25' span plate girder steel bridge.
  
- 3. Drawing of Irrigation Structures. 2 Hours**
  - 3.1 Instructions for drawing typical section of an Irrigation Channel in cutting and filling.
  - 3.2 Instruction for drawings of A.P.M. out-let, masonry flume.
  - 3.3 Instruction for drawing of sluice (gate) of barrage
  
- 4. Septic Tank and Soakage Pit 2 Hours**

- 4.1 Introduction to septic tank  
4.2 Introduction to soakage pit  
4.3 Sketch and label septic tank and soakage pit
- 5. Review of Coordinate System** 2 Hours
- 5.1 Cartesian and polar coordinates  
5.2 Absolute coordinates  
5.3 Relative coordinates  
5.4 Direct distance entry system  
5.5 U.C.S setting
- 6. Review of Menu of Auto CAD** 2 Hours
- 6.1 Navigation in AutoCAD for AutoCAD classic, 2D Drafting and Annotation, 3D Modelling and Initial Setup Workspace.  
6.2 Instruction on File, Edit, View, Insert, Format, Tools, Draw, modify, Parametric, Windows, help, and Express in AutoCAD classic.  
6.3 Instructions on 2D drafting and annotation menus i.e. Home, Insert, Annotate, Parametric, View, Manage, output and express tools.  
6.4 Instructions on use of various categories in ribbons of Home, Insert, Annotate, Parametric, View, Manage, output and express tools in 2D drafting and annotation menus.
- 7. Review of Tool Bars** 2 Hours
- 7.1 Instructions on tool bars of AutoCAD classic i.e. Draw, Modify, Standards, Properties, Layers, Osnap, Dimension and their practical application.  
7.2 Instructions on creation of user tool bars.
- 8. CAD Commands and their Aliases** 2 Hours
- 8.1 2D commands for plane figures.  
8.2 2D commands to draw geometrical solid figures.  
8.3 2D commands to draw isometric views.  
8.4 2D commands for orthographic views.
- 9. Drafting Setting** 1 Hour
- 9.1 Units, limits, grid, snap, snaps etc  
9.2 Model setting and layout setting. Layers and properties etc
- 10. Preparation of 2D Drawings** 1 Hour
- 10.1 Instructions on drawing of two roomed quarter.  
10.2 Plans, elevation and sections of buildings
- 11. Dimensioning & Text** 2 Hours
- 11.1 Dimensioning types, styles & application

## 11.2 Formatting Text styles & application

### 12. 3D Commands / 3D MAX

4 Hours

- 12.1 Commands for Solid figures
- 12.2 Modification of solid figures
- 12.3 Conversion of 2D into 3D
- 12.4 Shading and Rendering
- 12.5 View setup
- 12.6 Introduction to 3D Max and its interface.
- 12.7 Instructions on menus and toolbars of 3D Max.
- 12.8 Application of 3D max of 3D drawings of AutoCAD.

### 13. Plotting

2 Hours

- 13.1 Layout setting
- 13.2 Print layout setup
- 13.3 Use of printers and plotters

#### RECOMMENDED / REFERENCE BOOKS:

1. Building Drawing : **Gur Charn Singh**
2. Engineering Drawing : **French and Vierick**
3. How to plan a House : **Townsend**
4. Be your own Architect: **Z.H. Syed.**
5. Irrigation : **Iqbal**
6. Building construction: **Michel.**
7. Building construction, drafting and design : **Molnar**
8. Engineering Drawing: **N.D. Bhatt and V. M. Panchal**, [2006], Prabhat Publishers, Delhi
9. Harnishing AutoCAD
10. Mastering AutoCAD

**INSTRUCTIONAL OBJECTIVES****1. Understand Techniques of Drawing Building Components.**

- 1.1 Define and sketch the spread footing.
- 1.2 Define and sketch the raft foundations.
- 1.3 Define and sketch the grillage foundation.
- 1.4 Define and sketch the well and pile foundation.
- 1.5 Define and sketch the caisson foundations.
- 1.6 Label different parts of spread footing i.e. base concrete, sub grade, steps offsets, and plinth.
- 1.7 Calculate the depth and breadth required for spread footings.
- 1.8 Sketch out the x-section of lintels and arches.
- 1.9 State the various parts of lintels and arches.
- 1.10 Define stair and stair case
- 1.11 Define the terms and parts used in different types of stairs.
- 1.12 Explain the stairs according to their layout.
- 1.13 State the suitability of each type of stair.
- 1.14 Sketch the plans and sections of different types of stairs according to their layout.
- 1.15 Define different types of floors.
- 1.16 Draw the sketches of different parts of floors.
- 1.17 Explain the standard proportions for the different layers of floors.
- 1.18 State different types of roofs i.e. first class mud roofing, 2nd Class mud roofing, R.C.C and R.B roof and Pre-cast roof slabs.
- 1.19 State different types of sloping roof.
- 1.20 Draw the sketches of steel trusses up to 25' span from the given data.
- 1.21 Label the sketches of different parts of trusses.
- 1.22 State need of doors and windows.
- 1.23 Define clerestory windows and ventilators.
- 1.24 State the different types of doors and windows.
- 1.25 Explain the various parts of doors and windows.
- 1.26 State the different materials used for doors, windows and ventilators
- 1.27 Sketch the elevations, sectional plans and vertical sections of doors, windows and ventilators.
- 1.28 Sketch and label the raft foundation with steel reinforcement.
- 1.29 Distribute the space for different views evenly on drawing sheet.
- 1.30 Define columns.
- 1.31 Sketch & show steel reinforcement at appropriate place in the column sections of different shapes.
- 1.32 State the position of over laps and its length.
- 1.33 Sketch different types of hooks and bends with their standard dimensions.
- 1.34 Define beam & types of beam
- 1.35 Sketch the x-section and L-section of a singly reinforced beam & show steel reinforcement (simply supported, cantilever, over hanging, continuums beam)

- 1.36 Differentiate between the Primary and Secondary beam.
- 1.37 Sketch and label the details of Reinforcement of T-and L-Beam.
- 1.38 Sketch and label the details of Reinforcement of two way continuous slab over Tee-Beam.
- 1.39 State the purpose of stirrups and bent up bars
- 1.40 Types of mild steel bars (plain, deformed, cold twisted, presented)

## **2. Understand Techniques of Drawing Road Structures.**

- 2.1 Sketch the X-section & L-section of Road in plain area. (urban and rural)
- 2.2 Sketch the Long section and X-section of Road in hilly area.
  - 2.3 Sketch the X-section of Bituminous Road in plain and hilly area.
  - 2.4 Sketch the X-section of concrete Road structure.
  - 2.5 State various parts of culverts i.e. abutment, wing wall, toe wall parapet, base plate.
  - 2.6 Sketch the Plan, Foundation Plan, Long Section and X-Section of Culvert.
  - 2.7 Explain the various terms used in Bridge.
  - 2.8 State the difference between culvert and Bridge.
  - 2.9 Explain the various types of bridges.
  - 2.10 Sketch the Plan, Foundation Plan, Long section and X-Section of two Span Bridge.
  - 2.11 Sketch the detailed drawing of 25' span plate girder steel bridge.

## **3. Understand Techniques of Drawing Irrigation Structures.**

- 3.1 State the different irrigation structures.
  - 3.2 State the definition of irrigation channel.
  - 3.3 Define the terms used in irrigation channel i.e. Bed Width, Side Slopes, F.S.L., H.F.L., Free Board, Gradient Spoil Bank, Service Bank, Dowel, Berm etc.
  - 3.4 Sketch the different Sections of Irrigation channels i.e. fully in cutting, fully in banking, partially in cutting & partially in banking.
  - 3.5 Select appropriate scale for horizontal and vertical section.
  - 3.6 Define the A.P.M. outlets.
  - 3.7 Sketch and label the different parts of A.P.M. outlets.
  - 3.8 Define the Masonry Flume.
  - 3.9 Sketch & label the parts of Masonry Flume.
  - 3.10 Sketch to label parts of sluice (steel gate) of barrage.

## **4. Know the Need and Constructional Features of Septic Tank and Soakage Pit:**

- 4.1 Define the septic tank and soakage pit.
- 4.2 State different parts of septic tank and soakage pit.
- 4.3 Sketch the plans and sections of septic tank and soakage pit.
- 4.4 State the constructional features of septic tank and soakage pit.
- 4.5 State the minimum size of chambers of septic tank.
- 4.6** State the importance of free board.

## 5. Understand use of Coordinate System in preparation of drawing

- 5.1 State Cartesian and polar coordinates
- 5.2 State Absolute coordinates
- 5.3 State Relative coordinates
- 5.4 Use Direct distance entry system for drawing lines
- 5.5 Set U.C.S for different situations

## 6. Understand the use of Menu of Auto CAD

- 6.1 Describe the procedure for Navigation in AutoCAD for AutoCAD classic, 2D Drafting and Annotation, 3D Modelling and Initial Setup Workspace.
- 6.2 Describe the options in File, Edit, View, Insert, Format, Tools, Draw, modify, Parametric, Windows, help, and Express in AutoCAD classic.
- 6.3 Describe the use of ribbons of “2D drafting and annotation” i.e. Home, Insert, Annotate, Parametric, View, Manage, output and express tools.
- 6.4 Describe the use of various categories in ribbons of Home, Insert, Annotate, Parametric, View, Manage, output and express tools in 2D drafting and annotation menus.

## 7. Understand the use of various Tool Bars

- 7.1 Describe the use of tool bars of AutoCAD classic i.e. Draw, Modify, Standards, Properties, Layers, Osnap, Dimension and their practical application.
- 10.1 Explain the procedure for creation of user tool bars.

## 8. Understand CAD Commands and their Aliases

- 8.1 Describe the use of 2D commands for plane figures.
- 8.2 Apply 2D commands to draw geometrical solid figures.
- 8.3 Apply 2D commands to draw isometric views.
- 8.4 Describe use of 2D commands for orthographic views.

## 9. Understand different Drafting Settings.

- 9.1 State the process of Units, limits, grid, snap, osnap and other options to prepare drawing with precision and easiness.
- 9.2 State steps involved in Model setting and layout setting.
- 9.3 State the use and setting of Layers and properties options settings,

## 10 Prepare 2D Drawings

- 10.1 State steps to prepare two roomed quarter.
- 10.2 State steps to prepare Plans, elevation and sections of buildings.

## 11 Understand how to Dimension a drawing & add Text in it.

- 11.1 State Dimensioning types, styles & application

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## 11.2 Text settings & application

### **12 3D Commands / 3D MAX.**

- 12.1 State how to draw Solid figures
- 12.2 State steps how to Modification of solid figures
- 12.3 State steps to Convert of 2D into 3D
- 12.4 State steps to Shading and Rendering of existing drawing.
- 12.5 State multiple View setup
- 12.6 State the purpose of 3D Max.
- 12.7 State the interface of 3D Max software.
- 12.8 State the options available in menus and toolbars of 3D Max.
- 12.9 Apply 3D max on 3D drawings of AutoCAD.

### **13 Understand Plotting Procedure for hard copy output.**

- 13.1 State steps for Layout setting.
- 13.2 State steps how to setup a Print layout.
- 13.3 State steps in Use of printers and plotters



LIST OF PRACTICAL	HOURS
1 Draw manually architectural and structural drawing for a double storey RCC framed structure building (key plan, layout plan, detailed plan, elevations, sections, structural drawing of building components).	21
2 Draw manually structural drawing of raft foundation, grillage foundation, well foundation.	9
3 Draw plan and section of staircases (dog legged, spiral).	6
4 Draw manually detailed drawing of steel trussed roof shed (60' x 40').	9
5 Draw detailed plan, sections and elevation doors( panelled, flush, wire gauzed)	9
6 Draw detailed sections for conglomerate floor and roof treatment.	6
7 Draw detailed drawings of irrigation channels.	3
8 Draw detailed drawing of RCC high level deck bridge 2 spans	9
9 Draw detailed drawing of masonry segmental arched 1 span	6
10 Draw detailed drawing of Steel plate girder bridge 1 span.	9
11 Draw sections of standard public health drains ( 12 Nos)	12
12 Detailed drawing of septic tank and soakage pit.	6
13 Practice of Installation of Auto CAD software	3
14 Practice of applying drafting setting (units, limits, snap, auto on. Off	3
15 Practice of various 2D commands i.e. Line, trim, offset, extend etc	15
16 Practice of using layer option	3
17 Practice of using dimensioning & text option	3
18 Practice of preparing plan, elevation & section two roomed quarter.	6
19 Practice of x-section & L-section of road & canal.	9
20 Practice of using basic 3D commands.	6
21 Practice to convert 2D single room into 3D	3
22 Practice of using 3D MAX Commands of above single room in 3D.	3
23 Practice of layout setting and printing of CAD drawing	9
24 Practice of drawing of overhead & underground Water Tanks (detailed) plan,	6
25 Elevation, steel reinforcement and sections) and setting layouts for plotting.	6
26 Practice of Plotting of drawing of overhead & underground Water Tanks (detailed plan, elevation, steel reinforcement and sections)	3
27 Practice of drawing of framed structure building ( detailed plan, elevation, steel reinforcement and sections) and setting layouts for plotting.	6
28 Practice plotting of drawing framed structure building.	3
29 Drawings of road structures and their plotting.	3
30 Practice Integration of Total Station with AutoCAD & MS Excel.	3

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**CIVIL-263****ENGINEERING MECHANICS**

<b>TOTAL CONTACT HOURS:</b>	<b>160</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	2	3	3
Practical:	96			

**AIM:** On completion, the student will understand and analyze the strength and behaviour of engineering materials & elementary structural members.

**COURSE CONTENTS**

- |          |   |         |
|----------|---|---------|
| <b>1</b> | <b>Centre Of Gravity(C.G)</b>   | 4 Hours |
| 1.1      | Introduction and definition of terms used.  |         |
| 1.2      | Methods of determining C.G  |         |
| 1.3      | Steps for the calculation of centroid of composite sections.  |         |
| 1.4      | Calculation of C.G. of various structural sections, i.e. I-Section, H-Section, T-section, Channel Section, Angle Section and Composite Section. |         |
| <b>2</b> | <b>Moment Of Inertia.</b>   | 4 Hours |
| 2.1      | Introduction and definition of terms used.  |         |
| 2.2      | Moment of Inertia of rectangle, triangle and circle.  |         |
| 2.3      | Theorems of perpendicular and parallel axes.  |         |
| 2.4      | Calculation of moment of inertia of common structural sections, I, T, Circular, Angle and Composite sections.                                   |         |
| 2.5      | Calculation of polar moment of inertia for circular sections.   |         |
| <b>3</b> | <b>Mechanical Properties of Materials</b>   | 2 Hours |
| 3.1      | Brief description of Tension, compression, hardness, Toughness, Brittleness, ductility, Resilience, Flexural.                                   |         |
| 3.2      | Brinell Hardness Test & Rockwell Hardness test.   |         |
| <b>4</b> | <b>Shear Force and Bending Moment.</b>  | 8 Hours |
| 4.1      | Definition of beam, support and load.   |         |
| 4.2      | Types of supports, beams and loads.   |         |
| 4.3      | Calculation of reactions for different types of Statically determinate beams  |         |
| 4.4      | Introduction to Shear force and bending moment.   |         |
| 4.5      | Calculation of S.F. & B. M. for different types of beams carrying Point loads, U.D.L. and combined loadings.                                    |         |

- 4.6 Draw S F D and B M D
- 4.7 Drawing of Shear Force Diagram, Bending Moment Diagram.
- 4.8 Calculation of maximum and minimum shear force and bending moments for the beams and their locations and Point of zero shear and point of contraflexure.
- 4.9 Standard rules and formulas for S.F. and B.M.
- 5 Simple Stresses and Strains** 6 Hours
- 5.1 Introduction, definitions of stress
- 5.2 Description of strain
- 5.3 Hook's Law
- 4.10 Different moduli
- 5.4 Introduction of universal testing machine, tensile and compression test and stress-strain curve.
- 5.5 Numerical problems.
- 6 Stresses In Beams** 4 Hours
- 6.1 Types of stresses in beams (bending and shearing stresses).
- 6.2 Assumptions in simple bending
- 6.3 Bending equation
- 6.4 Normal stress distribution in beams of Rectangular section.
- 6.5 Practical application and simple problems, based on bending equation.
- 6.6 Shear stress in beams and distribution of shear stress for rectangular, circular and I-sections.
- 6.7 Problems based on shear stress
- 7 Biaxial Stresses** 6 Hours
- 7.1 Fundamental equations for normal stress and shear stress
- 7.2 Mohr's circle for biaxial stress.
- 7.3 General biaxial stress situation.
- 7.4 Graphical representation by Mohr's circle of stresses,
- 7.5 Principal stresses and principal planes.
- 7.6 Maximum shear stress.
- 7.7 Steps for drawing Mohr's circle.
- 7.8 Numerical problems.
- 8. Deflection of Beams.** 4 Hours
- 8.1 Introduction and significance of deflections
- 8.2 Name of various methods of deflection calculation.
- 8.3 Maximum deflection in different types of beams.
- 8.4 Formula for calculation of maximum deflection in cantilever and simply supported beams for various loading conditions.

- 8.5 Problems of beam deflection by moment area method.
9. **Column.** 6 Hours
- 9.1 Introduction of different terms used
- 9.2 Failure patterns of columns
- 9.3 Buckling load, crushing load, safe load, F.O.S, slenderness ratio, radius of gyration, fatigue, effective length of column
- 9.4 End conditions of column
- 9.5 Euler's formula and Rankine's formula
- 9.6 Numerical problems based on Euler's and Rankine's formulae.
10. **Riveted Joints.** 4 Hours
- 10.1 Introduction to different terms related to riveted joints.
- 10.2 Different types of riveted joints.
- 10.3 Failure of riveted joints, strength and efficiency of a joint.
- 10.4 Design of riveted joints, strength, efficiency and pitch.
11. **Welded Joints.** 3 Hours
- 11.1 Introduction and comparison of riveted and welded joints.
- 11.2 Types of welded joints.
- 11.3 Design of welded joint, fillet welds only (strength and dimension).
12. **Fundamentals of Steel Structures** 2 Hours
- 12.1 Introduction to Steel Structures
- 12.2 Merits of Steel Construction
- 12.3 Demerits of Steel Construction
- 12.4 Types of Structural Steel
- 12.5 Hot Rolled Structural Shapes
- 12.6 Cold-formed Shapes
- 12.7 Built-up Sections
- 12.8 Cladding
13. **Trusses** 6 Hours
- 13.1 Introduction of truss, steel truss, parts.
- 13.2 Methods of truss analysis.
- 13.3 Determination of forces in members of statically determinate trusses by method of section and method of joints.
14. **Retaining Walls.** 5 Hours
- 14.1 Introduction and description of terms used.

- 14.2 Pressures on retaining wall and stresses at base (toe and heel) Rankine's formula and application.
- 14.3 Stress distribution diagram.
- 14.4 Conditions of stability of retaining wall.
- 14.5 Checking stability of retaining wall.
- 14.6 Numerical problems

**RECOMMENDED / REFERENCE BOOKS:**

- 1 Strength of Materials: **Singer.**
- 2 Strength of Materials: **William A. Nash.**
- 3 Strength of Materials: **R.S. Khurmi.**
- 4 Mechanics of Solids: **F. Warnik.**
- 5 Elementary Structural Analysis : **Schneider**
- 6 Strength of Materials : **G.H. Ryder**
- 7 Mechanics of Structures : **Junarkar**
- 8 Strength of Materials for Civil Engineers: **T. H. G. Megson,** [1987], Van Nostrand Reinhold, UK
- 9 Elementary Structural Analysis: **Charles Head Norris, John Benson Wilber and Senol Utku,** [1987], McGraw-Hill Singapore
- 10 Steel Structures(Revised Second Edition): **Zahid Ahmed Siddiqui & Muhammed Ashraf**

**INSTRUCTIONAL OBJECTIVES****1. Understand the Concept and Computation of Center of Gravity**

- 1.1 Define and explain the terms: Center of gravity, Centroid, first moment of area, reference axes, centroidal axes and symmetrical axes.
- 1.2 Describe the methods of finding center of gravity.
  - By geometrical consideration
  - By the method of moments
- 1.3 Explain the steps for the calculation of centroid of composite sections
- 1.4 Determine position of C. G. for various structural sections i.e. I-section, H-section, T-section, channel section, angle section, Z-section and composite sections by method of moments.

**2. Understand the Concept of Moment of Inertia and its Determination**

- 2.1 Define moment of inertia, second moment of area, polar moment of inertia, radius of gyration and their units.
- 2.2 State moment of inertia of simple geometrical shapes; rectangle, triangle and circle etc (their formulae).
- 2.3 State perpendicular and parallel axes theorems.
- 2.4 Determine moment of inertia of simple and composite sections by applying parallel axes theorem with sketches.
- 2.5 Determine polar moment of inertia for circular section applying perpendicular axes theorem

**3. Understand the Mechanical Properties of Material.**

- 3.1 Define Hardness Tension, compression, hardness, Toughness, Brittleness, ductility, Resilience, Flexural..
- 3.2 Explain Hardness tests; (a) Brinell's Hardness test (b) Rockwell Hardness test (c) limitations of Brinell's hardness test (d) comparison of Brinell & Rockwall hardness tests..

**4. Determine Shear Force and Bending Moment, Draw S.F.D. & B.M.D.**

- 4.1 Define beam, support and load.
- 4.2 State difference between statically determinate and indeterminate structures.
- 4.3 Calculate reactions for simply supported, overhanging and cantilever beams under various loading conditions (Point loads-U.D.L & Combined loading).
- 4.4 Explain shear force & Bending Moment in beams and their significance.
- 4.5 Calculate shear forces and Bending Moments at various sections of different types of beam, under different loading conditions (Point loads-U.D.L & Combined loadings).
- 4.6 Draw shear force and Bending Moment diagrams of beams (simply supported

beam, over hanging beam & cantilever beam).

- 4.7 Calculate maximum and minimum shear force and bending moment and determine their positions.
- 4.8 Explain Point of zero shear, point of contraflexure and their significance and calculations.
- 4.9 State standard formulas for shear force and bending moments for:
  - Simply supported beam subjected to a central point load and U.D.L on a whole span.
  - Cantilever beam subjected to a point load at free end and U.D.L on whole span.

## **5. Understand Behavior of Materials under Simple Stress.**

- 5.1 Define and explain the terms stress, and its types (tensile, compressive and shear)
- 5.2 Define and explain strain, its types (tensile, compressive, shear, linear, lateral and volumetric) and poisson's ratio.
- 5.3 Define and explain Hook's Law.
- 5.4 State modulus of elasticity, modulus of rigidity and bulk modulus.
- 5.5 Explain mechanical properties of materials like elasticity, plasticity, ductility, brittleness and hardness, etc.
- 5.6 Identify parts and attachments of U.T.M for tensile and compression tests. Also explain the salient points in stress strain curve for ductile material.
- 5.7 Numerical problems relating to simple stress, strain, Poisson's ratio and Hook's Law.

## **6. Understand the Shear and Bending Stresses in a Beam.**

- 6.1 Explain the types of stresses in beams (Bending & Shear stresses).
- 6.2 State the assumptions made in theory of simple bending.
- 6.3 State and explain bending equation.
- 6.4 Explain Bending stress distribution across rectangular section.
- 6.5 Solve problems on theory of simple bending.
- 6.6 State formula for shear stress and shear stress distribution across rectangular, circular & I-sections of beam.
- 6.7 Solving problems on shear stress.

## **7. Biaxial Stresses**

- 7.1 State fundamental equations for normal stress and shear stress.
- 7.2 Explain Mohr's circle for biaxial stress.
- 7.3 Describe general biaxial stress situation.
- 7.4 Describe graphical representation by Mohr's circle of stresses.
- 7.5 Explain principal stresses and principal planes.
- 7.6 Explain maximum shear stress.

7.7 State steps for drawing Mohr's circle.

7.8 Solve numerical problems on normal stresses and shear stresses, principal stresses and maximum shear stresses.

## **8. Understand Deflection of Beams under Loading.**

8.1 Define deflection of beam and state its significance.

8.2 Name various methods of deflection calculation i.e. moment area method, double integration method, Macaulay's method and unit load method, etc.

8.3 State maximum deflection in different types of beams.

8.4 State formulae for calculation of maximum deflection in cantilever & simply supported beam for following loading conditions.

### **a. For cantilever beam.**

i Point load at free end.

ii U.D.L on full span.

iii U.D.L covering a part of span from fixed end

iv combination of above loads

### **b. For simply supported beam.**

i Point load at mid span.

ii U.D.L on whole span.

iii Combination of above loads.

8.5 Solve problems of beam deflection by moment area method for above beams and loading conditions.

## **9. Understand the Behaviours of Columns under Axial Loads.**

9.1 Define the terms: column, strut, long column, short column, axial and eccentric loading

9.2 State failure patterns of short and long columns.

9.3 Define the terms: buckling load, crushing load, safe load, F.O.S, slenderness ratio, radius of gyration, fatigue, effective length, etc.

9.4 State four end conditions for the calculation of effective length of column.

9.5 State Euler's formula & Rankine's formula for calculating ultimate load.

9.6 Practice of numerical problems based on Euler's and Rankine's formulae.

## **10. Understand the Behaviour of Rivetted Joint.**

10.1 Define terms: Pitch, back pitch, margin, edge distance, nominal diameter of rivets, gross dia of rivets.

10.2 Explain the different types of riveted joints.

10.3 Explain failure strength and efficiency of riveted joints.

10.4 Calculate the strength, efficiency, pitch etc, of riveted joints.

## **11 Understand the Behavior of Welded Joints.**

11.1 Define welded joint and compare riveted joints and welded joints



- 11.2 State different types of welded joints
- 11.3 Calculate strength & dimensions of fillet welded joints only.

## **12 Understand the theoretical fundamental concepts of Steel Structures**

- 12.1 State the types of steel structures
- 12.2 Describe the merits of steel construction
- 12.3 Describe the demerits of steel construction
- 12.4 State the types of structural steels
- 12.5 Describe and sketch the hot rolled structural shapes
- 12.6 Describe and sketch the cold formed shapes
- 12.7 Describe and sketch the built-up sections
- 12.8 Define cladding

## **13 Understand the Effect of Loads on Statically Determinate Truss.**

- 13.1 Define truss, state types and parts of steel trusses.
- 13.2 State methods of truss analysis.
- 13.3 Determine forces in members of statically determinate truss by method of joints & method of sections.

## **14 Understand Stability and Stresses Developed in Retaining Walls.**

- 14.1 State the terms: retaining wall, classification of retaining wall, angle of repose, level & surcharge backing, active and passive earth pressure.
- 14.2 Explain the pressures on retaining wall and stresses at base (toe and heel) Rankine's formula and its applications.
- 14.3 Describe the stress distribution diagram at base of the retaining wall.
- 14.4 Describe conditions of stability of retaining walls.
- 14.5 Check and compare the results of stability of retaining walls with standards in numerical problems.
- 14.6 Numerical problems relating to stresses at base of retaining wall.

LIST OF PRACTICALS	HOURS
1. Solving problems of centroid for composite sections.	3
2. Solving problems of M.O.I for composite sections.	6
3. To find the relation between the stress and strain of a given copper wire with the help of a Young's modulus apparatus. Plot a graph between the stress and strain. Hence find the Young's modulus of the material of the wire.	3
4. To find tensile strength of a mild steel specimen plotting and interpretation of stress strain curve.	6
5. Draw S.F.D. and B.M.D in case of simply supported beams under various loading conditions.	3
6. Draw S.F.D. & B.M.D in case of over hanging beams under various loading conditions.	6
7. Draw S.F.D & B.M.D of cantilever beams under various loading conditions.	6
8. Practice in designing the homogeneous beam by simple bending equation.	6
9. Drawing of bending and shear stress distribution for symmetrical sections of beams.	3
10. Solving problems on principal stresses and maximum shear stress and drawing Mohr's circle.	9
11. Show by means of deflection of beam apparatus that the deflection is proportional to the cube of span also draw a graph and also show that the deflection is proportional to the load.	6
12. Solving problems on deflection of beams	6
13. Solving problems on Euler's and Rankine's formulae.	6
14. Design & drawing of butt-joint and lap joint.	6
15. Design problems on welded joints	6
16. Practice in finding stresses in various members of a given truss by joint and section methods.	6
17. Check stability of given retaining wall.	6
18. Sketch stress distribution diagrams for retaining walls.	3

**DAE CIVIL TECHNOLOGY  
YEAR 2**

**CIVIL-271****ENTREPRENEURSHIP**

<b>TOTAL CONTACT HOURS:</b>	<b>32</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	32	<b>1</b>	<b>0</b>	<b>1</b>
Practical:	0			

**AIM:**

The student will be able to understand the procedures governing estimation of earth work and complete estimate of single storey building in order to:

- 1- Understanding the concept and elements of small business enterprise.
- 2- Apply the techniques for generating business ideas as well as for identifying and assessing business opportunities.
- 3- Understand the procedures required for establishing an enterprise.
- 4- Understand the procedures for assessing market and for selecting location for a small business.
- 5- Understand the importance of financial record keeping in a small business.
- 6- Develop business plan and evaluate it in real market situation.
- 7- Apply the concepts of Chemical / Pharmaceutical Engineering on planning, designing and layout of related technical projects.

**COURSE CONTENTS**

- |  |                    |
|--|--------------------|
| <b>1- Entrepreneurship and Management</b>  | <b>4Hours</b>      |
| 1.1 The concept of entrepreneurship  |                    |
| 1.2 Entrepreneurial style Vs Managerial style  |                    |
| 1.3 Terminology used in entrepreneurship   |                    |
| 1.4 Classification of business; difference between social and commercial business  |                    |
| 1.5 Reasons for Entrepreneurship; importance in society, self employment, benefits & limitation, Importance of relations/links |                    |
| 1.6 Entrepreneurial motivation; setting goals and risk assessment.   |                    |
| 1.7 Small enterprises; elements, ideas, motivation, resources, business plan etc.  |                    |
| <br><b>2- Entrepreneurship and innovation</b>  | <br><b>3 Hours</b> |
| 2.1 Creativity and innovation; creativity potential, techniques for developing creative abilities                              |                    |
| 2.2 Business ideas; resources of business ideas, collective thinking and creative thinking,                                    |                    |
| 2.3 Risk involved in innovation  |                    |
| 2.4 Identifying and assessing business opportunities   |                    |

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- |  |         |
|--|---------|
| <b>3- Entrepreneurs</b>  | 5 Hours |
| 3.1 Entrepreneurial characteristics  |         |
| 3.2 Assessment of entrepreneurial potential; assessment of individuals   |         |
| 3.3 Entrepreneurial Leadership: abilities for a successful businessman   |         |
| 3.4 Self discipline; check list for attaining self discipline  |         |
| 3.5 Decision making skills; steps for decision making, rating of decision making skills  |         |
| 3.6 Principles of negotiation; resolving business issues through negotiation   |         |
| <b>4- Establishment of An Enterprise</b>   | 8 Hours |
| 4.1 Market; Five 'W' of market, competitors, assessment of market size & demand  |         |
| 4.2 Business location; importance, selection of site   |         |
| 4.3 Legal forms of business; Proprietorship, Partnership, limited company, Cooperative, advantages &disadvantages  |         |
| 4.4 Costing of product; direct and indirect cost   |         |
| 4.5 Break even analysis: fixed and variable costs, calculating break even indicates & applications   |         |
| 4.6 Finance & sources of financing; equity financing & loan financing, initial capital & working capital estimation  |         |
| <b>5- Management of an Enterprise</b>  | 8 Hours |
| 5.1 Hiring and managing people; hiring procedures, term & condition of services and Job description etc.   |         |
| 5.2 Managing sales & supplies; characteristics of successful sales personals, importance of advertisement, life cycle of product, selection of supplies, work order, delivery & payment etc. |         |
| 5.3 Management of capital; operating cycle concept, management of cash & stock etc.  |         |
| 5.4 Accounting and book keeping: cash book, balance sheet etc.   |         |
| 5.5 Income tax; income tax returns, computation of business income   |         |
| 5.6 Sales tax; basic scheme of sale tax, assessment of return etc  |         |
| <b>6- Business Plan</b>  | 4 Hours |
| 6.1 Purpose of business plan   |         |
| 6.2 Components of business plan; outline, process of writing business plan   |         |
| 6.3 Analysis of business plan: feasibility; breakeven point, evaluating problem in starting business   |         |
| 6.4 Standard business plan   |         |
-

**RECOMMENDED / REFERENCE BOOKS:**

- 1 Small Business and Entrepreneurship by Paul Burns and Jim Dew Hurst.
- 2 Innovation and Entrepreneurship By Peter F. Drucker
- 3 Entrepreneurial Success By John B. Miner
- 4 Entrepreneurship for economic Growth by P.N Singh
- 5 Knowing About Business (KAB), ILO

**INSTRUCTIONAL OBJECTIVES****1- Understand the concept and elements of Entrepreneurship**

- 1.1 Define entrepreneurship
- 1.2 Explain the concept of entrepreneurship
- 1.3 Explain the various types of enterprise that exist in the community
- 1.4 Identify and interpret the terms and elements involved in the concept of enterprise
- 1.5 Appreciate that the advancement of individual and society in general when entrepreneurship is adopted
- 1.6 Explain various motivational factors that entrepreneurs possess and utilize.
- 1.7 Exhibit the skills needed to assess and evaluate a risk
- 1.8 Describe the outline of small enterprise

**2- Understand the techniques for generating business ideas as well as for identifying and assessing business opportunities**

- 2.1 Describe the creativity and innovation
- 2.2 Apply the techniques for developing creative abilities
- 2.3 Explain the resources of business idea
- 2.4 Explain the collective and creative thinking
- 2.5 Explain how to generate a business idea
- 2.6 Appreciate the importance of, and possess techniques for identifying and assessing business opportunities.

**3- Understand personal characteristics needed to be a successful entrepreneur**

- 3.1 Identify the various entrepreneurial characteristics
- 3.2 Assess personal potential for becoming future entrepreneurs.
- 3.3 Identify leadership qualities which are essential to the success of entrepreneurs
- 3.4 Identify self- management skills and how they are important to be enterprising
- 3.5 Apply a rational approach to make personal and business decisions
- 3.6 Explain the steps for decision making and rating of decision making skills
- 3.7 Apply the rules of negotiation for resolving business issues

**4- Understand the procedures required for establishing an enterprise**

- 4.1 Describe the market & marketing
- 4.2 Differentiate between sellers and buyers' market
- 4.3 Describe the five 'w' of market
- 4.4 Explain the procedure for assessing the market size and demand
- 4.5 Explain the major factors to be considered when selecting a location for a business
- 4.6 Describe the basic types of business ownership and the limitation of each
- 4.7 Explain the computation of initial and working capital needed to start an

enterprise

- 4.8 Identify the advantages and disadvantages of using various sources of capital to start an enterprise
- 4.9 Explain the component of cost of product
- 4.10 Explain the break even analysis for a new business
- 4.11 Calculate the breakeven point for various new business

**5- Understand the various techniques that affect the management of an enterprise.**

- 5.1 Describe the hiring method/Procedures
- 5.2 Describe the term & conditions of services and job description for various employments
- 5.3 Describe the characteristics of successful sales personals
- 5.4 Describe the life cycle of product
- 5.5 Identify the various ways of selecting suppliers,
- 5.6 Explain the inventory management of stock, raw material and finished goods etc.
- 5.7 Appreciate the importance of financial record keeping in a small business
- 5.8 Explain techniques to keep cost as low as possible
- 5.9 Develop balance sheet for a small enterprise
- 5.10 Explain the operating cycle concept
- 5.11 Explain the income tax computation procedure for a small business
- 5.12 Explain the basic scheme of sales tax
- 5.13 Explain the assessment procedure for returns and filling of returns.

**6- Apply the entrepreneurship knowledge for development of business plan for a small business and evaluate in a real market situation.**

- 6.1 Appreciate the importance of business plan
- 6.2 Explain the process of writing a business plan
- 6.3 Develop feasibility for a business idea
- 6.4 Realize the problem that may be encountered when starting a small business/Enterprise
- 6.5 Develop a business plan for a small business on the standard format
- 6.6 Evaluate the business plan in a real market satiation

**DAE CIVIL TECHNOLOGY**  
**YEAR 3**

اسلام مہارت / مسما العہد ، آستانہ

سال سوئم  
حصہ اول اسلامیات

**تدریس مقاصد**

قرآن حکیم

- عمومی مقصد: منتخب سورتوں اور آیات کی روشنی میں اسلام کے بنیادی مقاصد اور عبادت جان سکے  
خصوصی مقاصد: طالب علم اس قتل ہو جائے گا کہ  
سورۃ الفاتحہ: آیتہ الکرسی۔ سورۃ بقرۃ 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 پادشاہی اللہ کی ہوگی
  - ☆ عبادت اور استعانت 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 ملا کہ کتب سلویہ پر ایمان لانا فرض ہے
  - ☆ اطاعت حقیقی صرف اللہ کے لیے ہے
  - ☆ اسلامی احکامات پر عمل کرنا انسانی بسلا 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



۶۱	احادیث کی تشریح کر سکے
۶۲	معاشرتی اور انفرادی زندگی میں احادیث سے رہنمائی حاصل کر سکے
	<b>حقوق و فرائض</b>
	عمومی مقصد: اسلامی معاشرے کا ایک اچھا فرد بن سکے
	خصوصی مقاصد:
۶۳	والدین کے حقوق و فرائض بیان کر سکے
۶۴	بسیوں کے حقوق بیان کر سکے
۶۵	اسلام میں حقوق و فرائض کی اگلی کی صورت میں اپنے اندر خدمت مطلق کا جذبہ پیدا کر سکے
	اسلامی اقدار
	عمومی مقصد: طالب علم جہاں سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہو رہا ہے
	خصوصی مقاصد
۶۶	اخلاق کے معنی و مفہوم کو بیان کر سکے
۶۷	اسلام میں حسن اخلاق کی اہمیت بیان کر سکے
۶۸	قرآن و سنت کی روشنی میں صبر و استقامت کی اہمیت بیان کر سکے
۶۹	اسلام میں غفور و درگزر کی اہمیت بیان کر سکے
۷۰	ایمانی عہد کی اہمیت بیان کر سکے
۷۱	انہوت کے معنی و مفہوم کو بیان کر سکے
۷۲	انہوت اسلامی کی اہمیت بیان کر سکے
۷۳	اسلام کی اعلیٰ قدر کو اپنا کر مثالی معاشرہ پیدا کر سکے

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کل وقت: 20 گھنٹے

GEN 511

نصاب (سہل سوئم)  
مظاہرہ پاکستان  
حصہ دوئم

### موضوعات

- ☆ قیام پاکستان
- ☆ پونڈری کمیشن
- ☆ ریڈ کلف ایوارڈ
- ☆ تقسیم بنگلہ و کلکتہ
- ☆ تقسیم پنجاب
- ☆ مسئلہ سماجی
- ☆ ریاست کالہاٹی
- ☆ ریاست جموں و کشمیر
- ☆ سری پٹی کا تنازعہ
- ☆ قرار داد مقاصد
- ☆ علماء کے بائیس نکات
- ☆ 1956-1962 اور 1973 کے دستاویز کی اسلامی دفعات
- ☆ پاکستان کا محل وقوع اور اس کی جغرافیائی اہمیت
- ☆ قدرتی وسائل (تیل-گیس-کونکرہ)

مطالعہ پاکستان (حصہ دوئم)

قیام پاکستان

تدریس مقاصد

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

خصوصی مقاصد:

- ☆ 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
- ☆ سری 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-کونکرہ) کے بارے میں بیان کر سکے

## (غیر مسلم طلباء کے لئے)

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Gen III

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

## (غیر مسلم طلباء کے لئے)

نصاب اخلاقیات

سل 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 اوارہ 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 ☆

پابھی احترام کی برکات سے استفادہ کر سکے ☆

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-303****ADVANCED QUANTITY SURVEYING**

<b>TOTAL CONTACT HOURS:</b>	<b>224</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	<b>32</b>	<b>1</b>	<b>6</b>	<b>3</b>
Practical:	192			

**AIM:** To understand :

1. Estimation of multi-storied buildings, R. C. C. bridges, water tanks including bar scheduling, etc.
2. Estimation of building services and wells
3. Application of software in estimation (MS EXCEL, AutoCAD Civil 3D)

**COURSE CONTENTS**

- |  |                |
|--|----------------|
| <b>1 Estimation of Framed Structure Buildings.</b>   | <b>6 Hours</b> |
| <ol style="list-style-type: none"> <li>1.1 Enlist different items of work for RCC Framed Structure Building.</li> <li>1.2 Instructions on calculation of quantities of different items of work.</li> <li>1.3 Instructions on calculation of quantity of structural steel work, beams and columns of different shape (I, L, H, etc) and truss of 60' span (60x100 shed)</li> <li>1.4 Instructions on Preparation of Abstract of Cost &amp; Bar Bending Schedule</li> </ol>  |                |
| <b>2 Estimation of Bridge and Water Tanks</b>  | <b>5 Hours</b> |
| <ol style="list-style-type: none"> <li>2.1 Enlist different items of work for RCC Over Head Deck Bridge and single span masonry arch culvert.</li> <li>2.2 Instructions on calculation of quantities of different items of work.</li> <li>2.3 Instructions on preparation of Abstract of Cost.</li> <li>2.4 Enlist different works for RCC Over Head and Under Ground Water (polygonal with flat slab and Circular with segmental top slabs)</li> <li>2.5 Instructions on calculation of quantities of different items of work for steel plate Girder Bridge.</li> <li>2.6 Estimation of single span plate girder steel bridge 40' span</li> </ol> |                |
| <b>3 Rate analysis for various items of building work viz, cement conglomerate floor, Tile work flush door., Manhole, Sewer line, Bituminous road components</b>   | <b>2 Hours</b> |
| <b>4 Building Services Estimation.</b>   | <b>5 Hours</b> |
| <ol style="list-style-type: none"> <li>4.1 Introduction on calculation of quantities of various items of work for C Class residence           <ol style="list-style-type: none"> <li>1. Water supply installations</li> <li>2. Sanitary installation</li> <li>3. Septic tank for 25 users</li> </ol> </li> </ol>   |                |

4. Soakage pit for 25 users
5. Electrification
6. Telephone and cable
7. Gas installations

## 5 Well Estimation

3 Hours

- 5.1 Calculation of quantities of for tube well:
  - Tube well boring
  - Lowering of pipes
  - Turbine installation and accessories
  - Pump rooms
  - External Electrification
- 5.2 Excavation of Persian well
- 5.3 Estimate for Construction and sinking of Persian well.

## 6 Application of Softwares

### MS EXCEL

5 Hours

- 6.1 Instructions regarding use of MS EXCEL software.
- 6.2 Prepare detailed estimate for framed structure building in MS EXCEL.
- 6.3 Prepare detailed estimate for water tanks in MS EXCEL.
- 6.4 Prepare detailed estimate for Bridge in MS EXCEL.
- 6.5 Prepare detailed estimate for Building Services in MS EXCEL.
- 6.6 Prepare detailed estimate for Tube well and Persian well in MS EXCEL.
- 6.7 Prepare hydraulic statement of water supply and sewerage schemes in MS EXCEL.
- 6.8 Earthwork calculations, Bituminous Road, Rate analysis, materials statement in MS EXCEL.

### AutoCAD Civil 3D

6 Hours

- 6.9 Loading and unloading of AutoCAD Civil 3D.
- 6.10 Interface and Workspaces of AutoCAD Civil 3D,
- 6.11 Toolspace, panorama, Templates, Settings, and Styles
- 6.12 AutoCAD Civil 3D Projects, Sharing Data, Using Data Shortcuts for Project Management
- 6.13 Create and edit parcels and print parcel reports
- 6.14 Create points and point groups and work with survey figures
- 6.15 Create, edit, view, and analyze surfaces
- 6.16 Create and edit alignments
- 6.17 Create data shortcuts
- 6.18 Create sites, profiles, and cross-sections
- 6.19 Create assemblies, corridors, and intersections
- 6.20 Create grading solutions
- 6.21 Create gravity fed and pressure pipe networks
- 6.22 Perform quantity takeoff and volume calculations
- 6.23 Use plan production tools to create plan and profile sheets
- 6.24 Steps in designing a project in AutoCAD Civil 3D.
- 6.25 Design of a road project for 1 km length as per data collected from the civil engineering project.

**RECOMMENDED / REFERENCE BOOKS:**

1. Estimating and Costing: ***G.S. Bridge.***
2. Estimating and Costing in Civil Engineering: **B.N. Dutta**, [2005], UBSPD, New Delhi
3. Estimating and Costing: ***Rangwala.***
4. Civil Estimating and Costing: ***A.K. Upadhyay***
5. Estimating and Costing (Civil): ***Kohli & Kohli.***
6. AutoCAD Civil 3D Tutorials
7. MS Excel and AutoCAD Civil 3D Help reference



**INSTRUCTIONAL OBJECTIVES****1. Under Stand Procedure for Estimation of Framed Structure Buildings.**

- 1.1 State list of different items of work for RCC Framed Structure Buildings.
- 1.2 Know procedure on Calculation of quantities of different items of work. including steel reinforcement
- 1.3 Prepare of Abstract of Cost & Bar schedule.
- 1.4 Workout quantities and cost of steel roof trussed shed of size 60ft x 100 ft.

**2. Estimation of Bridge and Water Tanks**

- 2.1 State list of different *items of* work for RCC Over Head Deck Bridge and single span masonry arch culvert.
- 2.2 Know procedure on Calculation of quantities of different items of work.
- 2.3 Prepare Abstract of Cost.
- 2.4 Enlist different works for R. C. C. Over Head and Under Ground Water (, polygonal with flat and Circular with segmental top slabs)
- 2.5 Know procedure on Calculation of quantities of different items of work for plate Girder Bridge.
- 2.6 Prepare of Abstract of Cost
- 2.7 Workout quantities and cost of plate girder steel bridge 40 ft span

**3. Understand Rate Analysis For Various Items Of Building Work**

- 3.1 Prepare rate analysis for cement conglomerate floor,
- 3.2 Prepare rate analysis for Tile work
- 3.3 Prepare rate analysis for flush door.,
- 3.4 Prepare rate analysis for Manhole,
- 3.5 Prepare rate analysis for Sewer line,
- 3.6 Prepare rate analysis for Bituminous road components

**4. Understand Building Services Estimation**

- 4.1 Enlist different items of work for water supply and gas installations for a building
- 4.2 Instructions on calculations of quantities for water supply and gas installations for the buildings
- 4.3 Enlist different items of work for sanitary installations for a building
- 4.4 Instructions on calculations of quantities for sanitary installations for the buildings
- 4.5 Instructions on calculations of quantities for Septic tank for 25 users.
- 4.6 Instructions on calculations of quantities for Soakage pit for 25 users
- 4.7 Enlist different items of work for electrification, telephone and cable installations for a building
- 4.8 Instructions on calculations of quantities for electrification, telephone and cable installations for the buildings

## 5. Understand Estimation of Wells

- 5.1 Explain to work out the quantities of various items of under mentioned works:
- 5.2 tube well boring
- 5.3 lowering of pipes
- 5.4 pump/turbine installation and accessories
- 5.5 Pump room/Station
- 5.6 External Electrification
- 5.7 Enlist different items of work for the construction of Persian well
- 5.8 Explain the procedure for working out quantities of various items of work for Persian well

## 6. Understand Softwares Used for Estimation and Planning

- 6.1 Instructions for application of formulae for estimation of civil engineering structures in tabulated form in MS EXCEL
- 6.2 Explain purpose of AutoCAD Civil 3D software in project designing
- 6.3 State interface of AutoCAD Civil 3D
- 6.4 State Toolspace, panorama, Templates, Settings, and Styles
- 6.5 Explain AutoCAD Civil 3D Projects, Sharing Data, Using Data Shortcuts for Project Management
- 6.6 Describe how to Create and edit parcels and print parcel reports
- 6.7 Describe how to Create points and point groups and work with survey figures
- 6.8 Describe how to Create, edit, view, and analyse surfaces
- 6.9 Describe how to Create and edit alignments
- 6.10 Describe how to Create data shortcuts
- 6.11 Describe how to Create sites, profiles, and cross-sections
- 6.12 Describe how to Create assemblies, corridors, and intersections
- 6.13 Describe how to Create grading solutions
- 6.14 Describe how to Create gravity fed and pressure pipe networks
- 6.15 Describe how to Perform quantity take-off and volume calculations
- 6.16 Describe how to Use plan production tools to create plan and profile sheets
- 6.17 State Use of Tools and Commands for project designing
- 6.18 Prepare a road project for 1000 m length.

**LIST OF PRACTICALS****HOURS**

- |   |    |
|---|----|
| 1. Complete estimate of a small two storeyed R. C. C. frame structure building (of given drawing) including bar scheduling and abstract of cost.  | 27 |
| 2. Complete estimate of steel roof shed 60' x 40'.  | 09 |
| 3. Complete estimate of brick masonry 8' span segmental arched culvert.   | 15 |
| 4. Complete estimate of R. C. C. Bridge (high level Three Spans Bridge) including bar scheduling and abstract of cost.  | 18 |
| 5. Complete estimate of R. C. C. rectangular masonry underground water tank   | 3  |
| 6. Complete estimate of R. C. C. circular masonry underground water tank  | 3  |
| 7. Complete estimate of R. C. C. hexagonal masonry underground water tank   | 3  |
| 8. Complete estimate of R. C. C. rectangular masonry underground water tank having tank bed level higher than those of walls.   | 3  |
| 9. Complete estimate of R. C. C. under ground water tanks and overhead water tank.  | 6  |
| 10. Complete estimate of single span plate girder steel bridge 20' span   | 12 |
| 11. Complete estimate of Building services i.e. internal electrification of C type residential building.  | 3  |
| 12. Complete estimate of Building services i.e. water supply and Gas installations of C type residential building.  | 6  |
| 13. Complete estimate of Building services i.e. sanitary of C type residential building.  | 3  |
| 14. Preparation of rough cost estimate of sewerage scheme comprising of 1000 ft sewer line, min 10 manholes and 5 branches of min 2 sizes of sewer including analysis of rates for works and preparation of hydraulic statement..   | 9  |
| 15. Complete estimate of Septic tank and Soakage pit for 25 users.  | 6  |
| 16. Use of MS EXCEL software in estimation (Prepare detailed estimate for framed structure building, water tanks, Bridge, Building Services, Tube well and Persian well, hydraulic statement of water supply and sewerage schemes, Earthwork calculations, Bituminous Road, Rate analysis, materials statement in MS EXCEL. | 30 |
| 17. Use of AutoCAD Civil 3D software for Design of a road project for 1 km length as per data collected from the civil engineering project.   | 36 |

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-314 CONSTRUCTION PROJECT PLANNING & MANAGEMENT**

<b>TOTAL CONTACT HOURS:</b>	<b>256</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	<b>64</b>	<b>2</b>	<b>6</b>	<b>4</b>
Practical:	192			

**AIM:**

The student will understand the theory and practice in managerial concepts and points required in the planning and execution of a civil engineering project with a view to achieve the desired goal by use of computer software.

**COURSE CONTENTS**

<b>1</b>	<b>Introduction.</b>	<b>4Hours</b>
1.1	Objectives and functions of Project Management.	
1.2	Construction stages.	
1.3	Types of civil engineering projects.	
1.4	Classification of works-original, major, minor & petty work, annual repair and special repair works.	
1.5	Parties/Professionals - scope of duties & responsibilities of construction team	
1.6	Project Management Life Cycle	
<b>2.</b>	<b>Organization Aspects</b>	<b>4 Hours</b>
2.1	Forms of organizations-	
2.2	Organizational structure of different engineering departments-duties of various officers/officials, power of sanction of various officers.	
2.3	Classes of Establishment in works department.	
2.4	Essential qualities of project Manager	
<b>3.</b>	<b>Preliminary Planning.</b>	<b>4 Hours</b>
3.1	Preliminary aspects of planning.	
3.2	Pre feasibility study.	
3.3	Types of feasibility study.	
3.4	Steps involved in feasibility study.	
3.5	Collection of data and preparation of project report.	
<b>4.</b>	<b>Construction Planning.</b>	<b>10 Hours</b>
4.1	Construction activities.	
4.2	Construction schedule, rate of executing work, time calculations.	
4.3	Material, labour and equipment schedule.	
4.4	Procurement of labour, material and equipment.	
4.5	Planning by bar chart/time and progress chart Gantt Chart	
4.6	Project planning with net work analysis (CPM)-terms used, advantages of CPM.	
4.7	Steps in CPM method-preparation of net work, critical path, determination of	

- network time.
- 4.8 Review of network and crash programming
- 4.9 Preparation of work progress charts.
- 4.10 Site organization of a construction job.
- 5. Planning and Management of Construction** 6 Hours
- 5.1 Characteristics, operations and safety of construction machinery
- 5.2 Cost of owning and operating construction machinery
- 5.3 Main factors in selection of construction machinery
- 5.4 Productivity of different construction machinery, e.g. Bulldozer, Excavator, etc
- 6. Planning Scheduling & Monitoring with Primavera P6** 10 Hours
- 6.1 Navigation:** Introduction to Primavera P6, Understanding the benefits of true Enterprise Project Management systems, Logging In, Understanding the Views and Layouts, Customizing Layouts.
- 6.2 Enterprise Project Structure** Understanding the Enterprise Project Structure, Modifying the EPS
- 6.3 Project Creation** Preparing and Creating a new project
- 6.4 The Work Breakdown Structure** Defining and modifying a Work Breakdown Structure
- 6.5 Adding Activities** : Describing an Activity and its attributes, Working with Activity Types, Adding Activities, Understanding Duration Types, Importing Activities, Assigning Activity Codes, Adding Activity Steps
- 6.6 Relationships and Constraints:** Relationship Types, Creating Relationships, Performing a Forward and Backward Pass, Apply a Constraint to an Activity, Critical Path Method, Modifying the Project Duration
- 6.7 Formatting Project Data:** a. Formatting overview, b. Grouping, c. Sorting, d. Filtering
- 6.8 Roles and Resources:** Describing Roles and Resources, Assigning Roles to an Activity, Assign Rates on Roles, Assigning Resources, Displaying the Resource Usage Profile, Analyzing Resource Assignments
- 6.9 Analysis, Risks and Issues:** Analysis overview, Adjusting the Project Schedule, Analysing Resource Availability, Entering Risks, Entering Issues, Using Thresholds to monitor Issues
- 6.10 Baselines:** Baselines overview, Creating a Baseline Plan, Display Baseline Bars on the Gantt Chart, Setting up a Baseline view
- 6.11 Project Execution:** Project execution overview, Status update methods, Progressing activity status, Progressing activities using steps, Rescheduling the Project, Summarizing Projects, Working with Reflections, Monitoring Issues using Thresholds
- 6.12 Reporting:** Reporting overview, Describing Reporting Methods, Running a Schedule Report, Creating a report with the Report Wizard
- 7. Inspection and Quality Control** 6 Hours
- 7.1 Duties of inspecting officers-Assistant Engineer, Executive Engineer etc

- 7.2 Duties of sub-engineer-regarding works, stores and accounts, Handing over and taking over charge. Including duties of Sub Engr. Railways and his responsibilities about record keeping.
- 7.3 Site order book-principles of supervision.
- 7.4 Quality control-enforcement of specifications, sampling and testing materials.

## 8. Methods of Execution of Works.

4 Hours

- 8.1 Departmental execution of works - daily labour, day work and piece work
- 8.2 Contract:-
  - 8.2.1 Definitions-contract, tender.
  - 8.2.2 Types of contracts-Lumpsum contract, item rate contract, cost plus fee contract, cost plus percentage contract, labour contract, Negotiated rate contract, turn-key contract and package contract etc.
  - 8.2.3 Merits and limitations of each contract system.
- 8.3 Work order-difference between work order and contract.

## 9 Tendering

6 Hours

- 9.1 Pre-requisite for tendering-administrative approval, technical sanction, Budget provision and allocation of funds
- 9.2 Invitation of tenders- by negotiation, selective tenders and public notice.
- 9.3 Prequalification of Bid. Tender notices - Characteristics, instruction on calling tender.
- 9.4 Tender document-components, condition of contract, special condition of tender, guarantees from tender, tender fee, Tender report.
- 9.5 Submission of tenders/bids-instruction to bidders.
- 9.6 Earnest money, security deposit.
- 9.7 Opening of tenders, tender evaluation, scrutiny of tenders, comparative statement, acceptance of tenders, Bid bond, performance bond, and insurance bond.
- 9.8 Award and commencement of work, possession of site.
- 9.9 Mobilization advance, secured advance, retention money.
- 9.10 Conditions of contract agreement-penalty, Liquidated damages, time of completion, Extension of time, termination of contract, Arbitration Delays.
- 9.11 Variation order

**10 Work Records and Payment.**

6 Hours

- 10.1 Measurement Book (MB), standard measurement book, rules to be followed in recording measurements, preparation of abstract of payment in measurement book, irregularities in M.B.
- 10.2 Muster-roll, preparation, daily labour report, casual labour.
- 10.3 Preparations of bills, running bills, final bills, deductions to be made from bills checking of bills, value engineering, cost accounting (interim payment certificate)
- 10.4 Mode of payment-bills, vouchers, first and final bill, interim payment, final payment, advance payment, secured advance payment, bill forms, Hand receipt, imprest, recoverable payments.
- 10.5 Terms-competent authority, controlling officer, Disbursing officer, Divisional officer, contingencies of work, deposit work, supervision charges, issue rate, market rate, storage rate and charges, suspense account.
- 10.6 Major expenditure heads-major head, minor head, sub head and detailed head.

**11 Stores.**

4 Hours

- 11.1 Classification of stores - stock, tools and plants, Road metal and materials charged direct to the work.
- 11.2 Stock-sub-heads of stock receipts and issue of stock, stock account, Register of stock receipts and issues, shortages and surpluses of stock, monthly stock account.
- 11.3 Material at site account, Road metal account.
- 11.4 Tools and plants-sub heads of tools and plants, Issues and receipts of T & P, T & P account, verification of tools and plants (Shortage and surplus).
- 11.5 Principles of storing materials, Location of T & P protection of stores, store room record, bin card, ordering procedure of store.
- 11.6 Indenting of materials-instruction for preparation of indents, specifications, and supply procedures in works departments.

**RECOMMENDED / REFERENCE BOOKS:**

1. Construction Management and Accounts: Vazirani.
2. Estimating and Costing: B. N. Dutta.
3. Professional practice: Vazirani.
4. Rasul Manual on P.W. Accounting
5. Primavera Manual P6
  1. Primavera P6 R8.2 Software Manual:  
[http://tollintl.vpweb.com/upload/p6\\_professional\\_users\\_guide.pdf](http://tollintl.vpweb.com/upload/p6_professional_users_guide.pdf)
  2. PSP Certification Study Guide:  
<http://tollintl.vpweb.com/upload/PSP%20Certification%20Study%20Guide.pdf>
  3. Primavera P6 Training Manual:  
[http://www.dot.ca.gov/hq/construc/publications/CPM\\_P6\\_User\\_Manual\\_v1.pdf](http://www.dot.ca.gov/hq/construc/publications/CPM_P6_User_Manual_v1.pdf)

6. Manual on Project Scheduling, Transportation Department, California
7. P6 Professional Use Guide “ORACLE”
8. Professional practice: **Roshan Nama Vati**

## INSTRUCTIONAL OBJECTIVES

### 1. Understand Management, Functioning of Civil Engineering Projects

- 1.1 Explain the objectives and functions of project management
- 1.2 Explain the different stages and activities involved in construction projects i.e. planning stage, designing stage, tendering stage and execution stage.
- 1.3 State the types of civil engineering projects
- 1.4 State the classification of works
- 1.5 List the parties/persons involved in a construction project
- 1.6 Explain the importance and role of each member of construction team
- 1.7 Explain project management life cycle i.e. project initiating, planning, execution and project closer.

### 2. Understand Organization and Organizational Structure of Govt Engineering Departments

- 2.1 Explain that organizations i.e. line staff, direct and functional organization, their features, merits and demerits giving merits and demerits of each
- 2.2 List the engineering departments of government
- 2.3 Draw organizational chart of C&W department Irrigation & power department, public Health Engineering department
- 2.4 List the duties of different officers of works departments
- 2.5 State the power of sanction of various officers of works departments
- 2.6 Explain the classes of establishments in works department
- 2.7 State Essential qualities of project Manager

### 3. Understand Various Aspects of Preliminary Planning

- 3.1 Explain the importance of preliminary planning
- 3.2 Explain Pre feasibility study.
- 3.3 Explain Types of feasibility study.
- 3.4 Explain Steps involved in feasibility study.
- 3.5 Explain difference between feasibility report and project report
- 3.6 Explain the data to be collected and aspects to be considered in feasibility report
- 3.7 Explain aspects to be considered during preparation of project report

### 4. Understand the Principles of Planning and Organizing a Construction Project



- 4.1 State the objectives of scheduling
- 4.2 Break down the constructions work in to activities
- 4.3 Explain the procedure of making constructions schedule i.e. sequencing and time computation of each activity
- 4.4 State the need for material, equipments and Labour schedule
- 4.5 Explain methods of procurement of Labour, materials and equipments
- 4.6 Prepare bar chart and explain its limitation
- 4.7 Explain the advantages of project planning by network analysis (only with critical path method)
- 4.8 Plan and draw c.p.m network for a construction project
- 4.9 Calculate net work time, critical path, free float and total float
- 4.10 Draw progress charts for a construction project

## **5. Understand the Methodologies behind Planning and Management of Construction**

- 5.1 Explain characteristics, operations and safety of construction machinery
- 5.2 Explain cost of owning and operating construction machinery
- 5.3 List main factors in selection of construction machinery
- 5.4 Describe productivity of different construction machinery, e.g. Bulldozer, Excavator, etc

## **6. Understand the Planning Scheduling & Monitoring with Primavera P6**

- 6.1 Describe Navigation: Introduction to Primavera P6, Understanding the benefits of true Enterprise Project Management systems, Logging In, Understanding the Views and Layouts, Customizing Layouts.
- 6.2 Describe Enterprise Project Structure Understanding the Enterprise Project Structure, Modifying the EPS
- 6.3 Describe Project Creation i.e. Preparing and Creating a new project
- 6.4 Explain Work Breakdown Structure and to Define and modify a Work Breakdown Structure
- 6.5 Explain procedure of Adding Activities : Describing an Activity and its attributes, Working with Activity Types, Adding Activities, Understanding Duration Types, Importing Activities, Assigning Activity Codes, Adding Activity Steps
- 6.6 Describe different Relationships and Constraints: Relationship Types, Create Relationships, Perform a Forward and Backward Pass, Apply a Constraint to an Activity, Critical Path Method, Modify the Project Duration
- 6.7 Describe process of Formatting Project Data: i.e. Format Group, Sort, & Filter
- 6.8 Describe the different Roles and Resources for a project, Assign Roles to an Activity, Assign Rates on Roles, Assign Resources, Display the Resource Usage Profile, Analyze Resource Assignments
- 6.9 Describe the procedure of Analysis, Risks and Issues. Adjust the Project Schedule, Analyze Resource Availability, Enter Risks, Enter Issues, Use Thresholds to monitor Issues

- 6.10 Describe the procedure of creating of Baselines Plan, Display Baseline Bars on the Gantt Chart, Set up a Baseline view
- 6.11 Explain the procedure of Project Execution. Describe Status update methods, Describe Progressing activity status, Describe Progressing activities using steps, Explain the procedure of Rescheduling the Project and Summarizing Projects, Work with Reflections, Monitor Issues using Thresholds
- 6.12 Describing Reporting Methods, Run a Schedule Report, Create a report with the Report Wizard

## 7. Understand the Principles of Inspection and Quality Control

- 7.1 Explain the need for inspection of works
- 7.2 List the duties of various inspecting officers
- 7.3 Explain the duties of sub-engineer regarding works, store and account
- 7.4 Explain the use of site order book
- 7.5 Explain the principles of supervision
- 7.6 Explain need and methods of quality control
- 7.7 List the points to be considered in enforcing specifications
- 7.8 State the necessity for sampling and testing of materials

## 8. Understand the Methods of Execution of Works

- 8.1 State methods of departmental execution of works i.e. daily Labour, piece work and day work
- 8.2 Define terms contract, tender
- 8.3 Explain the various contracting systems for construction works i.e. Lumpsum contract, item rate contract, cost plus fee contract, cost plus percentage contract, labour contract, Negotiated rate contract, turn-key contract and package contract etc.
- 8.4 List the merits and limitations of each contracting system
- 8.5 Distinguish between work order and contract

## 9. Understand the Procedures of Fixing Agencies for Execution of Works

- 9.1 Define terms budget provision, administrative approval, Technical sanction and Allocation of funds
- 9.2 State the pre-requisites for tendering
- 9.3 State the methods of invitation of tender
- 9.4 Draft a tender notice
- 9.5 Prepare tender documents
- 9.6 Explain the need of earnest money and security deposit
- 9.7 Lists the steps involved in fixing up the agency through tender system
- 9.8 Discuss the instruction to bidders/contractor for filling tenders/bids
- 9.9 Prepare comparative statement and selection of contractor from tenders
- 9.10 Explain the conditions of contract such as penalty, Arbitration, Time of completions and Extension of time

**10. Understand the Procedures of Measurements and Payments**

- 10.1 State the importance of measurement book
- 10.2 List the rules to be followed in recording measurement
- 10.3 Record measurements in M.B and prepare abstract of payment in M.B
- 10.4 Explain the mode of payment to contractors
- 10.5 State the types of bills to be used
- 10.6 Prepare works bills of payment, surveying bills, final bills
- 10.7 Prepare muster roll, daily labour report etc
- 10.8 Explain terms, Hand receipt, imprest, recoverable payment, competent authority, controlling officer, Disbursing officer, Divisional officer, cognice of work, deposit work, supervision charges, suspense account, market rates, storage rate and charges, major head, minor head, sub head, Detailed head

**11. Understand Store Management**

- 11.1 Explain need for store in a project
- 11.2 State the classification of stores
- 11.3 State the classification of the items held in general stock
- 11.4 Explain the principles of storing materials and T&P in store
- 11.5 Prepare the register of store issuer and receipt
- 11.6 State the need for materials at site account
- 11.7 Explain the verification procedures of stores
- 11.8 Explain the procedure of taking delivery from stores
- 11.9 Explain procedure involved in indenting of materials

**List Of Practicals****HOURS****CONSTRUCTION PROJECTS PLANNING & MANAGEMENT**

1- Location Survey and preparation of map of proposed site.	12
2- Preparation of Contract Documents for the project.	24
3- Preparation of Working Drawings for the project.	24
4- Preparation of Specifications for the project components.	06
5- Engineering Estimation comprising of Cost, Materials, Time (Labour, machinery)	24
6- Layout of Structures and Planning for the project.	06

**Note:** Assign any one of the following projects for each group of students, distributing all the projects in a single class.

1. Double storey R.C.C. frame structure building: Slab, beams, columns, lintels & foundation. Prepare complete set of drawings (Architectural structural drawings and report).
2. Design under ground and over head R.C.C water reservoir (50,000 gallons - capacity) prepares structural drawing and report.
3. Layout, design, preparation of drawing and specification for a water supply scheme of a small Town (200 houses in 25 acres) for population of 1000 persons
4. Layout, design, preparation of drawing and specification for a sewerage scheme of a colony (200 houses in 25 acres) for population of 1000 persons.
5. Carry out high way project-layout, reconnaissance survey, selection of road alignment, topographic map and drawing longitudinal section and cross-section of a road (2 km long) and preparation of report.
6. Irrigation Project for 2 RD Canal Field work, topographic map, marking of alignment, detailed drawing, schedule of quantities and abstract of cost,

**PRIMAVERA SOFTWARE PROJECT**

1. Loading and unloading Primavera Software.	03
2 Recognition of Menu and Toolbars	12
3 Add Project by Defining OBS, WBS, Addition of activities and codes, defining Roles and Assign Resources to activities	12
4 Create relationships, and run schedule Preparing Primavera P6 project including all stages as narrated in theory component.	12
5 Add a Project to the Project Structure	03
6 Create a Work Breakdown Structure	03
7 Add Activities	06

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8	Add Codes to Activities	06
9	Create Relationships	06
10	Schedule a Project	06
11	Add Constraints	03
12	Organize Activities	03
13	Assign Resources and Costs	06
14	Analyse Resource/Cost Usage	03
15	Status the Project	03
16	Mitigate the Schedule	03
17	Analyse the Updated Project	06
	<b>Total Hours</b>	<b>192</b>

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-322****ENVIRONMENT, HEALTH AND SAFETY**

<b>TOTAL CONTACT HOURS:</b>	<b>64</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	2	0	2
Practical:				

**AIM:** To understand the need of environmental technology including pollution their effects. and remedies  
 Safety practices adopted for civil engineering works.  
 Health hazards, site dangers.  
 Body and Health protection.

**COURSE CONTENTS**

- |   |                |
|---|----------------|
| <b>1. Water Pollution</b>   | <b>8 Hours</b> |
| 1.1 Definition  |                |
| 1.2 Sources of Water Pollution  |                |
| 1.3 Composition of Sewage   |                |
| 1.4 Properties of Sewage( physical, chemical, biological)                             |                |
| 1.5 Tests for Sewage ( physical, chemical, biological)                                |                |
| 1.6 Biochemistry  |                |
| 1.7 Sewage treatment and disposal   |                |
| 1.8 Water standards for different uses  |                |
| <br>  |                |
| <b>2. Air Pollution</b>   | <b>6 Hours</b> |
| 2.1 Definition, sources and emission of air pollutants                                |                |
| 2.2 Methods of detection and measurement of air pollution                             |                |
| 2.3 Common air pollutants, their sources and pathological effects on man              |                |
| <br>  |                |
| <b>3. Solid waste pollution</b>   | <b>8 Hours</b> |
| 3.1 Definition  |                |
| 3.2 Sources of solid waste  |                |
| 3.3 Classification of solid wastes  |                |
| 3.4 Disposal of solid wastes(sanitary, landfill, incineration, composting, recycling) |                |
| <br>  |                |
| <b>4. Noise Pollution</b>   | <b>6 Hours</b> |
| 4.1 Definition  |                |
| 4.2 Sources of noise Pollution (Noise from traffic, Aircraft noise, Noise from        |                |

	construction and civil engineering works, Noise from industry	
4.3	Measurements of intensity of sound	
4.4	Effects of noise on peoples' lives	
4.5	Control of noise pollution	
<b>5.</b>	<b>Land Pollution</b>	<b>3Hours</b>
5.1	Definition and Importance	
5.2	Main soil pollutants and their influence	
5.3	Control of land pollution	
<b>6.</b>	<b>Industrial waste pollution</b>	<b>9 Hours</b>
6.1	Paper and card Industry	
6.2	Main pollutants, their sources & Effects	
6.3	Remedial measures	
6.4	Fertilizer industry	
6.5	Main pollutants, their sources & Effect	
6.6	Remedial measures	
6.7	Dairy industry	
6.8	Tannery Industry	
6.9	Main pollutants, their sources & Effects	
<b>7</b>	<b>Remedial measures from waste Pollution</b>	<b>3 Hours</b>
7.1	Petro Chemical Industry	
7.2	Main pollutants, their sources & Effects	
7.3	Remedial measures	
7.4	Tannery Industry	
7.5	Main pollutants, their sources & Effects	
7.6	Remedial measures	
<b>8</b>	<b>Accidents</b>	<b>3 Hours</b>
8.1	Types	
8.2	Causes	
8.3	Effects	
8.4	Remedial measures	
<b>9</b>	<b>Fire Hazards and Health Hazards</b>	<b>4 Hours</b>
9.1	Introduction.	
9.2	Causes	
9.3	Control of Hazards	
9.4	Prevention from Hazards	

<b>10</b>	<b>Safety</b>	<b>6 Hours</b>
10.1	Introduction	
10.2	Industrial ventilation, exhaust systems.	
10.3	Industrial noise and its control.	
10.4	Safety Precautionary Measures for	
	– Scaffolding, Formwork, and Ladder.	
	– Drilling & Blasting.	
	– Demolition.	
	– Hot bituminous works.	
	– Fire hazards in building.	
	– Excavation and Dewatering	
<b>11</b>	<b>Fire Control Systems</b>	<b>4 Hours</b>
11.1	Introduction	
11.2	Type of equipment / tools	
11.3	Operations and practices	
<b>12</b>	<b>Natural Hazards (Earth Quakes, Slides, Etc)</b>	<b>4 Hours</b>
12.1	Introduction	
12.2	Causes	
12.3	Effects	
12.4	Remedial measures	

**Recommended / Reference Books:**

- 1. Fundamentals of Construction: P.T Armstrong.**
- 2. Safety and security in building design : Ralph Sinnot**
- 3. Labour Compensation Act 1923.**
- 4. Safety Practices and Procedures : NISTE**
- 5. Sanitary Engg. By Rangwala.**
- 6. Sanitary Engg. By Deshpande.**



**INSTRUCTIONAL OBJECTIVES****1. Understand the Environment, Water Pollution and Sewage Treatment**

- 1.1 State interaction of humans and environment
- 1.2 State the role of Environmental scientist, Technologist and Engineer
- 1.3 State ecology and ecosystem
- 1.4 State Sources of Sewage.
- 1.5 Composition of sewage
- 1.6 Explain Properties of sewage
- 1.7 Explain Tests of sewage
- 1.8 Explain sewage treatment and water standards

**2. Understand the Concept of air Pollution**

- 2.1 Define air Pollution
- 2.2 State sources and emission of air pollution
- 2.3 Explain methods of detection and measurement of air pollutants
- 2.4 State air pollutants, sources and its effects

**3. Understand the concept of solid waste Pollution**

- 3.1 Define solid waste Pollution
- 3.2 State sources and classification of solid wastes
- 3.3 Explain disposal of solid wastes

**4. Understand the concept of noise pollution**

- 4.1 Define noise pollution
- 4.2 State sources, of noise pollution
- 4.3 Explain intensity of sound and its effects
- 4.4 Explain Control of noise pollution

**5. Understand the concept of land pollution**

- 5.1 Define land pollution
- 5.2 State soil pollutants and its influence
- 5.3 Explain control of land pollution

**6. Understand the concept of industrial waste pollution with reference to industr**

- 6.1 State pollutants and its types
- 6.2 State Sources of pollutants
- 6.3 Explain effects of pollutants
- 6.4 Explain remedial measures

**7. Understand the remedial measures of waste pollution.**

- 7.1 State different type of pollution.
- 7.2 Source of waste pollution

7.3 Effects of the pollution.

7.4 Explain remedial measures

**8. Understand the Accidents and their causes.**

8.1 State Accidents

8.2 Explain causes of Accidents.

8.3 Explain Effects of Accidents.

8.4 Explain Remedial measures.

**9. Understand Fire Hazards and Health Hazards.**

9.1 Define Hazards.

9.2 State Fire Hazards.

9.3 State Health Hazards.

9.4 Causes of Fire

9.5 Explain methods to prevent from fire.

9.6 State control of Hazards.

**10. Understand Safety Measures w.r.t. Building and Environment**

10.1 Introduction of safety measures

10.2 Explain Industrial ventilation, exhaust systems.

10.3 Explain safety Precautionary Measures for

- Scaffolding, Formwork, and Ladder.
- Drilling & Blasting.
- Demolition.
- Hot bituminous works.
- Fire hazards in building.
- De-watering
- Excavation and Timbering
- Shuttering and its precautions
  - Steel, Wooden and Fiber Shuttering

**11. Understand the Fire Control System**

11.1 Explain Fire Control System

11.2 Explain types of Equipment / Tools

11.3 Explain Operations and Practices

**12. Understand the Natural Hazards (Earth Quakes, Slides, etc)**

12.1 Introduction to natural hazards

12.2 Causes

12.3 Effects

12.4 Remedial measures

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-334****HYDRAULICS AND IRRIGATION ENGINEERING**

<b>TOTAL CONTACT HOURS:</b>	<b>192</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Theory:</b>	<b>96</b>	<b>3</b>	<b>3</b>	<b>4</b>
<b>Practical:</b>	<b>96</b>			

- AIM:**
1. Apply the fundamental principles of hydraulic to Civil Engg projects.
  2. Gain knowledge about the principles involved in irrigation engineering.
  3. Apply principles of irrigation engineering and study irrigation system of Pakistan.

**COURSE CONTENTS**

- |   |                |
|---|----------------|
| <b>1. Introduction</b>  | <b>3 Hours</b> |
| 1.1 Introduction to the Hydraulics  |                |
| 1.2 Physical properties of fluids; density, specific weight, specific volume, specific gravity, surface tension, viscosity, capillary action, cohesion, and adhesion. |                |
| <b>2. Fluid Pressure and its Measurement.</b>   | <b>3 Hours</b> |
| 2.1 Pressure, intensity of pressure, pressure head and Pascal's law.  |                |
| 2.2 Atmospheric pressure, Gauge pressure, Absolute pressure   |                |
| 2.3 Measurement of fluid pressure through Piezometer tube, simple Manometer, Differential manometer, Inverted differential manometer and Micro manometer.             |                |
| <b>3. Hydrostatics.</b>   | <b>6 Hours</b> |
| 3.1 Introduction  |                |
| 3.2 Pressure on immersed surface.   |                |
| 3.3 Total pressure on a horizontal ,vertical immersed surface, and inclined immersed surface  |                |
| 3.4 Center of pressure, resultant pressure and center of pressure of immersed surfaces.   |                |
| <b>4. Floating Bodies Equilibrium.</b>  | <b>3 Hours</b> |
| 4.1 Buoyancy & floatation, buoyant force, center of buoyancy  |                |
| 4.2 Metacentre, metacentric height  |                |
| 4.3 Kinds of equilibrium of a floating body   |                |

<b>5.</b>	<b>Hydro kinematic.</b>	3 Hours
5.1	Introduction	
5.2	Discharge-equation of continuity of a liquid flow	
5.3	Types of flows, Types of flow lines, path lines and stream lines	
<b>6.</b>	<b>Hydrodynamics.</b>	6 Hours
6.1	Introduction	
6.2	Kinds of energy of flowing liquid	
6.3	Total head of flowing liquid	
6.4	Bernoulli's theorem definition, formula.	
6.5	Practical application of Bernoulli's equation.	
<b>7.</b>	<b>Flow through Pipes.</b>	3 Hours
7.1	Introduction	
7.2	Types of flow in a pipe	
7.3	Loss of head in pipes & Darcy's formula	
7.4	Chezy's formula for loss of head in pipe	
7.5	Hydraulic gradient and total energy lines	
<b>8.</b>	<b>Flow through Orifices.</b>	3 Hours
8.1	Introduction	
8.2	Types of orifices	
8.3	Jet of water, vena contract	
8.4	Co-efficient of discharged	
8.5	Discharge through a large rectangular orifice	
8.6	Mouth pieces	
<b>9.</b>	<b>Flow over Notches.</b>	3 Hours
9.1	Introduction	
9.2	Types of notches	
9.3	Discharge formula for notches	
9.4	Numerical problems	
<b>10.</b>	<b>Flow over Weir.</b>	3 Hours
10.1	Introduction	
10.2	Types of weirs	
10.3	Velocity of approach discharge formula for weirs	
10.4	Velocity of approach	
10.5	Numerical problems	

<b>11. Flow through Open Channel.</b>	<b>6 Hours</b>
11.1 Introduction	
11.2 Chezy's formula for discharge through open channel	
11.3 Manning's formula for discharge through open channel	
11.4 Bazin's formula for discharge through open channel	
11.5 Kennedy's Critical velocity & Lacy's regime velocity	
11.6 Most economical section of channel, conditions for maximum discharge through channel	
11.7 Discharge through rectangular & trapezoidal channel sections	
11.8 Numerical problems	
<b>12. Introduction of Irrigation.</b>	<b>3 Hours</b>
12.1 Historical Background of Irrigation	
12.2 Definition, necessity and scope of Irrigation	
12.3 Benefits of Irrigation and ill effects of Irrigation	
12.4 Types of Irrigation	
12.5 Sources of irrigation water	
<b>13. Irrigation System in Pakistan</b>	<b>5 Hours</b>
13.1 Characteristics of Pakistan rivers	
13.2 Irrigation net-work in Pakistan	
13.3 Important barrages of country	
13.4 Indus Basin project	
13.5 Need and details of water replacement works	
13.6 Water regulatory bodies	
<b>14. Water Requirement Of Crops</b>	<b>3 Hours</b>
14.1 Brief Description	
14.2 Factors affecting Water Requirements	
14.3 Definitions of Some Common Important Terms	
14.4 Factors Affecting Duty and Methods of Improving Duty	
14.5 Relation between Duty (D), Base (B) and Delta	
<b>15. Methods of Water Distribution to Crop Fields</b>	<b>2 Hours</b>
15.1 Basic Methods of Distribution	
15.2 Sprinkler Irrigation Method	
15.3 Sub-surface Irrigation (Drip or Trickle Irrigation)	

<b>16. Storage Irrigation.</b>	1 Hours
16.1 Necessity.	
16.2 Various terms used.	
16.3 Assessment of maximum runs off from a catchment area.	
<b>17. Reservoirs</b>	6 Hours
17.1 Definition	
17.2 Purposes of Reservoir: classification	
17.3 Site Selection of Reservoir	
17.4 Classification of Dams	
17.5 Choice of Kinds of Dam for Hydro project	
17.6 Construction details of earthen dams.	
17.7 Causes of failure of Earthdams and their remedies.	
17.8 Seepage Control in Earth Dam.	
17.9 Raising of dams, necessity and methodology.	
<b>18. Weirs &amp; Barrages.</b>	3 Hours
18.1 Introduction to weir	
18.2 Purpose of weir/barrage	
18.3 Types of weirs	
18.4 Site selection	
18.5 Component parts	
18.6 Surface flow over weirs	
<b>19. Regulating and Silt Controlling Works.</b>	3 Hours
19.1 Brief Description.	
19.2 Head regulator	
19.3 Types of head regulators	
19.4 Types of silt controlling works	
<b>20. Canals</b>	6 Hours
20.1 Irrigation Canals and their types	
20.2 Components of canal Section	
20.3 Classifications of Canal	
20.4 Alignment of Canal	
20.5 Necessity of Lining	
20.6 Types of Lining	
20.7 Selection of Type of Lining	
20.8 Merits & Demerits of Lined and unlined channel	

20.9	Kemmedy's critical velocity and Lacy's Regime velocity	
20.10	Design of canals	
<b>21.</b>	<b>Canal Falls.</b>	3 Hours
21.1	Introduction, Definition & basic requirements.	
21.2	Types of Canal Fall	
21.3	Site selection for canal falls	
<b>22.</b>	<b>Cross Drainage Works.</b>	3 Hours
22.1	Introduction	
22.2	Types; aqueduct, siphon, and drainage inlet.	
22.3	Super passage, siphon super passage, level crossing.	
22.4	Drainage out let, tail escape	
<b>23.</b>	<b>Maintenance of Canals.</b>	3 Hours
23.1	Up-keep and maintenance.	
23.2	Breaches in canals-courses, preventive measures and methods of closing.	
23.3	Silting tanks, their classes, objects and working.	
23.4	Repair to berms, formation of new berms.	
<b>24.</b>	<b>Distribution Works.</b>	6 Hours
24.1	Introduction of outlets	
24.2	Essential requirements of an outlet.	
24.3	Characteristics of outlet.	
24.4	Types of outlet-modular, semi modular and non-modular outlet.	
24.5	Design of outlet-modular, semi-modular and non-modular	
<b>25.</b>	<b>Water Logging &amp; Salinity.</b>	2 Hours
25.1	Water logging, definition	
25.2	Causes and prevention	
25.3	Salinity, definition	
25.4	Causes & prevention	
25.5	Methods of reclamation of soil	
<b>26.</b>	<b>River Training Works.</b>	2 Hours
26.1	Spurs and their types.	
26.2	Groynes	
26.3	Guide Banks	

**RECOMMENDED / REFERENCE BOOKS:**

- 1 Hydraulics Fluid Mechanics and Hydraulic Machines : **R.S Khurmi**
- 2 Irrigation Engineering : **Dr. Iqbal Ali**
- 3 Hydraulics & Fluid Mechanics: **E.H. Lewitt.**
- 4 Fluid Mechanics : **Daughty**
- 5 The Fundamental Principles Irrigation Water Power : **V.B Priyani**
- 6 Principles & Practice of Irrigation Engineering: **S.K. Sharma**
- 7 Irrigation Engineering : **Birdie & Dass**
- 8 Hydraulic Engineering Schaum Series
- 9 Irrigation Engineering : **Punmia**
- 10 Irrigation Engineering : **V.B. Priyani**
- 11 Irrigation Hand Book : **Syed Inam Ali**
- 12 Asan Abpashi : **Abdullah Jani**
- 13 Irrigation and Hydraulic Structures: **Iqbal Ali**, [2001], Laser Enterprises Karachi
- 14 Irrigation and Water Power Engineering:**B.C.Punmia and B.B.Lal**,[1992], Jodhpur Publishers, Delhi



**INSTRUCTIONAL OBJECTIVES****1. Know the Scope, Significance and Basic Definitions of Hydraulics.**

- 1.1 State development, scope and significance of Hydraulics in civil engineering.
- 1.2 Define density, specific weight, specific volume, specific gravity, surface tension, viscosity compressibility, cohesion, and adhesion.

**2. Understand Fluid Pressure and its Measurement.**

- 2.1 State pressure, intensity of pressure, pressure head, Pascal's law and its simple applications.
- 2.2 Distinguish among atmospheric pressure, gauge pressure and absolute pressure.
- 2.3 Describe measurement of fluid pressure by Piezometer tube and different manometers.

**3. Understand the Application and Location of Total Pressure on Immersed Surface.**

- 3.1 Define Hydrostatics
- 3.2 State pressure on immersed surface.
- 3.3 Define centre of pressure and resultant pressure.
- 3.4 Calculate the total pressure and centre of pressure on a horizontal vertical and inclined surface immersed in a liquid (i.e. water)

**4. Know the Equilibrium of Floating Bodies.**

- 4.1 Define the terms, buoyancy, floatation, buoyant force and center of buoyancy.
- 4.2 Define metacentre and metacentric height.
- 4.3 State the kinds of equilibrium of a floating body.

**5. Understand the Different Types of Flow of Liquids.**

- 5.1 Define hydro kinematics
- 5.2 State discharge and equation of continuity of a liquid flow.
- 5.3 Distinguish path lines and stream lines.
- 5.4 Distinguish the type of flow in pipes i.e. steady and unsteady flow, uniform and non uniform flow, turbulent flow.

**6. Understand the General Principles of Flow of Liquids.**

- 6.1 State the term hydrodynamics.
- 6.2 State the energies of liquid in motion.
- 6.3 State the total head of flowing liquid and total energy.

6.4 Explain Bernoulli's theorem with its formula, limitations and practical application i.e., venturimeter & pipit tube.

**7. Understand the Flow Through Pipes.**

7.1 State and explain difference between flow through pipes and open channel flow

7.2 Distinguish types of flow in pipes i.e. steady and unsteady flow, uniform and non-uniform flow, turbulent flow.

7.3 Explain the major and minor losses of head of water flowing through pipes.

7.4 State Chezy's and Darcy's formulae for friction loss in pipe flow.

7.5 Apply Chezy's & Darcy's formulae for calculation of losses in pipes.

7.6 Explain with sketches the hydraulic gradient and total energy line under different conditions.

**8. Understand the Function and Flow Through Orifices.**

8.1 Define orifice

8.2 State types of orifices

8.3 State the terms; jet of water, vena contracta, co-efficient of discharge and velocity of approach.

8.4 Derive formulae for discharge through orifices

8.5 Differentiate between orifice and mouth piece.

**9. Use Discharge Formula for Solving Problems on Notches.**

9.1 Define notch

9.2 State types of notches

9.3 State the discharge formulae for notches.

9.4 Solve problems based on discharge formulae.

**10. Understand the Flow Over Weirs.**

10.1 Define weir

10.2 State types of weirs

10.3 Differentiate sharp crested and broad crested weirs.

10.4 State the discharge formulae for weirs.

10.5 Solve problems based on discharge formulae.

**11. Understand the Principles of Flow Through Open Channel.**

11.1 State the flow through open channels.

11.2 State Chezy's, Manning & s Bazin's formulae for discharge through open channel.

11.3 State most economical section of channel and condition for maximum discharge through channel.

11.4 State discharge through rectangular & trapezoidal channel section and their formulae.

11.5 Solve problems on discharge through open channels.

**12. Understand the History, Necessity and Scope of Irrigation.**

- 12.1 State history of irrigation.
- 12.2 Define irrigation.
- 12.3 State necessity and scope of irrigation.
- 12.4 State merits and demerits of irrigation
- 12.5 Explain types of irrigation i.e. flow irrigation and lift irrigation
- 12.6 Explain various sources of irrigation water.

**13. Understand the Salient Features of Irrigation System of Pakistan.**

- 13.1 Describe with map the irrigation net work in Pakistan.
- 13.2 State the characteristics of Pakistan's rivers.
- 13.3 State the important barrages of Pakistan.
- 13.4 State Indus Basin Project
- 13.5 Explain need and details of replacement works in Indus Basin Project
- 13.6 Know IRSA and PIDA

**14. Understand Water Requirement of Crops.**

- 14.1 Describe the term water requirement of crops.
- 14.2 Enlist factors affecting water requirement
- 14.3 Define the terms crop period, base period. Kharif Rabi ratio, core watering, cash crop, crop rotation, delta.
- 14.4 Explain duty of water, factors affecting and its significance.
- 14.5 State relation between duty and delta.

**15. Understand Water Distribution to Crop Field**

- 15.1 Explain basic methods of water distribution to fields i.e. Surface irrigation method, Furrow method, Contour method, Flooding method.
- 15.2 Explain Sprinkler irrigation method
- 15.3 Explain Drip or Trickle irrigation method.

**16. Understand the Basic Idea of Storage Irrigation.**

- 16.1 State the necessity of storage irrigation.
- 16.2 Define the various terms used in storage irrigation.
- 16.3 Explain the methods of assessment of maximum run off from a catchment area

**17. Understand Reservoirs**

- 17.1 Define reservoirs
- 17.2 State the purpose of reservoir and its classification
- 17.3 Describe the location of site selection for reservoir
- 17.4 State classification of dams i.e. based on function and use, structural design,

- materials of construction, shape of X-section
- 17.5 State factors to be considered during choice of dam for hydro project
  - 17.6 Explain the construction details of earthen dams
  - 17.7 State the causes of failure of earthen dams and their remedies
  - 17.8 Explain methods to control seepage in earthen dams
  - 17.9 Explain necessity of raising of dams.
  - 17.10 Explain methods of raising dam.

## **18. Understand Features and Function of Weir/Barrages.**

- 18.1 Define weir and barrages.
- 18.2 Distinguish between barrages and weirs and explain their purposes.
- 18.3 Describe with sketches the components/parts of a barrage.
- 18.4 State the factors governing the site selection of a barrage.
- 18.5 State the types of weirs.
- 18.6 Explain surface flow at weirs.

## **19. Understand the Regulating and Silt Controlling Works.**

- 19.1 Describe the necessity and importance of regulation and silt controlling works.
- 19.2 Explain head regulator and its types, i.e. flume, meter flume.
- 19.3 Describe with sketches the silt ejector, silt vanes, silt excluder and skimming platform.

## **20. Understand the Basic Ideas About Canals.**

- 20.1 State the types of canal.
- 20.2 Explain with sketches, components of a canal section
- 20.3 State classification of canals
- 20.4 Explain the factors governing alignment of canal.
- 20.5 Explain lining and its types.
- 20.6 Enlist factors to be considered for selection of type of lining
- 20.7 State merits and demerits of lined and unlined channels.
- 20.8 Describe Kennedy's critical velocity and Lacy's regime velocity for design of canals

## **21. Understand the Basic Idea of Canal Falls.**

- 21.1 Define canal falls.
- 21.2 State the basic requirement of canal fall.
- 21.3 Describe the types of canal falls.
- 21.4 Explain the factors governing the site selection of canal falls.

## **22. Understand the Basic of Idea Cross Drainage Works.**

- 22.1 Describe with sketches the different types of cross drainage works.

- 22.2 Describe with sketches, super passage, syphon supper passage and level crossing.
- 22.3 Describe drainage outlet and tail escape.

**23. Understand the Principles of Maintenance of Canals.**

- 23.1 Describe up keep and maintenance of canals.
- 23.2 Explain breaches in canal, water courses, preventive measure and methods of closing.
- 23.3 Describe with sketch the silting tanks their classes, objects and working.
- 23.4 Explain repair to bunds and formation of new bunds.

**24. Understand the Basic Idea of Distribution Works.**

- 24.1 Define outlet.
- 24.2 State essential requirements of an outlet.
- 24.3 Explain the characteristics of outlets.
- 24.4 Describe with sketches the types of outlets (modular, semi modular and non modular).
- 24.5 Design of outlet, modular, semi-modular and non-modular

**25. Understand Water Logging & Salinity causes and remedial measures.**

- 25.1 State Water logging,
- 25.2 State Causes and prevention measures.
- 25.3 Explain Salinity.
- 25.4 State Causes & prevention measures.
- 25.5 Explain Methods of reclamation of soil.

**26 Understand the Types of River Training Works.**

- 26.1 List the objects of river training.
- 26.2 Explain with sketches different types of protective and river training works.

**LIST OF PRACTICALS****HOURS**

1.	Find the properties of fluids through hydrostatic bench:	
	<b>a.</b> Study of pressure gauges	3
	<b>b.</b> Determination of discharge through a pipe with Pitot tube.	3
	<b>c.</b> Find Hydrostatics pressure and centre of pressure of vertically immersed surface.	3
	<b>d.</b> Numerical problems on floating bodies equilibrium	3
2.	Find the Metacentric height of a floating body in Lab.	3
3.	Numerical problems on Hydro kinematics	3
4.	Numerical problems on Hydrodynamics	3
5.	Determination of coefficient of discharge using Venturimeter	3
6.	Finding the velocity by velocity rod and by current meter.	3
7.	Numerical problems on flow through pipes	3
8.	To find the co-efficient of discharge through a rectangular notch.	3
9.	Determination of hydraulic characteristics of various orifices	3
10.	Numerical problems on uniform flow in open channels	3
11.	Draw a skeleton map of Pakistan showing rivers, main and link canal, Head works and barrages	3
12.	Draw a plan showing general lay out of river training and protection works.	3
13.	Draw typical cross-sections of a weir floors	3
14.	Draw a plan showing the general layout of head works of a perennial canal	3
15.	Draw the alignment of a canal, distributor minors and water courses on contour map	3
16.	Numerical problems on duty, delta and discharge	3
17.	Draw the typical X-sections of channels	3
18.	Numerical problems on velocity (Kennedy critical velocity & Lacey's regime velocity)	3
19.	Draw the plan and section of a silt ejector	3
20.	Draw the plane and L-section of a masonry flume	3
21.	Drawings of an Aqueduct crossing	3
22.	Drawings of a pipe outlet	3
23.	Drawings of an A.P.M outlet	3
24.	Sketches of various canal falls	3
25.	Practical on discharge measurement	3
26.	Draw the plan of a multipurpose irrigation project	3
27.	Practice for Lining in the campus for irrigation channels	6
28.	Draw typical cross section of dams	3

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-343****TRANSPORTATION ENGINEERING**

<b>TOTAL CONTACT HOURS:</b>	<b>160</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	64	<b>2</b>	<b>3</b>	<b>3</b>
Practical:	96			

**AIM:** To understand the fundamentals of various forms of transportation engineering involving highways, airports, runways, railways, alignment and maintenance of tracks, docks and harbours

**COURSE CONTENTS**

1. **Highway Development and Planning.** 2 Hours
  - 1.1. Introduction importance of transportation and modes of transportation.
  - 1.2. Historical development of roads with special references to Pakistan.
  - 1.3. Technical terms Road highway, carriage way dual carriageway etc.
  
2. **Road Alignment** 2 Hours
  - 2.1. Introduction
  - 2.2. Fundamental principles.
  - 2.3. Factors controlling selection of road alignment.
  - 2.4. Special consideration for hilly road: grades and camber.
  - 2.5. Pak China Economic Corridor
  
3. **Highway Geometric Design** 4 Hours
  - 3.1. Elements of geometrical design of road-Kerb, shoulder, footpath, driveway, right of way, bay of road, road margins.
  - 3.2. Sight distance- types and factors.
  - 3.3. Necessity of super elevation.
  - 3.4. Derivation of formula for super elevation.
  - 3.5. Method of introducing super elevation.
  - 3.6. Widening at curves and formula.
  - 3.7. Highway cross section.
  
4. **Road Structures.** 2 Hours
  - 4.1. Introduction.
  - 4.2. Types of roads.
  - 4.3. Components of roads.

- 4.4. Types of surfacing earth, gravel,
- 4.5. Economic consideration for selection of road surfaces.
- 4.6. Road materials-stone aggregates, bituminous materials, cement and concrete.
- 4.7. Retaining walls.
  
5. **Road Construction.** 5 Hours
  - 5.1. Introduction of water bound macadam road.
  - 5.2. Dust nuisance and its prevention.
  - 5.3. Construction of bituminous roads.
  - 5.4. Construction details of surfacing cold and hot process bituminous macadam, premix asphalt macadam bituminous concrete pavement, sheet asphalt pavement.
  - 5.5. Kinds of premix concrete roads, cement bound macadam.
  - 5.6. Construction of concrete roads.
  - 5.7. Ductility, Softening point, Marshal stability, Viscosity, Flash and fire, consistency, Quantitative extraction tests for bitumen
  - 5.8. Los Angeles Abrasion test and CBR test for road materials
  - 5.9. Comparison between rigid and flexible pavements.
  - 5.10. Standard highway construction items of works
  - 5.11. Joints in concrete pavements.
  
6. **Road Drainage.** 2 Hours
  - 6.1. Introduction
  - 6.2. Importance of highway drainage.
  - 6.3. Surface drainage
  - 6.4. Sub-surface drainage.
  - 6.5. Drainage of slopes and erosion control.
  - 6.6. Catch water drain in hilly area.
  - 6.7. Cross drainage structures
  
7. **Traffic Engineering.** 2 Hours
  - 7.1. Scope of traffic engineering.
  - 7.2. Traffic density surveys.
  - 7.3. Road accidents and their causes.
  - 7.4. Method of prevention of accidents.
  - 7.5. Traffic island, Refuge Island, pedestrian crossing.
  - 7.6. Types of road signs
  - 7.7. Characteristics of signs.
  - 7.8. Road signals, types and purposes.
  
8. **Intersections.** 2 Hours
  - 8.1. Road junction and its types.



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- 8.2. Design consideration for provision of junctions.
- 8.3. Factors affecting the layout of junctions.
- 8.4. Provision of junctions of single & dual carriageway sites, parking spaces.
- 8.5. Introduction to underpasses, flyovers.
- 8.6. Introduction to motor ways and motorway intersections.
9. **Metro Bus System** 1 Hours
- 9.1. Introduction.
- 9.2. Advantages.
- 9.3. Factors effecting alignment of metro bus system.
- 9.4. Construction details.
- 9.5. Integrated route system for metro service.
10. **Road Maintenance.** 2 Hours
- 10.1. Resurfacing.
- 10.2. Defects in roads- Corrugations, Ruts, pot holes, etc.
- 10.3. Remedies of road defects- Removal of existing surface, resurfacing, patch repair
- 10.4. Causes of defects of concrete roads and repair of concrete roads
- 10.5. Recycling of used materials
11. **Road Construction Machinery** 4 Hours
- 11.1. Rollers, bulldozers and grader
- 11.2. Types of rollers and bulldozer
- 11.3. Tar boiler, premix plant, Asphalt paver, tractor, trolleys, batching plant, excavator, dragline, trencher, shovel, etc.
12. **Air Ports and Runways** 4 Hours
- 12.1. Important technical terms
- 12.2. Factors affecting site selection and layout of an airport.
- 12.3. Classification of air ports.
- 12.4. Runway pavement, its types and typical cross section
- 12.5. Patterns of runway
- 12.6. Drainage systems of an airport
- 12.7. Repair of runway.
- 12.8. Layout of air port buildings
- 12.9. Lighting of airport.
13. **Role of Railways in Development of a Country.** 2 Hours
- 13.1. Introduction
- 13.2. Railway system in Pakistan
- 13.3. Comparison between Rail & Road transport
- 13.4. Metro Rail system
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14.	<b>Permanent Way.</b>	6 Hours
14.1.	Definition	
14.2.	Requirements of permanent way	
14.3.	Components of permanent way, functions and types of ballasts and sleepers	
14.4.	Gauge, its types	
14.5.	Factors governing adoption of a particular gauge	
14.6.	Rails-types Rail joints (including fastening-fish plates, bolts, spikes, chair and bearing plates)	
14.7.	Railway carriage wheel, conning of wheels	
14.8.	Requirement of good rail joint and ballast.	
15.	<b>Creep.</b>	2 Hours
15.1.	Definition	
15.2.	Cause of creep	
15.3.	Magnitude of creep	
15.4.	Results of creep	
15.5.	Methods of correction of creep	
16.	<b>Points &amp; Crossing.</b>	4 Hours
16.1.	Purpose	
16.2.	Sleepers for point & crossing (through & inter laced sleepers)	
16.3.	Switches-shapes, length of stock & tongue rails, heal clearance, switch angle, through switches	
16.4.	Types of crossing	
16.5.	Theoretical & actual nose of crossing	
16.6.	Crossing angle & number	
16.7.	Station yards and their layout.	
17.	<b>Signals.</b>	3 Hours
17.1.	Purpose & types	
17.2.	Classification of signals according to function & location	
17.3.	Signalling-objects	
17.4.	Inter locking, principles & requirements	
17.5.	Methods of inter-locking	
18.	<b>Tunnels.</b>	3 Hours
18.1.	Necessity of tunnels	
18.2.	Importance of tunnel engineering	
18.3.	Alignment of tunnels and their construction	
19.	<b>Docks Harbours.</b>	6 Hours

- 19.1. Definition of harbours  
 19.2. Classification of harbours  
 19.3. Requirement of a commercial harbour its location & size  
 19.4. Tidal waves break water & their classification  
 19.5. Wharves, quay walls & jetties, piers  
 19.6. Classification of docks.  
 19.7. Beach erosion & protection  
 19.8. Locks & lock gates
20. **Dredging.** 4 Hours
- 20.1. Definition  
 20.2. Necessity of dredging  
 20.3. Types of dredging devices  
 20.4. Methods of dredging  
 20.5. Disposal of dredged material
21. **Navigational Aids.** 2 Hours
- 21.1. Define: Navigation aids  
 21.2. Types of signals-light house, beacons, light ship & buoy

#### RECOMMENDED / REFERENCE BOOKS:

1. Road, Railways, Bridges and tunnel: **Deshpande and Antia.**
2. Railway Engineering: **Deshpande.**
3. Principles of Railway Engineering: **S.C. Rangwala.**
4. Docks and Harbors : **A.T. Khan**
5. Railways, Dock and Harbors (Urdu) : **A.B. Mallick**
6. Railway Bridges and Tunnels: **Vazarni.**
7. Operational Safety of Rail Transport in Pakistan: **Abdul Kadoos.**
8. Railway Tracks: **Antia.**
9. Railway Track Engineering : **Agor**
10. Highway Engineering: **Gurcharan Singh**, [2001], Standard Publishers, Delhi
11. Highways: **C.A. O'Flaherty**,[2001], Butterworth Heinmann, Oxford
12. Highway Engineering: **Paul H. Wright and Karen Dixon**,[2004], John Wiley & Sons
13. Port Engineering: **Gregory P. Tsinker**,[2004], John Wiley and Sons
14. Road Engineering: **Piryani.**
15. Highway Engineering: **Gurcharn Singh.**
16. Development of Road and Road Transport in Pakistan : **Khalifa Afzal Hussain**
17. Highway Engineering and Airports: **K.L.Bhanot and S.B.Sehgal.**

**INSTRUCTIONAL OBJECTIVES****1. Understand Highway Development Planning.**

- 1.1 Explain the necessity, importance and modes of transportation.
- 1.2 State early roads and historical development of roads with special reference to Pakistan.
- 1.3 Describe the terms road, highway, carriage way, dual carriage way etc.

**2. Understand Highway Surveys Required for Roads.**

- 2.1 Define the term road alignment.
- 2.2 State the fundamental principles of road alignment.
- 2.3 State the factors influencing selection of alignment for a road in plain and hilly area.
- 2.4 Explain the surveys required for fixing alignment.

**3. Understand Road Geometrics (Super Elevation).**

- 3.1 Define the terms Kerb, Shoulder, Footpath, Drive way, Right of way, Bay of roads, road margins.
- 3.2 Explain sight distance, stopping and over taking sight distance.
- 3.3 Explain the factors affecting sight distance
- 3.4 Define super elevation and state its necessity
- 3.5 Describe method of introduction super elevation.
- 3.6 Explain methods of introducing super elevation.
- 3.7 Derive formula for super-elevation.
- 3.8 Explain widening at curves.

**4. Understand the Component Part of Road Structure.**

- 4.1 Describe the types of roads with sketches.
- 4.2 Explain the component of road i.e. sub-grade, sub-base, base and wearing course.
- 4.3 State the types of surfacing earth surface, general surface, water bound, bituminous and concrete roads.
- 4.4 State the economic consideration for selection of road surfaces.
- 4.5 Describe the road materials, stone aggregate, bituminous materials, cement and cement concrete.
- 4.6 Describe the necessity and function of retaining walls, with sketches.

**5. Understand the Construction Process of Flexible & Rigid Pavements.**

- 5.1 Explain the construction procedure of water bound macadam road.
- 5.2 Explain the dust nuisance and its prevention.
- 5.3 Explain the construction procedure of bituminous roads.
- 5.4 Explain the construction detail of surfacing cold and hot process bituminous macadam, premix asphalt macadam, bituminous concrete pavements and sheet asphalt pavement.
- 5.5 Explain the construction procedure of cement bound macadam road
- 5.6 Explain Ductility, Softening point, Marshal stability, Viscosity, Flash and fire, consistency, Quantitative extraction tests for bitumen
- 5.7 Explain Los Angeles Abrasion test and CBR test for road materials
- 5.8 Explain the construction of concrete roads.
- 5.9 Compare rigid and flexible pavements.
- 5.10 State the items of work for roads
- 5.11 Explain the different types of joints in concrete pavement.

## **6. Understand the Drainage of Roads**

- 6.1 Introduction of highway drainage
- 6.2 State the necessity and importance of highway drainage.
- 6.3 Describe with sketch surface drainage.
- 6.4 Describe with sketch sub-surface drainage.
- 6.5 State drainage of slopes and erosion control.
- 6.6 State catch water drain in hilly area.
- 6.7 Describe with sketches cross design structures, lips, culverts, bridge

## **7. Understand the Causes and Prevention of Accidents, Road Signs and Signals., Traffic Islands and Pedestrian Crossings.**

- 7.1 State scope of traffic engineering.
- 7.2 Describe traffic density surveys and use.
- 7.3 State accidents and their causes.
- 7.4 State method of prevention of accidents.
- 7.5 Describe with sketches traffic island refuge Island and pedestrian crossing.
- 7.6 Describe with sketches different types of road sign.
- 7.7 Describe the purpose of road signals and their types.
- 7.8 Explain the characteristics of road sign

## **8. Understand the Purpose of Intersections and Road Junctions**

- 8.1 Define road junction and describe with sketches types of road junctions.
- 8.2 State design consideration for provision of junctions.
- 8.3 Describe the Factors influencing the layout of junctions, roundabouts.
- 8.4 Describe the provision of junctions for single & dual carriageway sites, parking spaces.
- 8.5 Explain structure of underpasses, flyovers.
- 8.6 Describe structure of motor ways and motorway intersections.

**9. Understand the Purpose of purpose and structure of Metro Bus System**

- 9.1 Describe the salient features of Metro bus system
- 9.2 State advantages of Metro bus system
- 9.3 Describe the Factors influencing the alignment/ layout of Metro bus system.
- 9.4 Describe the construction detail of Metro bus system.
- 9.5 Describe the integrated route system Metro bus service.

**10. Understand the Maintenance of Roads**

- 10.1 Explain defects liable to occur in road- corrugations, ruts, pot holes etc.
- 10.2 Explain the remedial measures for defects- scraping of existing layers, patch repair, replacing with reinforced layers, resurfacing etc. .
- 10.3 Describe the causes of defects in concrete roadside pot holes, corrugations and ruts.
- 10.4 Describe the repair of defects of concrete road.
- 10.5 Describe recycling procedure for road used materials

**11. Understand the Function of Different Types of Machinery used in Road Construction.**

- 11.1 Explain the working and uses of rollers, bulldozer, and grader.
- 11.2 Explain types of rollers and bulldozers
- 11.3 Explain the working and uses of tar-boiler, premix plant, asphalt paver, tractor, trolleys, batching plant, excavator, dragline, trencher, shovel, etc.

**12. Understand the Layout and Components of an Airport and Runway.**

- 12.1 Explain the terms, landing strip, approach zone, run way length, taxiway, apron, etc.
- 12.2 . Explain factors effecting site selection of airports- geographical, administrative, political and economic etc.
- 12.3 Describe considerations for selection of airport and state the classification of an airport Sketch the general layout of various types of airport e.g. civil aviation, defence
- 12.4 Describe the run way pavements, its types draw typical cross section.
- 12.5 Sketch different patterns of run way.
- 12.6 Explain the drainage systems of an air port.
- 12.7 Describe the routine and special repairs of run way.
- 12.8 Sketch the layout of air port buildings.
- 12.9 Describe the lighting of an airport.

**13. Understand the Importance of Railway.**

- 13.1 State the advantages of railway.
- 13.2 State salient features of railway system in Pakistan.
- 13.3 Compare rail and road transport.
- 13.4 Explain the metro rail system.

#### **14. Understand the Functions of the Permanent Way.**

- 14.1 Define permanent way.
- 14.2 State the requirements of permanent way.
- 14.3 Explain the components of permanent way, their functions and types (formation, ballast and sleepers).
- 14.4 Explain gauge and its types
- 14.5 Explain factors governing adoption of a particular gauge
- 14.6 Explain the different types of rails, rail joints, rail fittings and accessories.
- 14.7 Explain carriage wheel and conning of wheels.
- 14.8 State the requirement of good rail joint and ballast.
- 14.9 Explain modern methods of laying railway track.

#### **15. Understand Creep and its Correction.**

- 15.1 Definition of creep.
- 15.2 Explain the causes of creep.
- 15.3 Explain with sketch magnitude of creep.
- 15.4 State the results of creep.
- 15.5 State the methods of correction of creep.

#### **16. Understand the Arrangements of Points and Crossing for Safe Running of Trains.**

- 16.1 State the purpose of points and crossing.
- 16.2 Describe with sketches the sleepers for point and crossing (through and interlaced sleepers).
- 16.3 Explain the terms switches, shapes, length of stock and tongue rails, heel clearance, switch angle, through switches.
- 16.4 State the types of crossing.
- 16.5 Explain theoretical and actual nose of crossing.
- 16.6 Explain the terms crossing angle and number.
- 16.7 Explain station yards and sketch their layout.

#### **17. Understand the Arrangements of Signals for Safe Running of Trains.**

- 17.1 State the purpose and types of signals.
- 17.2 State the classification of signals according to function and location.
- 17.3 Explain signaling and its objects.
- 17.4 Describe with sketches the inter locking its principles and requirements.
- 17.5 Explain the methods of inter locking.

**18. Understand Alignment and Construction of Tunnels.**

- 18.1 State necessity of tunnels
- 18.2 State importance of tunnel engineering
- 18.3 Demonstrate alignment of tunnels and their construction
- 18.4 Enumerate tunnels as per their length

**19. Understand the Idea behind Docks and Harbours.**

- 19.1 Define harbours.
- 19.2 State the classification of harbours and list out harbours of Pakistan..
- 19.3 Explain the requirement of a commercial harbour, its location and size.
- 19.4 Explain the terms tidal waves, break water and their classification.
- 19.5 Explain terms: Wharves, quay walls, jetties, piers, and moorings.
- 19.6 State the classification of docks.
- 19.7 Explain beach erosion and its protection
- 19.8 State the terms locks and lock gates.

**20. Understand the Purpose of Dredging.**

- 20.1 Define dredging
- 20.2 State the necessity of dredging.
- 20.3 Explain the types of dredging devices.
- 20.4 Explain methods of dredging.
- 20.5 Explain disposal of dredging material.

**21. Understand Fundamentals of Navigation Aids.**

- 21.1 Describe navigation aids.
- 21.2 Explain types of signals, light house, beacons, light ship and buoys.



LIST OF PRACTICALS		HOURS
1	Drawing skeleton plan/map of Pakistan showing major roads.	3
2	Demarcation of road alignment on a given contour map.	3
3	Drawing typical cross-section of National and Provincial Highway.	3
4	Measurement of Stone metal at site and marking main quarries on Pakistan map.	3
5	Drawing typical cross-section of hill roads.	3
6	Sketching of subsurface drainage.	3
7	Visit to a road project under construction.	3
8	Ductility test for bitumen	3
9	Softening point test for bitumen (ring and ball apparatus)	3
10	Marshal stability test for bituminous mixture	3
11	Viscosity determination for cutback or emulsion	3
12	Flash and fire test for bitumen / cutback	3
13	Quantitative extraction of bitumen from bituminous paving	3
14	Penetration (consistency) of bituminous material	3
15	Los Angles Abrasion test	3
16	Sketching various road junctions, traffic and refuge islands.	3
17	Sketching various types of traffic signs.	3
18	Visit to motorway intersection, Metro bus system / Rail system	3
19	Preparation of general layout plan of an airport showing typical cross-section of run way.	3
20	Sketches of various airport patterns.	3
21	Visit to a nearby railway station and tracks, observation of parts drawing plan & cross section of permanent way	6
22	Drawing of the connection of rails to sleepers	3
23	Drawing of broad gauge track in cutting & filling	3
24	Drawing of various types of rails and chairs.	3
25	Sketching various types of signals. (common, semaphore, light disc and dwarf signals)	9
26	Drawing sections of breakwater.	3
27	Drawing layout of typical harbour and outline the important structures.	3
28	Sketching jetties and pier, lock gates, quay, draggers	3
29	Sketching a typical light house, floating signal (beacon, buoys, mooring buoys.)	3

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-354 CONCRETE TECHNOLOGY & R. C. C. DESIGN**

<b>TOTAL CONTACT HOURS:</b>	<b>192</b>	<b>T</b>	<b>P</b>	<b>C</b>
THEORY:	96	3	3	4
PRACTICAL:	96			

**Aim:** To establish an understanding of the behaviour of structural concrete and develop and understanding of the methods used in design practice

**Course Contents**

<b>1</b>	<b>Ingredients of Concrete</b>	<b>6 Hours</b>
1.1	Differentiate between good and bad concrete.	
1.2	Chemistry of Cement- chemicals in cement and their functions	
1.3	Binding materials and their properties	
1.4	Tests of cement	
1.5	Fine aggregate & coarse aggregate and their properties along with tests bulking of sand, grading of fine and course aggregates.	
1.6	Additives and Admixtures for concrete	
<b>2</b>	<b>Properties of Concrete</b>	<b>12 Hours</b>
2.1	Properties of fresh concrete	
2.2	Workability and Factors affecting workability of concrete	
2.3	Tests on fresh concrete	
2.4	Measurement of workability	
2.5	Recommended slump values	
2.6	Properties of hardened concrete	
2.7	Factors affective properties of hardened concrete	
2.8	Tests on hardened concrete.	
2.9	Non-destructive tests of concrete.	
2.10	Mix Design method as per ACI code.	
<b>3</b>	<b>CONCRETING OPERATIONS.</b>	<b>12 hours</b>
3.1	Introduction-List of operation.	
3.2	Storing of concrete materials-cement, aggregates.	
3.3	Batching of materials, by volume, by weight.	
3.4	Mixing of concrete-hand mixing, machine mixing, mixers and types.	
3.5	Structure and working of batching plant.	
3.6	Transportation of concrete-methods, time factor, loss of moisture, pumping of concrete.	
3.7	Compaction-hand and machine compaction, vibrators, precautions.	
3.8	Finishing concrete surface-types	

- 3.9 Curing of concrete-object, methods duration of curing.
- 3.10 Joints in concrete-types, construction and positions, joint fillers, joint treatments.
- 4 Concreting Under Special Conditions. 6 Hours**
- 4.1 Effects of temperature on concrete.
- 4.2 Recommended precautions and practice for hot weather concreting.
- 4.3 Recommended precautions and practice for cold weather concreting.
- 4.4 Under water concreting-method, precautions.
- 5 SPECIAL CONCRETES. 6 Hours**
- 5.1 Light weight concrete, classifications properties, uses.
- 5.2 High strength concrete.
- 5.3 Mass concrete.
- 5.4 Ready mixed concrete.
- 5.5 Shotcrete
- 5.6 Tilt up construction
- 5.7 Cellular Concrete
- 5.8 Self-consolidated Concrete
- 5.9 Fibre Reinforced Concrete
- 5.10 Pervious Concrete.
- 5.11 Antibacterial Concrete
- 5.12 Roller-compacted Concrete
- 5.13 Other Advanced Concretes.
- 6 Pre-stressed Concrete. 6 Hours**
- 6.1 Introduction to pre-stressing and methods of tensioning
- 6.2 System of pre-stressing
- 6.3 Steel and concrete used in pre-stressing
- 6.4 Advantages of pre-stressed concrete over R. C. C.
- 7 Reinforcement for R. C. C. Structures 3 Hours**
- 7.1 Types and their properties.
- 7.2 Storing, cleaning, bending, fixing, placing and binding of reinforcement.
- 8 R. C. C. Design. 6 Hours**
- 8.1 Introduction to R. C. C. Design.
- 8.2 Different types of Loads
- 8.3 Advantages and disadvantages of R. C. C.
- 8.4 Grades of concrete, characteristics, compressive strength, tensile strength, modulus of elasticities, modular ratio.
- 8.5 Working and ultimate stresses of concrete and steel

8.6	Bending moment and shear force in beams bending, moment and shear force coefficients.	
8.7	Loads to be adopted in R. C. C. design-live loads, dead loads, wind load, seismic loads, load factors and strength reduction factors.	
8.8	Methods of design: service load method (working stress Design (WSD) method), Ultimate strength Design (USD) method (limit-state design).	
8.9	Codes of practice for R. C. C. design: BS Code and ACI Code.	
<b>9</b>	<b>Shear and Bond Design in Beam.</b>	<b>6 Hours</b>
9.1	Shear stresses in beam-horizontal shear, diagonal tension and compression	
9.2	Types of shear reinforcements-stirrups, inclined bars	
9.3	Design for horizontal shear diagonal tension, bent up bars, spacing of stirrups, zones of shear reinforcement in beams.	
9.4	Design problems	
9.5	Bond between concrete and reinforcement, bond stresses, development length, checking bond stresses in beam	
<b>10</b>	<b>Design of Rectangular Beam.</b>	<b>6 Hours</b>
10.1	Method of design (Ultimate Strength design Method), assumptions used in Ultimate Strength design (USD) Method and behaviour of reinforced concrete beams.	
10.2	Whitney's stress diagram and formula for design	
10.3	Balanced, under reinforced and over reinforced sections. Cracked section, un-cracked section	
10.4	Practical design considerations.	
10.5	Design of simple R. C. C. beam code provisions, steps in design of R.C.C simple beam-design of simply supported, cantilever, over hanging beam under different situations.	
10.6	Design of R. C. C. lintel	
10.7	Problems solving related to beam & lintel.	
<b>11</b>	<b>Design of one Way Slab/Slab Spanning in One Direction)</b>	<b>3 Hours</b>
11.1	Definition, one way slab, two way slab	
11.2	Design steps and formulae	
11.3	Design of simply supported, overhanging one way slab in various situation	
<b>12</b>	<b>Design of Doubly Reinforced Beam.</b>	<b>6 hours</b>
12.1	Definition, necessity and use, limitation	
12.2	Elements and assumption related to design, design steps.	
12.3	Design of simply supported doubly reinforced beam.	
<b>13</b>	<b>Design of Two Way Slab.</b>	<b>3 Hours</b>

- 13.1 Definition, code provisions and assumption related to design.  
 13.2 Loads, bending moment coefficients and its use.  
 13.3 Design of isolated and two spans two way slab.
- 14 Design of Tee and Ell Beam. 6 Hours**
- 14.1 Definition, necessity, advantages, main and secondary beam  
 14.2 Design of *simply supported* reinforced Tee and Ell beam.
- 15 Design of Axially Loaded Columns and Footings. 6 Hours**
- 15.1 Columns- determine load carrying capacity of RCC columns  
 15.2 Design formulae and code provisions  
 15.3 Types of footing  
 15.4 Design of isolated column footing, design of wall/ strip footing.
- 16 Design of Simple Stair Case. 3 Hours**
- 16.1 Types, spanning horizontally and spanning longitudinally.  
 16.2 Loads, design elements procedure  
 16.3 Design of stair spanning horizontal and longitudinally.

#### Recommended / Reference Books:

- 1 R. C. C. design : *Winter and Nilson*
- 2 Concrete Technology : **Hando**
- 3 Properties of Concrete : **A. M. Neville**
- 4 Concrete and Structures by Prof. Dr. **Z. A. Siddiqui**
- 5 R. C .C. Design : by **ChuKia Wang**
- 6 Concrete Technology: **A. M. Neville and J.J. Brooks**, [2006], Dorling Kindersley India, Delhi
- 7 Design of Reinforced Concrete Structures: **N. Krishna Raju**, [2003], Satish Kumar Jain
- 8 Design of Concrete Structures: **Arthur H. Nilson, David Darwin and Charles W. Nolan**, [2006], John Wiley and Sons
- 9 Design of Reinforced Concrete Structures PWS Engineering: **Hasson M. N.**
- 10 ACI Design Codes

## Instructional Objectives

### 1. Understand the properties of Cement and other ingredients of Concrete

- 1.1 Explain difference between good and bad concrete.
- 1.2 Explain role of chemicals in setting process and effects on strength due to variance in quantity in the cement
- 1.3 Explain the various properties/ tests of cement (i.e. initial and final setting time tests, soundness test, compression strength test and tensile strength test and tensile strength test, etc.
- 1.4 State classification of aggregates according to nature of formation, size and shape
- 1.5 State the characteristics of good fine and coarse aggregates
- 1.6 Explain the tests on fine aggregates (Fineness, impurities) and on coarse aggregates (sieve analysis, Flakiness, elongation, Bulk density, impact value).
- 1.7 Explain the effects of bulking of sand on proportioning of materials and on strength of concrete
- 1.8 Define importance of gradation of aggregated in strength design of concrete
- 1.9 Explain the function of water in concrete
- 1.10 Explain the effects of excess impurities in water on strength of concrete
- 1.11 Differentiate between Additives and Admixtures.
- 1.12 Describe the types and functions of various additives and admixtures.

### 2. Understand the factor influencing concrete properties

- 2.1 State properties of fresh concrete: segregation, blending, workability, false set, flash set, etc.
- 2.2 State different factors affecting the workability of concrete
- 2.3 State relationship between hydrations of cement and water content, state the water cement ratio and its effects on strength of hardened concrete
- 2.4 Describe the different tests for the measurement of workability, i.e. slump test, compacting factor test, vee-bee test, etc.
- 2.5 State the different recommended values of slumps for various conditions of placements
- 2.6 State the different properties of hardened concrete. i.e. strength, impermeability, durability, elasticity, shrinkage, creep, thermal expansion, etc.
- 2.7 Describe the various factors affecting the properties of hardened concrete.
- 2.8 Describe the compressive strength (cube and Cylinder strength), Tensile strength (split cylinder test), Flexural strength test (Beam test), shear strength test and bond strength test of concrete.
- 2.9 Describe non-destructive tests (rebound hammer, PUNDIT test,

- Ultrasonic pulse test, Rebar detector Test).
- 2.10 Explain different methods of mix design i.e. (ordinary, minimum void w/c maximum density rate to method fineness methods)
  - 2.11 State the method of mix design by ACI code method for a specific strength of concrete for design of R. C. C. structures.

#### **4. Understand The Methods Of Batching, Mixing, Transporting, Placing, Compacting, Finishing, Jointing And Curing On Given Jobs.**

- 3.1 List the concreting operations
- 3.2 Discuss the storing of concrete materials at job site
- 3.3 Describe method of batching i.e by volume and by weight
- 3.4 Explain the procedure of hand and machine mixing of concrete
- 3.5 State the types of concrete mixers
- 3.6 Explain various methods of transportation of fresh concrete
- 3.7 Explain the factors affecting the selection of a system of transportation
- 3.8 Explain the preparation of form work for concrete
- 3.9 Explain the method of placing steel
- 3.10 Explain the method of placing concrete
- 3.11 State various methods of compacting concrete
- 3.12 Explain the method of the compaction by vibrators
- 3.13 Explain the various methods of finishing concrete surface
- 3.14 Describe the object of curing
- 3.15 Explain various methods of curing
- 3.16 Explain the need of joints in concrete structures
- 3.17 Explain the construction and position of construction joint i.e. contraction joints and expansion joint
- 3.18 State various types of joint fillers
- 3.19 Explain procedure of treatment of joints

#### **4 Understand Standard Practices for Concreting Under Special Conditions**

- 4.1 Explain the effects of temperature on concrete
- 4.2 Explain standard practices and precautions for hot and cold weather concreting
- 4.3 Explain methods of concreting under water

#### **5 Understand Light Weight Concrete, High Strength Concretes Mass Concrete Ready Mixed Concretes.**

- 5.1 State the types of light weight aggregates
- 5.2 Explain properties and uses of light weight concretes
- 5.3 State importance and uses of high strength concrete
- 5.4 Explain the special techniques involved in mass concreting
- 5.5 Explain necessity and manufacturing of ready mixed concrete

- 5.6 Explain Shotcrete
- 5.7 Explain Tilt up construction
- 5.8 Explain Cellular Concrete
- 5.9 Explain Self-consolidated Concrete
- 5.10 Explain Fibre Reinforced Concrete
- 5.11 Explain Pervious Concrete.
- 5.12 Explain Antibacterial Concrete
- 5.13 Explain Roller-compacted Concrete

## **6 Know About Principles of Pre-stressed Concrete**

- 6.1 Understand principles of pre-stressing and methods of tensioning, i.e. post and pre tensioning.
- 6.2 State the systems of pre-stressing such as Freyssinet, Magnel Blaton, and Lee Mecall systems
- 6.3 State the requirements of concrete and steel for pre-stressing
- 6.4 Explain the advantages of pre-stressed concrete over conventional R. C. C.

## **7 Understand Methods and Procedures of Laying Reinforcement**

- 7.1 State the types of steel and their properties used in R. C. C.
- 7.2 State standards for storing, straightening, cutting, bending, placing and binding reinforcement

## **8 Understand Basic Concepts to Design an R. C. C. Member**

- 8.1 Define R. C. C.
- 8.2 State advantages and disadvantages of R. C. C.
- 8.3 State grades of concrete, steel and their respective permissible stresses
- 8.4 Use standard tables of bending moment and shear force coefficients for finding bending moment in continuous beam
- 8.5 State the loads to be considered for design, load factors and strength reduction factors.
- 8.6 State the methods of design of R. C. C. structures i.e. Elastic Theory and Limit State methods. Adopt Limit State Method
- 8.7 State the codes of practice for R. C. C. design such as BS code and ACI code (*Adopt A.C.I. code of practice for design*).

## **9 Understand Shear and Bond Stresses in Beams**

- 9.1 State shear stress in homogenous beam
- 9.2 Explain shear stress in R. C. C. beam
- 9.3 Explain horizontal shear, diagonal tension and compression developed in a beam
- 9.4 Explain formulae and steps to be followed in the determination of number



- of stirrups and mild bars as shear reinforcement, zones of shear reinforcement in beams.
- 9.5 Explain bond between concrete and reinforcement
- 10 Understand the Flexural Formula and Design of Simple R. C. C. Beam**
- 10.1 State the assumption used in *Strength Design method(Limit State Method)* and behaviour of reinforced concrete beams.
- 10.2 Explain Whitney's stress diagram and formula for design
- 10.3 Explain balanced, under reinforced and over reinforced sections, Cracked section, un-cracked section
- 10.4 Explain practical design consideration.
- 10.5 Explain Design of simple R. C. C. beam
- 10.6 State the steps and formulae to be followed in design of lintels
- 10.7 Practice of relevant numericals
- 11 Understand the Principles Involved in the Design of Slab**
- 11.1 Distinguish between one way and two way slab and state the loads taken into account for design of slab
- 11.2 State the steps and formulae for designs of one way slab
- 11.3 Design simply supported, and overhanging one way slab in various situations
- 12 Understand Principles Involved in the Design of Doubly Reinforced Beam**
- 12.1 Define doubly reinforced beam and explain necessity of compression reinforcements in beam
- 12.2 Explain various methods of design of doubly reinforced beam, *ACI code*
- 12.3 Explain elements and assumption related to design of doubly reinforced beam, also state steps and formulae for design
- 12.4 Design a simply supported doubly reinforced beam
- 13 Understand the Principles Involved in the Design of Two Way Slab**
- 13.1 Define two way slab and explain design elements
- 13.2 Use banding moment coefficients for different conditions
- 13.3 State assumptions for design of simply supported and two spans continuous slabs
- 13.4 Solve problems on two way simply supported slab
- 14 Understand Principles Involved in the Design of Tee and Ell Beam**
- 14.1 Define Tee and Ell beam and explain advantages of Tee and Ell beams

14.2 Solve problem on simply supported Tee and Ell beam

**15 Understand The Principles Involved in the Design of Axially Loaded Column and Simple Column Footings**

15.1 State short and long columns

15.2 Determine load carrying capacity of RCC columns

15.3 Explain formulae for the design of column and its footing

15.4 Calculate depth of footing and reinforcement details

15.5 Design of isolated column footing; punching shear and BM in base, etc. and design of wall/ strip footing.

**16 Understand the Procedure Involved in the Design of Stairs**

16.1 Distinguish between stair spanning horizontally and stair spanning longitudinally

16.2 Compute loads taken into accounts for design of stairs and explain assumptions and steps involved in the design of stairs

16.3 Design a simple stair

16.3.1.1 Spanning horizontally

16.3.1.2 Spanning longitudinally

LIST OF PRACTICALS		96	HOURS
<b>1.</b>	<b>Test on cement</b>		
1.1	Fineness test of cement.		3
1.2	Preparation of cement paste of standard consistence.		
1.3	Determination of Initial and final setting time.		3
1.4	Le-Chatellier's test for soundness of cement.		3
1.5	Test for compressive strength of cement using mortar (1:3) cube and cylinder		3
1.6	Briquette test for tensile strength of cement using mortar (1:3)		3
<b>2.</b>	<b>Test on aggregates</b>		
2.1	Determine clay percentage in sand.		3
2.2	Determination of particle size distribution of fine and coarse aggregates by sieve analysis.		3
2.3	Determination of bulk density and voids in aggregates.		3
2.4	Determination of flakiness index and elongation index of coarse aggregates.		3
2.5	Determination of specific gravity and water absorption of aggregates.		3
<b>3.</b>	<b>Test on concrete</b>		
3.1	Test for workability of concrete by slump cone.		3
3.2	Test for workability of concrete by compacting factor apparatus.		
3.3	Preparation of concrete cubes and cylinders vibrated and hand compacted, hand mixed and machine mixed and with different water cement ratio.		3
3.4	Determination of compression strength of concrete using cubes and cylinders and compare the strength of both.		3
3.5	Preparation of standard size beams for flexural strength of concrete		
3.6	Modules of rupture test, (breaking of beam prepared in above practical)		3
3.7	Split cylinder test for tensile strength of R. C. C. concrete Design.		
3.8	Non-destructive test by rebound hammer.		3
3.9	Rebar Detector test NDT for steel reinforcement in R. C. C. structures like bridge, Water tank, framed structures e.g. buildings OHR etc.		
3.10	Solve problems on bending moment and shear force in beams		3
3.11	Design and drawing of simple rectangular R. C. C. beam with U. D .L.		3
3.12	Design and drawing of simply supported and overhanging one way slab		3
3.13	Design and drawing shear force reinforcements for a rectangular beam and check for bond		3
3.14	Design of cantilever beam and lintels.		6
3.15	Design and drawing of doubly reinforced beams along with shear reinforcement and check for bond.		6
3.16	Design and drawing of two way slab.		3

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3.17	Design and drawing of simply supported Tee and Ell beams.	6
3.18	Design and drawing of main and secondary Tee & Ell beam for a hall.	6
3.19	Design and drawing of R. C. C. column with isolated footing.	6
3.20	Design and drawing of stair case.	6

**DAE CIVIL TECHNOLOGY  
YEAR 3**

**CIVIL-373                      SOIL MECHANICS AND BRIDGE ENGINEERING**

<b>TOTAL CONTACT HOURS:</b>	<b>160</b>	<b>T</b>	<b>P</b>	<b>C</b>
Theory:	<b>64</b>	<b>2</b>	<b>3</b>	<b>3</b>
Practical:	96			

- AIM:**
1. To know the importance of soil as a foundation and source for construction material for every building, bridge, dam, power station, roads, railroad, etc.
  2. To understand the physical properties of soil and behaviour of soil masses subjected to various types of forces

**COURSE CONTENTS**

- |  |                |
|--|----------------|
| <b>1. Introduction</b>   | <b>5 Hours</b> |
| <ol style="list-style-type: none"> <li>1.1 Soil, soil mechanics, soil engineering</li> <li>1.2 Objectives of soil mechanics</li> <li>1.3 Types of soil and their formation</li> <li>1.4 Soil structure and its group</li> <li>1.5 Three phase diagram of soil</li> <li>1.6 Physical properties of soil</li> <li>1.7 Specific gravity and various densities</li> <li>1.8 Various interrelationships</li> <li>1.9 Numerical problems</li> </ol>  |                |
| <b>2. Soil Classification.</b>   | <b>5Hours</b>  |
| <ol style="list-style-type: none"> <li>2.1 Classification of soils</li> <li>2.2 System of classification:               <ol style="list-style-type: none"> <li>(i) particle size classification,</li> <li>(ii) Textural classification,</li> <li>(iii) AASHTO classification,</li> <li>(iv) Unified soil classification system</li> </ol> </li> <li>2.3 Particle size analysis</li> <li>2.4 Well graded, uniformly graded soil, poorly graded soil ,Effective grain size, coefficient of uniformity, coefficient of curvature</li> </ol> |                |
| <b>3. Plasticity.</b>  | <b>5Hours</b>  |

- 3.1 Consistency of soil
  - 3.2 Description of Atterberg's Limit.
  - 3.3 Different Indices(Plasticity index ,liquidity index, consistency index etc)
  - 3.4 Methods of determination of Atterberg's Limits for given soil sample.
- 4. Compaction.** 5 Hours
- 4.1 Compaction and Objectives of compaction
  - 4.2 Principles of compaction
  - 4.3 Compaction Effort or Energy
  - 4.4 Compaction and consolidation
  - 4.5 Standard proctor test and modified proctor test
  - 4.6 Field compaction test, Rubber balloon method, Nuclear density meter
  - 4.7 ,Methods of field compaction
  - 4.8 Factors affecting field compaction
- 5. Permeability** 7 Hours
- 5.1 Introduction to permeability
  - 5.2 Description of factors affecting permeability.  
Darcy's Law and its validity
  - 5.3 Laboratory permeability tests
  - 5.4 Field permeability tests
  - 5.5 Numerical problems on permeability.
- 6. Shear Strength of Soils.** 6 Hours
- 6.1 Introduction to shear strength of soils.
  - 6.2 Coulomb's Law for shear strength of soil.
  - 6.3 Laboratory measurement of shear strength
  - 6.4 Triaxial compression test and Mohr's circle
  - 6.5 Unconfined compression test.
  - 6.6 Factors affecting shear strength of soil
  - 6.7 Differentiate between cohesive and non-cohesive soil
- 7. Stability of Slopes.** 3 Hours
- 7.1 Necessity, types and failure of slopes
  - 7.2 Causes of failure of slopes
  - 7.3 Factors contributing to slope failure.
  - 7.4 Remedial measure to avoid slope failures.
- 8. Bearing Capacity of Soils.** 5Hours

8.1	Introduction to bearing capacity of soil.	
8.2	Factors affecting bearing capacity.	
8.3	Standard penetration test	
8.4	California bearing ratio test	
<b>9.</b>	<b>Introduction to Development of Bridges</b>	<b>3 Hours</b>
9.1	Definition of terms related to bridge engineering	
9.2	Structural parts of bridges	
9.3	Factors affecting the development of bridges	
<b>10.</b>	<b>Permanent Bridges</b>	<b>5 Hours</b>
10.1	Permanent girder bridges, component parts and type – (R. C. C, steel and pre stress conc.)	
10.2	arch bridges-types (masonry, R. C. C, steel and pre-stressed concrete)	
10.3	suspension and Rigid Frame Bridge (R. C. C and Steel)	
10.4	Permanent big bridges – Abutment, wing walls, approaches, piers and their foundation.	
<b>11.</b>	<b>Culvert</b>	<b>3 Hours</b>
11.1	Culvert and causeway	
11.2	Difference between culvert and causeway	
11.3	Types of culverts (pipe, box, arch and slab)	
11.4	Types of causeway	
<b>12.</b>	<b>Temporary Bridges</b>	<b>4 Hours</b>
12.1	Introduction types (wooden, suspended, floating and moveable)	
12.2	Necessity and suitability	
<b>13.</b>	<b>Selection of Bridge Type and Site</b>	<b>4 Hours</b>
13.1	Comparison of various types	
13.2	Characteristics of an ideal site for a bridge (River and Banks, foundation design and construction facilities, approaches)	
13.3	Location of an alignment and site	
13.4	Factor governing the choice of a bridge	
<b>14.</b>	<b>Maintenance of Bridge</b>	<b>4 Hours</b>
14.1	Brief description of general maintenance	
14.2	Brief description of maintenance of steel, masonry, R.C.C. bridges	
14.3	Brief description of maintenance of causeways.	
14.4	Introduction of modern techniques e.g. epoxies etc.	

**RECOMMENDED / REFERENCE BOOKS:**

1. Soil Mechanics:**Jumikis**.
2. Soil Mechanics: **M.S. Smith**.
3. Soil Mechanics and Foundations: **B.C. Punmia**.
4. Soil Mechanics and Foundation Engineering : **P. Purushothama Raj**
5. Soil Mechanics & Foundation Engineering: **P. Purushothama Raj**, [2009], Pearson Education
6. Soil Mechanics: **Alfred R. Jumikis**, [2003], McGraw-Hill
7. Soil Mechanics and Foundation Engineering: **K.R. Arora**, [2003], Standard 9 Hours Publishers, Delhi
8. Bridge Engg. By Khattak
9. Bridge Engg. By J.S Alagia
10. Road, Railways, Bridges and Tunnels by Desh Pande and Antia.
11. Soil Mechanics: B.C Punmia. [2002]Laxmi Publications, New Dehli.
12. Geotechnical Engineering: Braja M.Das. [2000], Brooks/ Cole USA
13. Soil Mechanics by Dr. Aziz Akbar, UET Lahore.



**INSTRUCTIONAL OBJECTIVES****1. Understand the Preliminary Definitions and Relationships.**

- 1.1 State Objectives of soil mechanics
- 1.2 Explain Soil structure and its group
- 1.3 Define the terms, solids, voids, voids-ratio, porosity, degree of saturation, percentage air voids and moisture contents.
- 1.4 Define specific gravity and various densities of soil.
- 1.5 Solve the numerical problems based on 1.1 to 1.2
- 1.6 Derive the various relationships

**2. Understand the Classification Systems of Soil.**

- 2.1 State classification of soil and its necessity.
- 2.2 Explain Particle size classification system, Textural classification system, AASHTO soil classification system, Unified soil classification system
- 2.3 Explain well graded, uniformly graded soil, poorly graded soil, Effective grain size, coefficient of uniformity, coefficient of curvature
- 2.4 Explain the particle size analysis for different soils.

**3. Understand the Plasticity Variation of Soil.**

- 3.1 State the consistency of soil
- 3.2 Describe the Atterberg limits.
- 3.3 Define the various indices
- 3.4 Explain different Indices (Plasticity index, liquidity index, consistency index etc)
- 3.5 Explain the methods of determination of Atterberg limits.

**4. Understand the Compaction Tests (Field And Lab).**

- 4.1 State term compaction its significance and necessity.
- 4.2 Discuss the principles of compaction
- 4.3 Compare between compaction and consolidation.
- 4.4 Describe Compaction Effort or Energy.
- 4.5 List the procedure of standard proctor test and modified compaction test.
- 4.6 List the procedure of field compaction tests, core cutter method and sand replacement method, Rubber balloon method, Nuclear density meter
- 4.7 State the factors affecting compaction.

**5. Understand the Methods Of Determining the Permeability of Soil.**

- 5.1 Define permeability.
- 5.2 Describe factors affecting permeability.
- 5.3 State the Darcy's law of permeability and its validity
- 5.4 Explain the method of determining the permeability of soil in the Lab
- 5.5 Explain the methods of determining the permeability of soil in the field.

**6. Know the Shear Strength of Soil.**

- 6.1 State the term shear strength of soil & its significance.
- 6.2 State Coloumb's law for shear strength of soil.
- 6.3 State and explain the shear box test
- 6.4 State and explain Triaxial compression test and present the results by Mohr's circle
- 6.5 Apply the equations of simple two dimensional stress systems to solve problems encountered in soil mechanics.
- 6.6 Verify results obtained in 6.5 above using Mohr's circle of stress graphical method.
- 6.7 Explain the unconfined compression test.
- 6.8 Describe the factors affecting shear strength of soil.
- 6.9 Differentiate between cohesive and non-cohesive soils.

**7. Understand the Need of Stability of Slope.**

- 7.1 State the necessity, types and failure of slope.
- 7.2 Explain causes of failure of slopes
- 7.3 State the factors contributing to slope failure.
- 7.4 Explain the remedial measure to avoid slope failure.

**8. Understand the Bearing Capacity of Soil.**

- 8.1 Define bearing capacity, ultimate bearing capacity and safe bearing capacity of soil.
- 8.2 State the factors affecting bearing capacity of soil.
- 8.3 Explain the method for finding bearing capacity of soil by standard penetration test.
- 8.4 Explain the California Bearing Ratio (CBR) method for finding bearing capacity of soil.

**9. Introduction To Development Bridges**

- 9.1 Definition of terms related to Bridge Engineering
- 9.2 Explain structural parts of a Bridge
- 9.3 Explain factors Affecting the Development of Bridges

**10. Permanent Bridges**

- 10.1 Explain structure permanent girder bridges
- 10.2 Explain components parts and type (RCC, steel and pre stressed concrete)

**11. Culvert**

- 11.1 Define Culvert and causeway
- 11.2 Explain the difference between culvert and causeway
- 11.3 Explain Types of culverts (pipe, box, arch and slab)
- 11.4 Explain Types of causeway

**12. Temporary Bridges**

- 12.1 State introduction types (wooden, suspended, floating and moveable)
- 12.2 Necessity and suitability

**13. Selection of Bridge Type and Site**

- 13.1 Comparison of various types
- 13.2 Characteristics of an ideal site for a bridge (River and Banks, foundation design and construction facilities, approaches)
- 13.3 Location of an alignment and site
- 13.4 State Factors governing the choice of a bridge

**14. Maintenance of Bridge**

- 14.1 Brief description of general maintenance
- 14.2 Brief description of maintenance of steel, masonry, R.C.C. bridges
- 14.3 Brief description of maintenance of causeways.
- 14.4 Introduction of modern techniques e.g. epoxies etc.

<b>LIST OF PRACTICALS</b>		<b>96 HOURS</b>
1.	Determination of moisture content in a given soil sample by	
i)	Speedy moisture content apparatus	03
ii)	Oven method in the lab	03
2.	Determination of specific gravity of given soil sample by pycnometer	03
3.	Sieve analysis for a given soil sample in the lab and preparation of gradation curve.	03
4.	Atterberg's (Liquid, Plastic & Shrinkage) Limit determination	06
5.	Performing standard and modified Proctor test.	06
6.	Finding field density by	
ii)	Core cutter method	03
iii)	Sand replacement method	03
7.	Permeability test and problem solving relating to Permeability	06
8.	Direct shear test for determining shear strength of soil in the laboratory	03
9.	Triaxial compression test and present the results by Mohr's circle	06
10.	Performing standard penetration test and finding bearing capacity of the soil	03
11.	California bearing ratio (CBR) test for finding bearing capacity for soil for buildings, bridges and roads.	03
12.	Sketching bridges according to:	03
i.	function / purpose	
ii.	materials of construction	
iii.	Relative portion of permanent floor	
iv.	types of super structures	18
13.	Drawing of R.C.C slab culvert	06
14.	Drawing of low level and high level causeways	06
15.	Drawing of R.C.C deck slab bridge having two span 10 m each	06
16.	Visit of a railway / highway bridges.	06

**LIST OF LABORATORIES SUBJECT WISE**

SUBJECT TITLE	NAME OF LABORATORY / WORKSHOP
Applied Chemistry	Chemistry Laboratory
Applied Physics	Physics Laboratory
Workshop Practice	Wood Workshop
Workshop Practice	Electrical Lab
Basic Civil Engineering Surveying Advanced Civil Engineering Surveying Construction Project Planning & Management	Surveying Laboratory
Basic Civil Engineering Drawing Civil Engineering Drawing & AutoCAD	Drafting Laboratory
Computer Applications Civil Engineering Drawing & AutoCAD Construction Project Planning & Management	AutoCAD Laboratory
Computer Applications Advanced Quantity Surveying Construction Project Planning & Management	Computer Laboratory
Engineering Materials & Construction Techniques Advanced Construction Techniques Construction Project Planning & Management Concrete Technology & R. C. C. Design	Construction Laboratory
Engineering Mechanics Concrete Technology & R. C. C. Design Soil mechanics & Bridge Engineering Transportation Engineering Construction Project Planning & Management	Materials Testing Laboratory (Combination of Soil Mechanics Lab, Mechanics Lab, Transportation Lab and Concrete Lab)
Hydraulics & Irrigation Engineering Public Health Technology	Public Health and Hydraulics Lab (Combination of Public Health Lab and Hydraulics Lab)

**List of Equipment and Machinery for DAE in Civil Technology****SURVEY LAB**

<b>S.#</b>	<b>Name of Equipment / Machinery with specifications</b>	<b>Quantity Required</b>
1.	<b>Electronic Total Station</b>	8
2.	<b>Electronic Digital Theodolite (Optional)</b>	8
3.	<b>Microptic Theodolite</b>	10
4.	<b>Auto Levels</b>	10
5.	<b>Auto Set Level : with built-in Micrometer: (Tilting Level)</b>	5
6.	<b>Laser level</b>	2
7.	<b>LEVELLING STAFF</b>	20
8.	<b>PLANE TABLE SET</b>	10
9.	<b>Prismatic Compass with tripod:</b>	20
10.	<b>Telescopic Alidade:</b>	05
11.	<b>Telescope Survey Compass:</b>	5
12.	<b>ENGINEER'S CHAIN</b>	10
13.	<b>METRIC CHAIN:</b>	10
14.	<b>GUNTER'S CHAIN</b>	4
15.	<b>STEEL TAPE</b>	20
16.	<b>STEEL BAND</b>	10
17.	<b>METALLIC TAPE</b>	20
18.	<b>INVAR TAPE</b>	4
19.	<b>ARROWS</b>	100
20.	<b>RANGING RODS</b>	100
21.	<b>Ranging Rods(Two pieces)</b>	40
22.	<b>CROSS STAFF</b>	20

23.	<b>OPTICAL SQUARE</b>	10
24.	<b>OPTICAL Square</b>	10
25.	<b>VELOCITY ROD</b>	4
26.	<b>MALLET</b>	20
27.	<b>ABNEY'S LEVEL</b>	4
28.	<b>SOUNDING ROD (Aluminium)</b>	20
29	<b>PLUMB BOB</b>	20
30	<b>PLANIMETER</b>	2
31	<b>BALL PEIN HAMMER</b>	10
32	<b>Levelling Tripod:</b>	20
33	<b>Target Staff:</b>	10
32	<b>Double frequency GPS</b>	2
35	<b>Hand Held GPS</b>	4
36	<b>Thermometer (Mercury):</b>	10
37	<b>Spring Balance:</b>	10
38	<b>Barometer:</b>	2

b) **Material Testing Lab** (Mechanics, Concrete, Transportation & Soil Mechanics)

S.#	Name of Equipment / Machinery with specifications	Quantity Required
1	<b>Compression Testing Machine</b>	1
2	<b>Flexure / Tension Machine (cement, Mortar, Briquette Tensile Testing)</b>	1
3	<b>Electronic Digital Balance (Top-Pan Type)</b>	1

4	<b>Electronic Digital Precision Balance (Top-Pan Type)</b>	1
5	<b>Top Pan Weighting Balance</b>	3
6	<b>Vicat Apparatus</b>	8
7	<b>Lechatlier's Apparatus</b>	2
8	<b>Desiccators cabinet</b>	1
9	<b>Specific Gravity Test Set</b> (Fine and course aggregates) • Confirming with ASTM + BS Standards <b>for fine aggregate</b> <u>Glass Pycnometer</u> • <u>Conical mould and temper:</u> • <u>For Coarse Aggregates:</u>	10
10	Set of Sieve	3 Sets
11	Sieve shaker	3
12	Speedy Moisture Content Apparatus •	8
13	Standard Proctor Compaction Apparatus:	8
14	Modified Proctor Compaction Apparatus:	8
15	Sand Cone Apparatus for Measurement of Field Density	8
16	Constant Head Permeability Apparatus	1
17	Direct Shear Test Machine	1
18	Digital Stop Watch	10
19	<u><b>Atterberg's Limit Determination</b></u> <b>1. Liquid Limit Test</b> a) Liquid Limit Device with Grooving tool and counter b) Glass Plate <b>2. Plastic Limit Test</b> a) Procelein Dish b) Spatula / Knife c) Glass Surface / Plate d) 12 number of Moisture Containers e) Steel Rod (3mm dia approximately) <b>3. Shrinkage Limit Test</b> a) Shrinkage Dish 45mm dia x 12.7mm height b) Crystallizing Dish 57mm x 31mm (approximate) c) Prong Plate with 3 metal prongs d) Evaporating Dish e) Spatula	8



	f) Graduated Cylinder 25ml	
20	Core Cutter Test Apparatus	8
21	Soil Samling Kit	5
22	Sample Extriuder	2
23	Standard Penetration Test Apparatus	2
24	Marshal Stability Test (30KN Capacity)	2
25	Saybolt Viscometer	2
26	Bitumen Ductility Test Apparatus	1
27	Thermostatic Lab Oven	1
28	Softening Point Test	2
29	Equipment Flash and Fire Test	2
30	Penetration of Bituminous Material	2
31	Loss Angles Abrasion Test	1
32	Extraction of Bitumen	2
33	Non-Distructive Test (Concrete Test Hammer)	2
34	Young's Modulus Apparatus:	8
35	Basic Roof Truss:	8
36	Shearing Force Apparatus:	8
37	Bending Moment Apparatus:	8
38	Loaded Beam Assembly:	8
39	Deflection of Beam Apparatus:	8
40	Flakiness Sieve Set	2
41	SPATULA	10
42	Wire Brush	20
43	Trimming Knife	10
44	Graduated Cylinders	10
45	Flakiness Index Guage	8
46	Elongation index guage (length guage)	5
47	Wire Basket	20
48	Tray SET	10
49	Pycnometer	10
50	Conical Flask	10
51	Beakers	20
52	Thermometers	10
53	Wash Bottle	10
54	Specific Gravity Bottles	10
55	Metallic Scoops	20
56	Mortar & Pestle	10
57	Mixing Spoon Set	20
58	Mixing Bowl	20
59	UNIVERSAL TESTING MACHINE	8
60	Rebar Locator Apparatus	

Equipment required for DAE Civil Technology(Group/Section Strength) = 50 Students)

c) Construction Lab (Construction and Concrete Technology)

S. #	Name of Equipment / Machinery with specifications	Quantity Required
1	Concrete Drum Mixer (Tilting Type)	1
2	Platform scale	1
3	<b><u>MOULDS:</u></b>	
a)	cubes 150mm (6") with clamp attached based plate, easily collapsible sides (made of cast iron)	10
b)	cubes 100mm (4") with clamp attached based plate, easily collapsible sides (made of steel)	10
c)	cylinders 150mm dia X 300mm height (6" dia x 12" height) complete with base plate and locking arrangement, made of Steel	10
d)	mortar cubes 50mm (2") made of brass / steel, three gnag mould, machined in internal surfaces, easily collapsible	10
e)	beams 150 x 150x600mm (6"x6"x24") made of steel	10
f)	Set of Spanners for (cubes and cylinder, beam moulds)	10
i	Tamping Rod for cubes/cylinders 16 mm dia 600 mm long ASTM	10
g	Tamping Rod for mould, 25 x 25 x380 mm (BS 1881)	10
4	<b><u>Concrete cylinder capping</u></b> complete including: 1. two steel retainers for 6" (15cm) dia cylinders 2. Electric melting pot for melting capping compound (with 20kg capping compound Tin)	2 Sets
5	Vibrating Table	2
6	Poker Vibrator	2
7	Slump Test Apparatus	10
8	Compacting Factor Apparatus	5
9	Mechanical Sieve Shaker	1
10	Wheel Barrow:	5
11	Bucket	10

12	Paint Scraper Set	10
13	Poteen Filler Knife Set	10
14	Mason Trowel	10
16	Chisel Set (9"-12"-18")	10
17	Brick Hammer	25
18	Hammer	10
19	Plumb Bob	25
20	Mason's Spirit Level	25
21	Straight Edge	10
22	Shovels with handle	10
23	Kassi (Plies) with handle	10
24	Spirit Level (Aluminium 2 ft. length)	25
25	Pick Axe	10
26	<b><u>Steel float Set</u></b> (Small, medium, large) Wooden Handle	10
27	<b><u>Wooden Float</u></b> (small, medium, large) Wooden Handle	25
28	<b><u>Wooden Scaffolding for Mason</u></b>	
	Bamboo (10 feet)	60
	Bamboo (15 feet)	40
	Battens (5'x3½"x2½")	40
	Shesham Wood Planks (7'x7"x1½")	40
29	<b><u>Mortar Pan</u></b>	10
30	<b><u>Adjustable Wrench Set</u></b>	10
31	<b><u>Steel Tape</u></b>	20

32	<b><u>Mixing Spoon Set</u></b>	25
33	<b><u>Tray (Galvanised Iron, 14 SWG) SET</u></b>	20
34	<b><u>Pointing Trowel</u></b>	25
35	<b><u>Pointing Tray</u></b>	20
36	<b><u>Striker for vertical joint (pointing)</u></b>	25
37	<b><u>Striker for horizontal joint (pointing)</u></b>	25
38	<b><u>Metallic Tape</u></b>	10

**d) Public Health Engineering & Hydraulics Lab**

S.#	Name of Equipment / Machinery with specifications	Quantity Required
1.	<b>ADJUSTABLE WRENCH Set</b>	20
2.	<b>Pipe Wrench Chain Type</b>	10
3.	<b>ADJUSTABLE PIPE WRENCH</b>	20
4.	<b>PIPE REAMER</b>	10
5.	<b>PIPE VICE (STAND TYPE)</b>	10
6.	<b>PIPE VICE (BENCH TYPE)</b>	10
7.	<b>PIPE THREAD CUTTING KIT</b>	10
8.	<b>TAP SET</b>	10
9.	<b>PIPE CUTTER</b>	10
10.	<b>PLIERS Adjustable</b>	10
11.	<b>COLD CHISEL Set</b>	10
12.	<b>STEEL TAPE</b>	20

13.	<b>Mason's Spirit Level</b>	20
14.	<b>STEEL RULE</b>	20
15.	<b>ELECTRIC DRILL MACHINE</b>	1
16.	<b>SCREW DRIVER SET</b>	20
17.	<b>Trowel (200-280 mm long steel)</b>	20
18.	<b>Mortar Pan</b>	20
19.	<b>Shovel with handle</b>	10
20.	<b>HACK SAW</b>	10
21.	<b>Bench Vice</b>	5
22.	<b>BALL PEIN HAMMER Set</b>	10
23.	<b>CLAW HAMMER</b>	10
24.	<b>FILES Set</b>	10
25.	<b>SCISSORS</b>	10
26.	<b>CENTRE PUNCH</b>	10
27.	<b>MELTING POT</b>	4
28.	<b>Ladle</b>	5
29.	<b>PIPE YARNING AND CAULKING TOOLS</b>	10
30.	<b>DRAIN CLEANING RODS</b>	2
31.	<b>Oil Cane</b>	10
32.	<b>DRILL/BIT SET</b>	2
33.	<b>Complete Set of Bath Room Fitting</b>	2
34.	<b>Complete set of Bath Sanitary Fixture</b>	2
35.	<b>HYDRAULIC BENCH</b>	2

36.	<b>METACENTRIC HEIGHT MEASURING APPARATUS:</b>	2
37.	<b>HYDROSTATIC PRESSURE APP.</b>	2
38.	<b>VENTURIMETER APP.</b> <b>Compatible with Hydraulic Bench.</b>	2
39.	<b>MANOMETER (U-TUBE)</b>	2
40.	<b>FLOW OVER WEIR APPARATUS</b> <b>Complete compatible with hydraulic bench.</b>	5
41.	<b>PITOT TUBE</b>	5
42.	<b>Energy losses in pipe Apparatus</b>	2
43.	<b>CURRENT VELOCITY METER</b>	1
44.	<b>WATER HARDNESS TEST APPARATUS:</b>	2
45.	<b>Turbidity Test Apparatus</b>	2

## e) Computer Lab

**(Computer Application / Auto CAD, Advanced Quantity Surveying and Construction Planning)**

(For class of 50 students)

Sr. No.	Name of Item with Specifications	Qty
1	Computer latest model Server	01
2	Computer latest model work stations	51
3	Laptop computer	01
4	Net working	01 set
5	UPS 2000 Watt with batteries	10
6	Multimedia Projector	01
7	Scanner for A-3 paper	01
8	Printer LaserJet	01
9	Plotter LaserJet A-0 Size	01
10	<b>Computer Chair (will be added in furniture portion)</b> Without arm rest – 5 legs base	<b>51</b>
11	<b>Computer Table (will be added in furniture portion)</b> 2½ x 2 x 2½	<b>51</b>
12	<b>License software for education Latest Versions</b> Auto CAD Civil 3D, 3D MAX Prima Vera M.S Office Antivirus Microsoft windows	<b>50</b> <b>50</b> <b>50</b> <b>50</b> <b>50</b> <b>50</b>

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**Drawing Hall / DRAFTING LAB**

Sr. No.	Name of Item with Specifications	Qty
1)	<b>Drafting Table</b> Portable (Taper Type) Table size 32" x 24"	51
2)	<b>Instruments Box</b> Special Compass Set	05 Set
3)	<b>Tee Square</b> (600 mm) Transparent	05Set
4)	<b>Set Square</b> Transparent medium size (300 mm)	05 Set
5)	<b>Templates</b> Circle Square, Hexagon, Triangle (03 each)	02 Set
6)	<b>French Curves</b> Good Quality, medium size	02 Set
7)	<b>Clutch Pencil</b> (0.5 mm)	12
8)	<b>Eraser</b>	12
9)	<b>Sharpener Machine</b>	05
10)	<b>Portable Drawing Board</b> (3'x2' with scale)	05
11)	<b>Drafting Machine Elbow type</b> Table size Ao complete with all accessories	01
12)	<b>Drafting Table with high level stools</b>	50

<b>TOOLS &amp; EQUIPMENT LIST</b>		
<b>WORKSHOP PRACTICE: ELECTRICAL WIRING</b>		
Sr. #	EQUIPMENT / INSTRUMENT	QUANTITY REQUIRED (Nos.)
1.	3-Phase Electric Motors	10
2.	3-Phase Energy Meter	10
3.	AVO Meters	15
4.	Clamp on Meter	15

5.	Cold Chisels 10" Long	10
6.	Combination Pliers 8"	15
7.	Electric Bells	50
8.	Fluorescent Tubes (with electric choke) Complete	50
9.	Hack Saws 15"	50
10.	Hand-Drill Machine Electric Two Speeds 3/4" Chuck Heavy Duty	10
11.	Kerosene Burners	10
12.	Long Nose Pliers 6"	25
13.	Megger/Insulation Tester	10
14.	Main Switch 3-Phase	50
15.	Main Switch Single Phase	50
16.	Masonry Drill Bit Set	50
17.	Masonry Hand Bit	25
18.	Phase Testers	25
19.	Plumb Bobs	12
20.	Rip Saw 12"	12
21.	Rough Cut File 12"	10
22.	Screw Driver Sets	30
23.	Screw Drivers 12"	30
24.	Side Cutter 6"	30
25.	Single-Phase Electric Motors	25
26.	Single-Phase Energy Meter	10
27.	Small Hammers	15
28.	Smooth Files 12"	10
29.	Spirit Levels 15"	25
30.	Two-way Switch	30
31.	Wiring Boards 3' x 5' Wall Mounted	20
32.	Wood Chisel 1"	5



33.	Work Benches 4' x 6' x 2.5'	15
<b>ADDITIONAL EQUIPMENT REQUIREMENT (OPTIONAL)</b>		
1.	Air Conditioners	2
2.	Circuit Breakers	30
3.	Electric Ballasts (40 W)	50
4.	Panel Board	25

WOODWORKS LABORATORY		
SR. #	EQUIPMENT / INSTRUMENT	QUANTITY REQUIRED
1.	Adjustable Wrench 8"	10
2.	Adze (Tessa) 1 kg	10
3.	Auger Bits 1/2"	15
4.	Block Plane	10
5.	C Clamps 10"	10
6.	Combination Square 12"	15
7.	Cross Cut Saw 18"	25
8.	Electric Drill Chuck Size 1/2" 220 V	10
9.	Flat Chisel 1/2"	25
10.	Hack Saw 15" With Handle	25
11.	Inside Callipers 8"	10
12.	Jack Plane (Stanley) 14"	25

13.	Jointer Plane	10
14.	Key Hole Saw 12"	15
15.	Mallets Wooden	25
16.	Marking Gauge	25
17.	Measuring Tapes 3 m	25
18.	Nail Puller 18"	10
19.	Oil Stone	20
20.	Outside Calipers 8"	10
21.	Pliers 8"	25
22.	Ratchet Brace	5
23.	Rebate Plane	10
24.	Rip Saw 18"	20
25.	Screw Drivers Flat 10"	20
26.	Smoother Plane 9"	20
27.	Surface Plate 24 x 18	5
28.	T Bevel 12"	10
29.	Tennon Saw 15"...	20
30.	Tri Square 30 cm. Steel	25
31.	Triangle File 5"	25
32.	Triangle File 6"	25
33.	Work Benches	10
34.	Bench Vices	25
<b>ADDITIONAL EQUIPMENT REQUIREMENT (OPTIONAL)</b>		
1.	Electric Circular Saw	2

2.	Electric Planer	2
3.	Electric Hand Planer	2

**CONSUMABLE MATERIAL REQUIRED FOR 50 STUDENTS.**

BASIC CIVIL ENGINEERING SURVEYING		
Wooden Pegs	1"x1"x4"	30 Nos.
Wooden Pegs	1"x1"x6"	30 Nos.
ENGINEERING MATERIALS & CONSTRUCTION TECHNIQUES		
Bricks		2000 Nos.
Cement		20 Bags
Coarse Aggregates		500 Cft
Distemper		10 Litres
Knotting & Lashing Rope		50 Yards
Lime		100 Kg
Paint		10 Liters
Sand		500 Cft
COMPUTER APPLICATIONS		
Cartridge Ink		4 Set
CDs		50 Nos.
Paper	8 1/2"x11"	5 Reams

Paper	11"x17"	5 Reams
Paper	Legal	2 Reams
Ribbons LQ 2170		4 Nos.
Toners Printers		4 Nos.
<b>PUBLIC HEALTH TECHNOLOGY</b>		
GI Pipe		100 Sq.ft
GI Pipe Special		12 Nos.
Lime		10 Kg
Cement		2 Bag
Jute		2 Kg
Plumbing Fixtures each type		1 No.
Rubber Rings		5 Kg
Sand		10 C. ft
GI, CI, PPRC, Specials each type and size		25 Nos.
<b>Advanced Civil Engineering Surveying</b>		
Lime		40 Kg
Pegs	1"x1"x4"	30 Nos.
Pegs	1"x1"x6"	30 Nos.
<b>ADVANCED CONSTRUCTION TECHNIQUES</b>		
Bitumen		20 Kg

Bricks	2000 Nos.
Cement	20 bags
Chalk	5 Sq.ft
Luminous Slip	5 Sq. ft
Lime	10 Kg
Sand	200 Sq. ft
Sand Dust	1 Kg
Stone Crush	300 Sq.ft

CIVIL ENGINEERING DRAWING & AUTO CAD		
Ammonium Liquid		2 Liters
Sensitized Paper		1 Ream
Tracing Paper		1 Ream
Printer Toner		1 No.
Printer Paper A2 size		1 Ream
Printer Paper Legal size		1 Ream
ENGINEERING MECHANICS		
Aluminum Sheet	1 sq. ft x 1/8"	1 No
Mild Steel Sheet	1 sq. ft x 1/8"	1 No
Copper / Brass Plates	1 sq.ft x 1/8"	1 No
Steel Bars	1/2" Dia	3 Kg

Steel Bars	3/8" Dia.	2 Kg
<b>CONCRETE TECHNOLOGY AND R. C. C. DESIGN</b>		
Cement		10 Bag
Sand		100 Cft
Stone Crush		100 Cft
<b>TRANSPORTATION ENGINEERING</b>		
Bitumen		5 Kg
Stone Crush	1- 1/2"	100 Cft
Stone Crush	3/4"	100 Cft
<b>Civil-314: Construction Project Planning &amp; Management</b>		
Limes		10 Kg
Papers	A4 & A3	4 Reams
<b>WOOD WORKS LABORATORY</b>		
SR.#	NAME OF ARTICLE	QUANTITY
1.	Deodaa Wood for Wooden Joints	50 ft
2.	Fire Fighting Safety Equipment (Fire Extinguishers and Safety Care, etc.)	1 Set
3.	Glue 5 Kg	6
4.	Kail Wood for Door & Frame	50 ft
5.	Kerosene Oil	10 Liter.

6.	Lubricating Oil / Grease	10 Liter.
7.	Nails 1", 1.5", 2", 3" (2 Kg each)	8 Kg
8.	Over all / Apron for Trainees	25
9.	Safety Shoes for Trainees	25 pairs
10.	Screw ¾", 1", 1½", 2" (2 Packets each)	12 packets
11.	Sheshum Wood	50 ft
12.	Veneer Board (4" x 8' x ¾")	10
<b>ELECTRICAL LABORATORY</b>		
SR.#	NAME OF ARTICLE	QUANTITY
1.	Cable 3/0.029, 7/0.029, 7/0.036, flexible, single core, double core each	3 Roles
2.	Fire Fighting Safety Equipment (Fire Extinguishers and Safety Care, etc.)	1 Set
3.	Wiring accessories( switch, sockets, boards of sizes, bulb holders, dimmer, Ceiling rose, indicators, breakers, main switches, two way switch, change overs, regulators, cleats, clips, insulation tape, screws of sizes, steel nails etc	50 each
4.	pipes, casing and capping, batten each	200 ft
5.	bulbs, tube lights, energy savers,	20 each

**NAMES OF REVISION COMMITTEE MEMBERS**

Sr #	Name	Designation	Organization	Contact / E.Mail
1	Engr. Mazher Abbas Naqvi	Principal	Govt. Staff Training College Faisalabad	0333-8005301 <a href="mailto:gstcfsd@yahoo.com">gstcfsd@yahoo.com</a>
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8	Mr. Muhammad Afzal Gondal	Chairperson	Gondal Pre-casting, GT Road, Gujrat	0300-4000070 <a href="mailto:gondalgroup@hotmail.com">gondalgroup@hotmail.com</a>



**Recommendations by TEVTA Curriculum Review Committee for DAE Civil**

1. The task for reviewing the following subjects may be assigned to the experts having relevant qualification as per the requirements of further education awarding bodies:
  - a. Islamiat and Pakistan Studies
  - b. English
  - c. Applied Mathematic-I and II
  - d. Applied Chemistry
  - e. Applied Physics
  
2. Merging of the subjects of Civil 332 Environmental Technology and Civil 371 Occupational Health and Safety Environment is suggested and renamed as “Civil 332 Environment, Health and Safety” and experts may be hired for its further improvement.
3. New subject Civil 271 Entrepreneurship is introduced to create concept of self-employability in students and encourage them for the purpose.
4. Primavera P6 is included in Civil 312 Project Management. Also Project is also merged in this subject with a new name as Civil 314 Construction Project Planning & Management.
5. New topics in Construction, Mechanics, and Transportation etc. have been added as per the need of the construction industry.
6. To reduce the cost of infrastructure, some labs have been merged in to a single one. But separate labs are necessary where more than 4 groups of students are enrolled in a single shift.
7. Technical teachers are eligible to teach civil related subjects with relevant computer course e.g. AutoCAD, AutoCAD Civil 3D, Primavera, 3D Max.